Introduction

The role of impact analysis is to "fairly, objectively, and candidly display the projected impacts of each alternative" (NPS 2004). The potential impacts of each alternative on the environment are analyzed for each of the impact topics or subtopics discussed in Chapter 3. For each of the impact topics, an indicator or a suite of indicators is chosen for analysis based on U.S. Department of Interior (DOI) NEPA-related guidance, CEQA significance criteria, laws, regulations, policies, and local ordinances. In using indicators, CEQ requests that impacts be quantified as much as possible and described in terms of their context, duration, and intensity, which are described more below (NPS 2001). In addition, impacts must include not only direct impacts from project implementation, but indirect and cumulative impacts: these are impacts that are either indirectly associated with implementation of the proposed project or that result from actions taken outside the proposed project that affect the same resources as the proposed project.

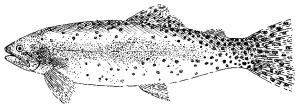
In addition to presenting the analysis of impacts, Chapter 4 describes the methodology used to evaluate potential impacts from the No Action and four action alternatives. The chapter first outlines a general methodology common to all impact topics and a list and short description of projects that will be considered during the cumulative impacts analysis. It then discusses the methodology specific to each impact topic addressed in Chapter 3 (e.g., Air Resources, Water Resources, Public Health and Safety).

Within each impact topic, the specific methodology used for evaluating impacts to the resource or public or social service is detailed, which includes any additional discussion of regulations, laws, policies, or ordinances needed to understand the framework for evaluation. An introduction to the relevant regulations, laws, policies, and ordinances often used to frame the description of the Affected Environment impact topics can be found in Chapter 3 for most of the impact topics. The impact topic methodology section also incorporates a description of the indicator or suite of indicators used to evaluate impacts, the assumptions used in evaluating impacts, the relevant context or contexts for the indicator or indicators used, and the specific thresholds used to assess intensity.

The impacts analysis section then assesses the potential impact of the No Action alternative and four action alternatives on each resource or service using the indicator or indicators discussed, characterizing the intensity, duration, and context of the impacts, as well as indicating whether they are direct or indirect. If measures, such as standardized best management practices (BMPs) for example, are mandatory or are certain to be implemented, impacts are analyzed assuming the measures are in place. These mitigation measures are described in Chapter 2. However, if mitigation depends on funding, permits or other decisions that are not absolute, impacts are analyzed both with and without mitigation in place. CEQA requires that mitigation measures must be fully enforceable to reduce an impact below the level of significance.

These impacts are then assessed relevant to other ongoing or reasonably foreseeable future projects within the local region or other appropriate frame of context to determine cumulative impacts to the resource or impact topic. The information for each impact topic is then summarized in a conclusions section.

Park Service policy also requires that sustainability and the long-term management implications of the proposed project be evaluated. This section evaluates: 1) The relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity; 2) Any irreversible or irretrievable commitments of resources that would be involved if the proposed project were implemented; and 3) Any adverse major impacts that could not be avoided or fully mitigated if the proposed project was implemented. In addition, CEQA mandates disclosure of: 1) Significant environmental effects which cannot be avoided if the proposed project is implemented and 2) Significant irreversible environmental changes which would be involved in the proposed project should it be implemented; as well as 3) Growth-inducing impact of the proposed project.



General Methodology for Assessing Impacts

National parks are directed to assess the extent of impacts on resources and services as defined by the context, duration, and intensity of the effect. For the purposes of the proposed project, which incorporates both Park Service and State lands, potential impacts are generally described in terms of the nature of the impact (Are the effects beneficial or adverse?), duration (Are the effects restricted to the construction period, relatively short-term, or long-term?), intensity (Are there no effects or would effects be negligible, minor, moderate, major, or constitute impairment of park resources), type of impact (Are the effects direct, indirect, and/or cumulative?) , and context (Are the effects restricted to the Project Area, local community, watershed, region, or supraregional or spanning larger regions or many regions; Table 22). Because definitions of intensity (negligible, minor, moderate, major, or impairment) and context (Project Area, local community, watershed, regional, etc.) vary greatly by impact topic, more detailed intensity and context definitions are provided separately for each impact topic analyzed in this document. A more detailed description of these categories and the general methodology for impact analysis can be found below.

Baseline Conditions

The use of the word, "change," implies a change relative to some existing condition. The change or impact potentially caused by the proposed project is typically evaluated relative to the baseline condition. For an EIS or EIR, baseline conditions are typically described as the conditions within the Project Area at the time the Notice of Intent and/or Notice of Preparation is issued. A general description of baseline conditions can be found in Chapter 2. A detailed description of resources and services in the Project Area and vicinity is the subject of Chapter 3 and the basis for evaluating potential impacts for implementation of the No Action or any one of the four action alternatives.

Nature of Impacts

Impacts from the proposed project can either be ***Beneficial*** by enhancing or improving resource values or social values and services or ***Adverse*** by degrading or lessening resource values or social values and services. Some actions can have both adverse and beneficial impacts. In addition, in some cases, the change would be considered neutral or not really beneficial or adverse. These neutral impacts are not evaluated in Chapter 4.

Intensity of Impacts

In a sense, the evaluation of the intensity of impacts represents one of the most important parts of Chapter 4, NEPA and CEQA approach the issue somewhat differently.

TABLE 22. GENERAL METHODOLOGY FOR ASSESSING IMPACTS

Nature	Describes the nature of the impact's overall effect on the environment. Nature is generally described as: *Beneficial* (enhancing or improving resource values or social services and values); or *Adverse* (lessening or degrading resource values or social services and values). Some projects may effect change that is considered to have a neutral impact or a change that would be considered neither beneficial nor adverse. These neutral changes are not evaluated in Chapter 4.
Intensity	Describes the degree to which an impact would affect a given resource or service. For the proposed project, impacts are generally described as: *No impact* (causing no change); or *Negligible* (causing no measurable change or change that is barely detectable and often within the natural range of variability); or *Minor* (causing small, but detectable or measurable change); or *Moderate* (causing apparent or appreciable change); or *Major* or Substantial (causing striking, highly-noticeable change. Often considered a "significant" effect under CEQA); or *Impairment* (causing substantial change to park resources that violates conditions of the Organic Act or park legislation: relevant to Park Service lands only).

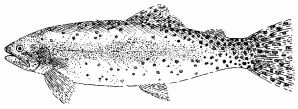


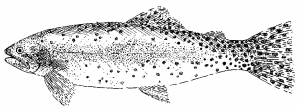
TABLE 22. GENERAL METHODOLOGY FOR ASSESSING IMPACTS

Duration	Describes the length of time that an impact would affect a given resource. Many impacts can occur over multiple timeframe or duration periods. Duration is generally described as: *Construction* (restricted to the construction period only); or *Short-term* (restricted to a two- to three-period only); or *Long-term* (continuing beyond two to three years).
Type	Describes the type of relationship between the proposed project and the impact. Type is generally described as: *Direct* (actions of the proposed project would directly effect this change); or *Indirect* (actions of the proposed project would not effect this change, but would enable change to occur, or change would occur later in time, or farther in distance than the actions); and/or *Cumulative* (actions of the proposed project would have an additive effect with the actions of other past, ongoing, or reasonably foreseeable future projects).
Context	Describes the geographic context in which the impacts will be evaluated. Impacts may be evaluated using one or multiple contexts. Context is generally described as: *Project Area* (limited to the Project Area); and/or *Local Community* (extending beyond the Project Area to the neighboring human communities in southern Tomales Bay); and/or *Watershed* (extending beyond the Project Area and southern Tomales Bay to encompass the entire Tomales Bay watershed); and/or *Regional* (extending beyond the Tomales Bay watershed to encompass 1) the entire park; OR 2) coastal Marin County; OR 3) the entire Marin County; OR 4) entire San Francisco Bay area (this can include Critical Habitat Recovery Units for certain special status wildlife species); and/or *Supraregional* (extending beyond the San Francisco Bay area to either the entire state or coastline of California or some multijurisdictional range for a special status species, etc.).

Under NEPA, this evaluation provides information on the intensity or degree of impacts that have been determined through earlier review to be potentially significant and is relevant to the choice of a particular NEPA "pathway" (e.g., Environmental Assessment or EIS). Under CEQA, this analysis enables the CEQA lead agency to determine whether an impact on the environment will be significant or less than significant on the environment. The *State CEQA Guidelines* defines "significant effect on the environment" as: "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance" (*Guidelines* Section 15382). Under both NEPA and CEQA, the potential for significant impacts on the environment or human environment trigger a more detailed evaluation and analysis of a proposed project through preparation of an EIS or an EIR, however, for CEQA, only ***adverse*** changes require preparation of an EIR, while, under Department of the Interior (DOI) NEPA guidelines, both potentially significant adverse **or** beneficial changes may require preparation of an EIS.

In determining significance of impacts, many CEQA documents such as EIRs generally categorize impacts are "significant" or "less than significant" based on stated significance criteria. As noted above, CEQA defines significance as a substantial or potentially substantial adverse change on the environment. CEQA has developed criteria that should be considered in determining whether the proposed project will have an effect on the environment, such as *Guidelines* issued both by the state and the County of Marin. However, within these guidelines, the definition of significant in terms of what is a "substantial" or significant effect has been left to lead agencies to determine. In CEQA, the point at which an impact goes from being less than significant to significant is called a threshold of significance. The threshold of significance is either a quantitative or qualitative standard, or set of criteria, pursuant to which the significance of a given environmental effect may be determined (OPR 1994). Under CEQA, significant impacts can be mitigated through measures designed to avoid or reduce the level of impact to less than significant. Those significant impacts that cannot be mitigated to a level that is less-than-significant are discussed under the "Avoidable and Unavoidable Major or Significant Adverse Impacts" section.

CEQ, which regulates implementation of NEPA, does not use significance other than to determine the appropriate NEPA pathway. DOI provides general criteria to guide evaluation during early planning stages of whether a proposed project might "significantly affect the quality of the human environment." To determine whether impacts might be significant, an identified threshold of significance can be used such that proposed projects whose impacts potentially fall above the established threshold would be considered to have potentially significant effects (Bass et al. 2001). Once the potential for a significant effect is determined to exist, significance is no longer used to evaluate specific impacts. Rather, the Park Service documents typically incorporate a fairly broad range of evaluation criteria or impact thresholds to determine the level or intensity



of an effect, ranging from negligible or barely detectable change to major or striking or highly apparent change.

Because this document must satisfy both NEPA and CEQA requirements, impacts will be analyzed using a broad range of evaluation criteria or impact thresholds, with the level or an intensity of effects ranging from negligible to major or substantial change. For each impact indicator, the intensity of effect associated with a substantial or significant impact under CEQA will be identified. Some agencies establish standard thresholds that are used for environmental compliance for all agency projects. Because considerations of intensity and context vary widely from park to park and even between projects within parks, the Park Service does not necessarily encourage parks to develop standardized impact thresholds. The CSLC has also not adopted thresholds.

Even when there are no standardized thresholds, the Park Service encourages project proponents to develop impact thresholds or evaluation criteria for individual projects to assist in analyzing the intensity of impacts for resource topics being evaluated. For this project, then, evaluation or significance criteria were specifically developed for indicators under each impact topic using information from a variety of sources. These sources included federal, state, and local regulations, laws, and policies; consultation with subject matter experts; best professional judgment of document preparers; and thresholds established for other Park Service projects, wetland restoration projects in the region and state, and local projects that are not necessarily wetland-related.

Evaluation or significance criteria may be based on standards such as the following:

- A health-based standard such as air pollutant emission standards, water pollutant discharge standards, or noise levels.
- Service capacity standards such as traffic level of service, water supply capacity, or waste treatment plant capacity.
- Ecological tolerance standards such as physical carrying capacity, impacts on declared threatened or endangered species, loss of prime farmland, or wetland encroachment.
- Cultural resource standards such as impacts on historic structures or archaeological resources.
- Other standards relating to environmental quality issues, such as those listed in the Guidelines' Initial Study Checklist or Appendix G of the Guidelines.

The DOI NEPA Guidelines encourage development of impact thresholds or evaluation criteria that are "based to the extent possible on scientific and factual data" and legal standards and policies (NPS 2004). Criteria may be either qualitative or quantitative, although impacts should be quantified as much as possible (NPS 2004). Some effects, such as traffic or noise, lend themselves to numerical standards; others, such as aesthetics are difficult to quantify and may rely more upon qualitative descriptions. In addition, qualitative standards may be used when available information is not sufficient enough to warrant use of numerical standards or to be able predict quantitatively the outcome should a particular alternative be implemented.

In this document, evaluation or significance criteria are generally based on the following analytical approaches:

- *Change/Trend*: The degree to which existing levels or areal extent of a particular resource might change should the proposed project be implemented and the direction of that change (i.e., increase, decrease).
- *Target/Threshold*: Effects of the proposed project on a particular resource relative to a target or threshold. Target or threshold numbers may derive from regulations, laws, or policies (e.g., water quality objectives in the RWQCB Basin Plan or acreage “triggers” in regulations governing impacts to wetlands and riparian habitat) or more subjective evaluation of the threshold at which significant impacts might occur (e.g., degree of flooding relative to existing conditions). Some of the target/threshold criteria may assess the project in relation to existing conditions of a particular resource or resource issue such that the focus is on the proposed project’s contribution to the total “load” or whether implementation of the proposed project would add to existing levels such that a threshold might be crossed (e.g., water quality objectives, flooding, salinity intrusion into municipal groundwater wells, etc.).
- *Qualitative*: When quantitative thresholds are not available or do not make sense, changes that might result from the implementation of the proposed project are discussed in a qualitative rather than in a quantitative or semi-quantitative manner.

Impairment

For Park Service lands, another criterion is evaluated, which is the potential for impairment of park resources. The Park Service Management Policies (NPS 2001) require an analysis of potential effects of proposed projects to determine whether or not actions would impair park resources identified as a Park Service goal or in enabling legislation or as key to integrity of the park.

The fundamental purpose of the national park system, as established by the Organic Act and reaffirmed by the General Authorities Act, begins with a mandate to conserve park resources and values.

The Organic Act of 1916 states that the Park Service:

> *…shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations…by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein…*

Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible Park Service manager, would harm the integrity of park resources or values.

An impact to any park resource or value may constitute impairment, but an impact would be more likely to constitute impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- Identified in the ***Organic Act***;
- Necessary to fulfill specific purposes identified in the ***establishing legislation*** or proclamation of the park;
- Key to the natural or cultural ***integrity of the park***; or
- Identified as a ***goal in the park's general management plan*** or other relevant Park Service planning documents.

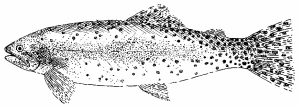
In general, potential for impairment is evaluated for cultural and natural resources and especially values which parks were specifically established to protect, such as the pastoral landscape. Impairment may also be considered for visitor experience when the condition of the resource directly affects the nature of the visit to the park. The Park Service does not address impairment with regards to operations, public health and safety, socioeconomics, and other non-resource topics.

Enabling legislation for the Seashore and for the GGNRA make clear reference to the natural historic, scenic, and recreational values of this portion of the central California coastline. The GGNRA was established by Congress "in order to preserve for public use and enjoyment certain areas of Marin and San Francisco Counties, California, possessing outstanding natural, historic, scenic, and recreational values, and in order to provide for the maintenance of needed recreational open space necessary to urban environment and planning…(PL 92-589)." The north district of the GGNRA is administered by the Seashore. The Seashore was established by Congress "to save and preserve, for the purpose of public recreation, benefit, and inspiration, a portion of the diminishing seashore of the United States that remains undeveloped" (PL 87-657).

Impairment may not be allowed to occur from Park Service activities in managing the park, visitor activities, or activities undertaken by contractors and others operating in the park.

The following steps were taken to determine whether the alternatives had the potential to impair park resources and values:

1. The park's enabling legislation, the *General Management Plan,* and other relevant background were reviewed with regard to the unit's purpose and significance, resource values, and resource management goals or desired future conditions.



2. Management objectives specific to resource protection goals at the park were identified.
3. Criteria were established for each resource of concern to determine the context, intensity and duration of impacts, as defined above.
4. An analysis was conducted to determine if the magnitude of impact reached the level of "impairment," as defined by Park Service Management Policies.

Mitigation

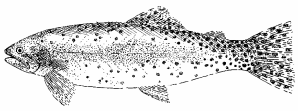
Mitigation measures are actions undertaken to avoid, reduce, or offset identified adverse impacts. NEPA requires that an EIS must include a discussion of the "means to mitigate adverse environmental effects" (40 CFR 1502.16(h)). In an EIS, mitigation measures must be discussed for all impact intensities, major or otherwise. CEQA requires that significant adverse impacts must be mitigated. As noted earlier, significant impacts for the preferred alternative that, for some reason, cannot be mitigated to a level of insignificance are considered significant and unavoidable and discussed in a separate section of this chapter, "Avoidable and Unavoidable Major or Significant Adverse Impacts section" (State CEQA Guidelines 15126.2(b). CEQ and State CEQA Guidelines recommend consideration of five types of mitigation measures: avoiding, minimizing, rectifying, reducing, and compensating (40 CFR 1508.20; State CEQA Guidelines 15370). Mitigation measures that are mandatory to implementation of the proposed project are discussed in Chapter 2 and include Best Management Practices or BMPs to avoid, minimize, or reduce the impact from construction. Optional mitigation measures that are subject to further discussions with regulatory agencies, etc., are discussed in this chapter. In some cases, measures to avoid or reduce potentially adverse impacts were incorporated into the design of the alternatives and are not specifically identified as mitigation measures.

Duration of Impacts

For projects such as the one proposed, impacts from implementation can generally occur over three timeframes. Implementation or ***Construction*** generally has its own unique set of impacts that are limited to the construction period, such as noise or traffic potentially generated by construction equipment. Within the first few years after implementation, the Project Area would be in a disturbed state from recent construction even though the earthwork portion would have ended. During this ***Short-Term*** period, the potential for certain types of impacts might be higher due to the fact that vegetation has not had enough time to recolonize within portions of the Project Area disturbed by earthwork activities. The potential for these short-term impacts decreases considerably after the first few years***. Long-Term*** impacts are those associated with what might be considered equilibrium or design conditions in the Project Area after earthwork-related and short-term disturbance conditions have passed. ***In general, if impacts would potentially occur during all duration timeframes, but potential impacts during construction or shortly after construction would not differ from long-term ones, construction and short-term impacts are not separated from long-term ones***.

Type of Impacts

Both NEPA and CEQA require the consideration of direct, indirect, and cumulative impacts that might result from the proposed project. ***Direct*** impacts are those that occur at the same time and location as the proposed project. For example, excavation of sediment as part of the proposed project removes soils and alters topographic resources, which would be the direct impacts. Conversely, ***Indirect*** impacts are those actions that occur later in time or are located at a distance from the proposed project. For example, sediment that falls into adjacent waters can increase turbidity thousands of feet downstream of the proposed project, and projects that increase visitor facilities can indirectly encourage growth-inducing impacts that occur later in time. For many projects, indirect effects are often ones that are related to changes in land use patterns, population density, or growth rate that may subsequently affect air, water, and other natural systems (Bass et al. 2001). If there is uncertainty regarding future land use, agencies are not required to speculate regarding future uses, but to make an educated decision based on "reasonably foreseeable occurrences" (Bass et al. 2001). ***Cumulative*** impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Under the State CEQA Guidelines, cumulative impacts refer to two or more individual affects which, when



considered together, are considerable or which compound or increase other environmental impacts (State CEQA Guidelines 15355). Cumulative effects are discussed in more depth later in this chapter.

Context of Impacts

The geographic area or boundary in which impacts to a particular resource or service are pertinent and need to be evaluated varies considerably among impact topics. For the proposed project, several general contexts were identified, which included the ***Project Area*** (the Giacomini Ranch, Olema Marsh, and portions of the undiked marsh north of the Giacomini Ranch); the ***Local Community*** (towns of Point Reyes Station, Inverness Park, Olema, and northern portion of the Olema Valley); ***Watershed*** (the entire Tomales Bay watershed stretching from the highest elevations of the Coast Range to the mouth of Tomales Bay and the Pacific Ocean); ***Region*** (varies from the Seashore and the north district of the GGNRA to Marin County to the entire San Francisco Bay region); and ***Supraregion*** (encompassing either the state, portions of the state of California such as central California, or ranges for wildlife and plant species). In certain instances, impacts to resources are considered from several contextual levels such as Project Area and watershed.

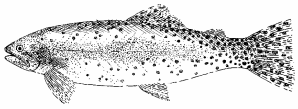
Projects Considered in Cumulative Impacts Analysis

While this document focuses on the Giacomini Wetland Restoration Project, specifically on the proposed actions and their impacts, ultimately, the effects of the proposed actions on physical, natural, and socioeconomic resources are integrally tied to the effects of other proposed projects and cannot be evaluated without considering the cumulative effect of relevant actions. A cumulative effect is "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions." Under the State CEQA Guidelines, cumulative impacts refer to two or more individual affects which, when considered together, are considerable or which compound or increase other environmental impacts (State CEQA Guidelines 15355). Cumulative effects may be the result of multiple, individually minor actions that aggregate to produce an adverse result over a period of time (40 CFR Sec. 1508.27), and a significant impact may exist if an action is related to other actions that have individually insignificant, but cumulatively significant, impacts (40 CFR Sec. 1508.27[b][7]). Cumulative effects may exert additive impacts on a resource or service, or effects may be synergistic (i.e., multiplicative or non-linear in cumulative effect) or even to some degree offsetting with one project potentially benefiting and another impacting a resource.

NEPA and CEQA require agencies to analyze the potential of their proposed actions to contribute to any cumulative effects identified in the project region or other appropriate context. Because ***cumulative effect*** refers by definition to a combined effect, there is no cumulative effect on a resource unless more than one action affects that resource, or a single action or activity results in repeated, but discrete, effects on the resource. Accordingly, the first step in analyzing cumulative effects is to identify the resources that have the potential to be affected by more than one action or activity during the timeframe analyzed. Once the cumulative effects have been identified, a proposed action's potential to contribute to each can be evaluated.

This document used the "list" approach, in which the additive, synergistic, or offsetting effects of specific actions proposed for an area are considered as a whole. For most resources, this cumulative effects analysis addressed the Tomales Bay watershed, including Olema Valley, with the following exceptions:

- Effects on air quality were analyzed for the watershed and adjacent downwind portions of the Bay Area Air Quality Management District (BAAQMD);
- Effects on traffic were analyzed for the whole of Marin County; and
  Effects on wildlife and certain plant species were analyzed based on the localized portion of the range or distribution that might be affected. Range or distribution during critical portions of a wildlife species' life cycle, such as breeding, nesting, or rearing, were considered most important. The range or distribution analyzed varied among species, with the principal Regions of Influence being: 1) the entirety of the Seashore and north district of GGNRA, 2) the Marin-Sonoma County coastline, 3) Marin County, and 4) San Francisco Bay.



The analysis included planned or "reasonably foreseeable" actions slated for implementation within the next 5 years (through 2011). Past, present, and "reasonably foreseeable" future projects are listed in Table 23. Information from other planning documents prepared both by the Park Service and other agencies and organizations was used to help compile information on projects being planned or considered. In addition, information on wetland restoration projects in Marin and San Francisco Bay was obtained from the San Francisco Wetland Project Tracker database/GIS system (www.projecttracker.org), as well as environmental documentation prepared for individual projects. Numerous small wetland restoration projects are currently being planned in San Francisco Bay in counties other than Marin. For the purposes of this analysis, restoration projects formally listed that are outside Marin County are limited to the largest projects that would be more likely to have a cumulative effect on actions undertaken outside San Francisco Bay on the Marin County coastline. However, the cumulative effect of these projects on wildlife and plant species is taken into account.

TABLE 23. ACTIONS INCLUDED IN CUMULATIVE EFFECTS ANALYSIS

Action, Location, and Project Proponent	Overview
Bear Valley Creek Watershed Enhancement and Fishery Restoration Project (Bear Valley; Marin; Point Reyes National Seashore Association/ Coastal Conservancy/Seashore)	This action occurs directly upstream of Olema Marsh and the Project Area in the middle and upper portions of the Bear Valley Creek watershed. The proposed project would involve replacement of undersized and otherwise underperforming culverts with either new culverts or bridges. An enhancement plan is in the process of being prepared, with an Environmental Assessment (EA) expected in 2006-2007.
Residential Home Development; C Street, Point Reyes Station (Point Reyes Station; Marin)	While a project has not been proposed for the lands owned by the Giacomini Trust on C Street in Point Reyes Station directly adjacent to the Project Area, most of these parcels are zoned commercial-residential (CRAB-2). This action was considered to be a reasonably foreseeable action and was incorporated into the cumulative effects analysis. The total number of homes that could be potentially built on these lands is uncertain, but could total as many as 10 at maximum allowable buildout, although specific site circumstances could dictate decreased density.
Housing Development Project (Point Reyes Station, Marin; Pacific Artisans LLC)	Pacific Artisans LLC is proposing to develop four homes on a property located at the intersection of Pt Reyes-Petaluma Road and State Route 1. A fifth lot may be developed for low-cost housing. This site is located approximately 1.5 miles east of the Giacomini Ranch portion of the Project Area. The proposed project is in the planning and design phase.
North Marin Water District Adjunct Well Development (Point Reyes; Marin; North Marin Water District)	This proposed action would involve the construction of an additional well upstream of the Coast Guard wells to meet current demand, particularly during high tide periods in Lagunitas Creek when salinity intrusion events can occur. An exact location for this well has not been identified, although NMWD has strongly been considering further development of the existing emergency well at the Gallagher Ranch (Figure 37). The agency is currently seeking funding for this purpose.
Chicken Ranch Beach Wetland Restoration Project (Inverness; Marin; Environmental Action Committee/ Tomales Bay Watershed Council)	This proposed action would occur on the western edge of Tomales Bay near Inverness approximately 3 miles northwest of the Project Area. The proposed project would create a functioning, self-perpetuating wetland, maintain an accessible swimming beach, and improve the potential water quality problems that may exist within one of the drainages to this former lagoon that was filled through the influence of a number of disturbance-related factors. A restoration plan is in the process of being prepared.
Coastal Watershed Restoration -- Drake's Estero Road Crossing (Point Reyes, Marin; Seashore)	This action includes the replacement or enhancement of road crossing facilities to accommodate natural hydrologic process and fish passage at six sites within the Drakes Estero watershed. These sites are located approximately 4.5 miles northwest of the Project Area. The Finding of No Significant Impact (FONSI) was approved in October 2006. Implementation is anticipated in 2007.
Horseshoe Pond Restoration to Coastal Lagoon (Point Reyes, Marin; Seashore)	This action involved the removal of spillway and dam materials to restore natural hydrologic and shoreline process to a 35-acre area immediately west of the mouth of Drake's Estero. This site is located approximately 7.3 miles northwest of the Project Area. It also restored and enhanced the access road, borrow quarry, and former waste lagoon to more natural conditions. The project was implemented in 2004.
Glenbrook Dam/Quarry Restoration Project (Point Reyes, Marin; Seashore)	This action involves the removal of dam remains and restoration of the borrow areas at the mouth of Glenbrook Creek in the Estero de Limantour. This site is located approximately 4.2 miles northwest of the Project Area. Implementation is anticipated in 2007.

TABLE 23. ACTIONS INCLUDED IN CUMULATIVE EFFECTS ANALYSIS

Action, Location, and Project Proponent	Overview
Coastal Watershed Restoration – Geomorphic Restoration Project (Point Reyes, Marin; Seashore)	The project is intended to restore natural conditions and increase estuarine habitat at Point Reyes. At three sites – two near Limantour Beach and one at Glenbrook Creek -- construction across stream or estuarine habitat impedes natural process and is not consistent with long-term park and Park Service management objectives. The nearest of these sites is located approximately 2.9 miles west of the Project Area. An EA was released in fall 2004, and implementation is anticipated in 2007.
Sand, Rock, and Gravel Plan (Point Reyes, Seashore)	The Seashore has a number of quarries within the park that have been used by ranches for removing soils needed for ranch management. Because of the amount of land degradation, the Seashore is planning on restoring the quarries by either regrading the existing topography or rebuilding more natural topographic contours using imported soils. Compliance for actual restoration of the quarries will be undertaken in a separate environmental document.
General Management Plan Update (Point Reyes, Marin; Seashore)	The Seashore is currently in the process of updating its General Management Plan for the Seashore and the north district of GGNRA, specifically Olema Valley and Tomales Bay. This is a long-term strategic planning document that would establish management direction in the park for the next 10–20 years. Decisions made as part of that document have the potential to affect or to have a cumulative effect on the Giacomini project. The EIS is currently being prepared, and the planning process is expected to be complete by 2006-2007.
Lawson's Landing Master Plan (Dillon Beach, Marin; Lawson's Landing)	Lawson's Landing Campground and RV Park is in the process of preparing an EIR for master planning and expansion of the existing campground and RV Park. This facility is located approximately 14 miles from the Project Area at the very northern end of Tomales Bay. The project would involve construction of a septic system, new water tanks, and new buildings. The proposed project is currently in hiatus, but a new EIR may be prepared in the future.
East Shore Wastewater Improvement Project (Marshall, Marin; County of Marin)	The County is proposing to construct a community wastewater system to replace individual substandard and marginally operating septic systems for 91 currently developed commercial and residential properties in Marshall and to form a wastewater district. Marshall is located approximately 6.6 miles north of the Project Area in Tomales Bay. The County is currently conducting scoping for the proposed project.
Wetland and Creek Restoration at Big Lagoon (Muir Beach, Marin; GGNRA, County of Marin, Green Gulch Zen Center)	GGNRA is proposing a tidal wetland, riparian, and dune restoration project on lower Redwood Creek at Muir Beach. Muir Beach is located approximately 20.5 miles southwest of the Project Area. The project would eliminate or replace impediments to natural hydrologic processes such as bridges, berms, and earthen fill, thereby improving habitat for native habitats and wildlife. A draft EIS/EIR is currently being prepared, with possible implementation of the project in 2007.
Bolinas Lagoon Ecosystem Restoration Project Bolinas Lagoon Project (Cont.) (Bolinas, Marin; County of Marin, Corps)	In the late 1990s, the Corps in cooperation with the County of Marin proposed to dredge Bolinas Lagoon for the purposes of restoring this coastal ecosystem, which had been purportedly impacted by excessive sedimentation. Bolinas Lagoon is located approximately 12.4 miles southwest of the Project Area. Following public review of the draft document, the county assumed management of the project and began re-examining whether dredging for restoration was really necessary. A new EIS/EIR may be prepared in 2007.
Hamilton Wetland Restoration Project (Novato, Marin; Corps and Coastal Conservancy)	The Corps and Coastal Conservancy are proposing to restore tidal wetlands at the former Hamilton Army Airfield, adjacent CSLC property, and the Bel Marin Keys Unit V property on the western margin of San Francisco Bay. Hamilton is located approximately 17.4 miles northeast of the Project Area. Dredge material would potentially be used to restore wetland habitat on 988 acres at the Hamilton Airfield and CSLC property. A Final EIS/EIR and Supplemental EIS/EIR have been prepared.
Bahia Acquisition and Wetland Restoration Project (Novato, Marin; Marin Audubon Society)	Marin Audubon Society (MAS) is pursuing a 330-acre wetland restoration project at the Bahia property on the western margin of San Francisco Bay. Bahia is located approximately 15.2 miles northeast of the Project Area. The project is in the final phases of planning and should be implemented shortly.
Triangle Marsh (Corte Madera, Marin; Marin Audubon Society, Coastal Conservancy, BCDC).	MAS and the Coastal Conservancy are planning a 16-acre wetland restoration project at Triangle Marsh on the western margin of San Francisco Bay. The site is located approximately 21 miles southeast of the Project Area. This project is in the planning phase.

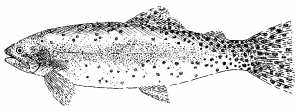


TABLE 23. ACTIONS INCLUDED IN CUMULATIVE EFFECTS ANALYSIS

Action, Location, and Project Proponent	Overview
Petaluma Marsh Expansion Project (Marin-Sonoma Counties; Marin Audubon Society, Coastal Conservancy)	MAS and the Coastal Conservancy are planning a 102-acre tidal marsh restoration project at MAS property in the Petaluma Marsh in north San Francisco Bay. Petaluma Marsh is located approximately 15 miles northeast of the Project Area. This project is in the planning phase.
Napa-Sonoma Marsh Restoration Project (San Pablo Bay, San Francisco Bay; Coastal Conservancy, Corps, California Department of Fish and Game)	The Coastal Conservancy, Corps, and California Department of Fish and Game (CDFG) are proposing a salinity reduction and habitat restoration project for the 9,460-acre Napa River Unit of the Napa-Sonoma Marshes Wildlife Area (NSMWA), formerly part of the Cargill Salt Pond operation in the North Bay of San Francisco. The site is located approximately 27 miles northeast of the Project Area. A Final EIS and EIR have been released, and the project is scheduled for implementation shortly.
South Bay Salt Pond Restoration Project (South San Francisco Bay; Coastal Conservancy; U.S. Fish and Wildlife Service, CDFG)	The State of California and the Federal government are conducting restoration of 15,100 acres of Cargill Salt Company's former salt ponds in South San Francisco Bay, which will be the largest wetland restoration project on the West Coast. The site is located approximately 62 miles southeast of the Project Area. Preparation of the draft environmental document is anticipated to begin in 2006, with construction starting in 2008.
Updated Marin Countywide Plan (County of Marin)	The County of Marin is currently in the process of updating the Marin Countywide Plan. The CWP is a general plan for the county that is used as a strategic document to guide decisions on development, land use, traffic, and other issues. A draft EIR has been released and should be finalized in 2006.

Resource-Specific Assessment of Impacts

Land Use and Planning – General Land Use

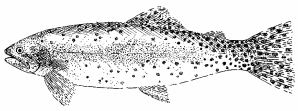
Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

Tomales Bay and the Point Reyes region falls within a complex, multi-jurisdictional region, with lands in a variety of ownership, including private, County, local water districts, state agencies (State Land Commission, state parks, Wildlife Conservation Board, CalTrans), and federal agencies such as the Park Service and the U.S. Coast Guard. Several agencies and organizations have established land use plans or guidance for development within this unincorporated portion of Marin County. These land use plans or guidances include the Point Reyes Station Community Plan, the Marin County Local Coastal Program (LCP) Unit II, the Marin Countywide Plan, and the Marin County Zoning Ordinance. In the Coastal Zone of California, LCPs actually supersede all local land use planning and take precedence over all other local policies and zoning on state, local, and privately owned lands. The Project Area falls within the Marin County LCP Unit II. On federal lands, projects are guided both by the LCP (Marin County Comprehensive Planning Department 1981) – as federal agencies must be consistent with the policies of the Coastal Act – and the General Management Plan (GMP). A description of these federal, state, and local policies can be found in Chapter 3 under Land Use and Planning.

Many of the policies regarding general land use have been directly incorporated into significance criteria established under both state and county CEQA guidelines.

General Assumptions and Methodologies

- Relevant policies differ depending on land ownership.
- Park Service lands, including the Giacomini Ranch and the southern portion of Olema Marsh, are subject to the LCP and GMP policies.
- State, local, and privately owned lands, including the undiked marsh north of Giacomini Ranch, the northern portion of Olema Marsh, White House Pool and Green Bridge County Parks, and most of Lagunitas Creek, are subject to the LCP, the Marin CWP, and, in some instances, the Point Reyes Station Community Plan.



- For each alternative, consistency with the relevant land use, zoning, and agricultural of policies is evaluated. Impacts were considered major under NEPA or substantial and significant under CEQA if the policy was violated.
- ***Certain policies relating to geologic hazards, streams, water quality, wetlands, riparian buffers, flooding, water supply and other public services, public access, visual resources, transportation, noise, and other subjects covered are evaluated under other focused impact topics***.

Specific General Land Use-Related Assumptions and Methodologies

- A number of relevant planning documents have established policies regarding general land use and development.
- In most cases, adherence to relevant policies is evaluated as a whole without individually evaluating specific policies (e.g., LCP policies on development).
- In specific instances, individual policies are evaluated separately, including, but not limited to, those policies that appear strongly relevant to the proposed project or are specific CEQA criteria.
- Depending upon the policy, either an expanded range of impact thresholds are provided (e.g., negligible through major criteria), or, for policies that appear to involve strictly compliance or no compliance, the range is collapsed to two or three criteria such as 1) no impact, 2) negligible/minor/moderate, and 3) major under NEPA or substantial under CEQA.

Described below are specific assumptions and methodologies for some of the impact indicators outlined in Table 24.

- *LCP -- Natural Resources on Federal Parklands*: Impact thresholds were scaled to encompass a range of activities expected to occur under existing management plans on federal parklands from activities expected to have barely detectable effects on parklands such as vegetation clearing associated with road and trail maintenance (negligible) to substantial activities such as large-scale controlled burns (major).
- *Community Station Plan – Increase Demand for Recreational Facilities*: Effects on demand in the local community for recreational facilities are evaluated under this impact indicator. Effects on existing recreational facilities are evaluated under Visitor and Resident Experience.
- *Community Station Plan -- Induce Substantial Growth*: Marin County has substantially lower overall growth rate (0.6 percent) in 2005 compared to many fast-growing counties in California that exceed 2 to 3 percent as a whole (California Department of Finance 2006). Because of this, impact thresholds were scaled to reflect growth rates only among Marin County cities, with Novato having the highest growth rates (1.4 percent), San Rafael and other cities showing slight increases (0.5-0.6 percent). A comparison of growth rates among other San Francisco Bay region cities suggested that Novato grew at a moderate pace in comparison to some other cities in the generally slow-growing San Francisco Bay region, including Dublin, Oakley, American Canyon, San Ramon, Emeryville, and Brentwood, which ranged from 3.0 to 9.1 percent growth in 2005 (California Department of Finance 2006). Point Reyes Station currently has 362 existing residential units and, based on zoning, there is potential for 326 additional residential units (Point Reyes Station Community Plan; Marin County Community Development Agency 2001). Based on the assumption of 2 percent being a high growth rate relative to other Marin County communities, proposed projects that would result in the addition of more than 7 new housing units would be considered a major effect under NEPA and a substantial effect under CEQA.
- *Community Station Plan -- Displace Existing Housing*: To maintain equitable standards of evaluation, potential displacement of existing housing was evaluated using the same impacts thresholds as inducement of substantial growth.

TABLE 24. LAND USE AND PLANNING- GENERAL LAND USE

Source: Seashore/north district GGNRA General Management Plan, LCP Zone II/CCC, Marin CEQA guidelines, Community Plan Nature: Beneficial, Adverse Context: Regional Duration: Long-Term
Seashore/north district GGNRA General Management Plan Context: Regional (Park Service lands)

TABLE 24. LAND USE AND PLANNING- GENERAL LAND USE

Would conflict with general policies of the GMP or constitute an impairment of land use standards.	No Impact/ Not Applicable	The proposed project would NOT affect GMP policies or land use standards established in enabling legislation; land use-related resources identified as critical to parks; or land use-related goals in Park Service management policies.
	Negligible/ Minor/ Moderate	The proposed project would NOT conflict with general policies of GMP or constitute an impairment of land use standards established in enabling legislation; land use-related resources identified as critical to parks; or land use-related goals in Park Service management policies park resources.
	Major	The proposed project would conflict with general policies of GMP.
Local Coastal Program Context: Regional (Zone II; Park Service, State, Local, and Privately Owned Lands)		
Would involve the modification or alteration of natural resources on federal parklands?	No Impact/ Not Applicable	The proposed project would NOT involve the modification or alteration of natural resources on federal parklands.
	Negligible	The proposed project would involve the alteration of natural resources on federal parklands, but impacts would be relatively negligible (<0.001 percent of the total park area or <1 acre) and would be related to such activities as vegetation clearing near existing roads and trails.
	Minor	Would involve the alteration of natural resources on federal parklands, but impacts would be relatively small (<0.01 percent of the total park area or < 8 acres).
	Moderate	Would involve the alteration of natural resources on federal parklands, but impacts would be relatively moderate (<0.1 percent of the total park area or < 80 acres)
	Major	Would involve the alteration of natural resources on federal parklands, and the impacts would be major (>0.1 percent of the total park area or ≥ 80 acres).
Coastal Resources and Planning Management Policies Context: Regional (Coastal Zone; Park Service, State, Local, and Privately Owned Lands)		
Would conflict with general policies on development in the Coastal Zone (Article 6)?	No Impact/ Not Applicable	The proposed project would NOT affect development in the Coastal Zone
	Negligible/ Minor/ Moderate	The proposed project would affect development in the Coastal Zone, but would comply with policies.
	Major or Substantial	The proposed project would affect development in the Coastal Zone and conflict with general policies on development.
Would conflict with general policies on industrial development in the Coastal Zone (Article 7)?	No Impact/ Not Applicable	The proposed project would NOT affect industrial development in the Coastal Zone.
	Negligible/ Minor/ Moderate	The proposed project would affect industrial development in the Coastal Zone, but would comply with policies.
	Major or Substantial	The proposed project would affect industrial development in the Coastal Zone and conflict with general policies on industrial development.
Point Reyes Station Community Plan/Marin Countywide Plan Context: Local Community, Regional (Marin County; State, Local, and Privately Owned Lands)		
Would conflict with land-use related policies of Marin CWP, including land use designation or zoning standards?	No Impact/ Not Applicable	The proposed project would NOT affect land use.
	Negligible/ Minor/ Moderate	The proposed project would affect land use, but would not conflict with land use-related policies of Marin CWP, including land use designation or zoning standards.

TABLE 24. LAND USE AND PLANNING- GENERAL LAND USE

	Major or Substantial	The proposed project would affect land uses and conflict with land use-related policies of Marin CWP, including land use designation or zoning standards.
Would conflict with applicable environmental plans or policies adopted by Marin County?	No Impact/ Not Applicable	The proposed project would NOT affect environmental plans or policies adopted by Marin County.
	Negligible/ Minor/ Moderate	The proposed project would affect environmental plans or policies adopted by Marin County, but would NOT conflict with them.
	Major or Substantial	The proposed project would conflict with environmental plans or policies adopted by Marin County.
Result in substantial alteration of the character or functioning of the community or present or planned future use of an area?	No Impact/ Not Applicable	The proposed project would NOT affect the character or functioning of the community or present or planned future use of an area.
	Negligible	The proposed project would have negligible effect on the character or functioning of the community or present or planned future use of an area with change barely perceptible to town residents.
	Minor	The proposed project would have minor effect on the character or functioning of the community or present or planned future use of an area by causing a noticeable change, but one that does not alter the character or the functioning of the community.
	Moderate	The proposed project would have moderate effect on the character or functioning of the community or present or planned future use of an area by causing an apparent or appreciable change that would affect the rural character or functioning of the community or present or planned future use of an area to some degree.
	Major or Substantial	The proposed project would result in substantial alteration of the character or functioning of the community or present or planned future use of an area.
Substantially increase demand for parks or other recreational facilities?	No Impact/ Not Applicable	The proposed project would NOT affect demand for neighborhood or regional parks or other recreational facilities.
	Negligible/ Minor/ Moderate	The proposed project would affect demand for neighborhood or regional parks or other recreational facilities, but not substantially.
	Major or Substantial	The proposed project would substantially increase the demand for neighborhood or regional parks or other recreational facilities or affecting existing recreational opportunities.
Increase density that would exceed the official population projections for the planning area within which the Project Area is located as set forth in either the CWP or Community Plan?	No Impact/ Not Applicable	The proposed project would NOT affect density for the planning area.
	Negligible/ Minor/ Moderate	The proposed project would affect density, but would NOT exceed the official population projections for the planning area.
	Major or Substantial	The proposed project would increase density such that it would exceed the official population projections for the planning area.
Induce substantial growth in an area either directly or indirectly (e.g., through projects in an undeveloped area or extension of major infrastructure)?	No Impact/ Not Applicable	The proposed project would NOT induce growth in an area either directly or indirectly.
	Negligible	The proposed project would induce negligible growth (<<1 percent) or up to approximately two (2) new housing units in the area either directly or indirectly.
	Minor	The proposed project would induce minor growth (~1 percent) or between three (3) and four (4) new housing units in the area either directly or indirectly.

TABLE 24. LAND USE AND PLANNING- GENERAL LAND USE

	Moderate	The proposed project would induce moderate growth (< 2 percent) or between five (5) and seven (7) new housing units in the area either directly or indirectly.
	Major or Substantial	The proposed project would induce substantial growth (> 2 percent) or more than seven (7) new housing units in the area either directly or indirectly.
Displace existing housing, especially affordable housing?	No Impact/ Not Applicable	The proposed project would NOT affect existing housing.
	Negligible	The proposed project would have negligible effect on existing housing in area through loss of << 1 percent (≤ 2 housing units) of homes present in 2000.
	Minor	The proposed project would have minor effect on existing housing in area through loss of ~ 1.0 percent (≤ 4 housing units) of homes present in 2000.
	Moderate	The proposed project would have moderate effect on existing housing in area through loss of < 2.0 percent (≤ 7 housing units) of homes present in 2000.
	Major	The proposed project would have major or substantial effect on existing housing in area through loss of > 2.0 percent (> 7 housing units) of homes present in 2000.

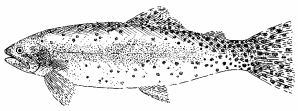
Impact Analysis

TABLE 25. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR LAND USE AND PLANNING – GENERAL LAND USE.
All impacts assumed to be Adverse unless otherwise stated, Long-Term, and Local Community (Point Reyes) or Regional (LCP Zone II, Marin County, or Seashore/north district of the GGNRA).

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Conflict with GMP Policies	No Impact	No Impact	No Impact	No Impact	No Impact
Modification of Natural Resources on Parklands	Beneficial - Moderate	Beneficial - Major	Beneficial - Major	Beneficial - Major	Beneficial - Major
Conflict with Development Policies in Coastal Zone	No Impact	No Impact	No Impact	No Impact	No Impact
Conflict with Industrial Development Policies in Coastal Zone	No Impact	No Impact	No Impact	No Impact	No Impact
Conflict with County Land Use Policies	Negligible/ Minor	Negligible/ Minor	Negligible/ Minor	Negligible/ Minor	Negligible/ Minor
Conflict with County Environmental Plans/Policies	Negligible/ Minor	Negligible/ Minor	Negligible/ Minor	Negligible/ Minor	Negligible/ Minor
Alter Character of Community	Minor	Minor	Minor	Minor	Minor
Increase Demand for Parks	No Impact	No Impact	No Impact	No Impact	No Impact
Increase Density Beyond Population Projections	No Impact	No Impact	No Impact	No Impact	No Impact
Induce Substantial Growth Directly or Indirectly	No Impact	No Impact	No Impact	No Impact	No Impact
Displace Existing Housing	Negligible	Negligible	Negligible	Negligible	Negligible

No Action Alternative

Analysis: The impacts of the No Action Alternative would generally range from an adverse minor impact to a beneficial moderate impact on general and park-related land use and land use and development policies in the Seashore and local community (Table 25). Under this alternative, the Project Area would be operated in compliance with existing Park Service management policies, General Management Plans (NPS 1980), and plans and policies established by the Park Service, the Seashore, and the California Coastal Commission (CCC) regarding general land use within parks and, where relevant, other local land use policies.



Relative to baseline conditions, the No Action Alternatives does have the potential to cause moderate beneficial impacts to natural resources on federal parklands through compliance with the Park Service's existing mitigation agreement with CalTrans, under which the Park Service is required to restore a minimum of 3.6 acres of wetland. The Park Service is proposing to restore up to 11 acres of wetlands to ensure that mitigation requirements are satisfied and to minimize the amount of levee removal and new levee construction that would need to be performed (see Chapter 2 for more detailed description). Also, under the Park Service's existing purchase agreement with the Giacomini Trust, the Reservation of Use Agreement with the Giacomini family would expire in March 2007, at which point the dairy would close. With the close of the dairy, all maintenance and other agricultural management practices would cease, although there would be the potential for a leased grazed through a separate environmental review process. The intensity of leased grazing would be expected to be lower than that under baseline conditions, and it is possible that the Seashore would institute requirements on resource setbacks and on the intensity, duration, and timing of grazing. These factors would be expected to have a beneficial effect on natural resources.

The No Action Alternative would have no impact on most of the LCP, Marin County, and Point Reyes Station Community Plan policies relating to development. This alternative would have a negligible/minor effect on County Land Use policies such that land use in the Giacomini Ranch might potentially be changed from a dairy to grazing land or open space, but this conversion would not conflict with this property's Agricultural Production – 60 (A-60) zoning. The close of the dairy would result in the loss of worker housing adjacent to Tomasini Creek and in Inverness Park, which would have a negligible adverse effect on housing. This issue is discussed further under Land Use and Planning – Agricultural Land Use. This alternative would have the potential to affect County environmental plans and policies, but actions would be expected to be consistent, and, so, therefore, impacts would be negligible/minor.

Conversion of the dairy to either leased grazing or open space would have the potential to alter the character or functioning of the Point Reyes Station community or the present or planned future use of an area. This effect would be expected to be noticeable due to the removal of the dairy facility and odors and sounds associated with the dairy that permeate the town of Point Reyes Station. However, the removal of the dairy would not be expected to alter the rural character or functioning of the community, and from public comments made during scoping, workshop, and other meetings, it is apparent that many in the local community would welcome removal of the truck-related noise and odors of the dairy. Therefore, this alternative would have only minor impacts on Point Reyes Station Community Plans related to altering character of the community.

This alternative would conflict to some degree with policies stated in the Point Reyes Station Community Plan that call for restoration of the former tidal marshes at the headwaters of Tomales Bay to natural conditions and protection of Tomasini Creek and restoration of the creek to its historic alignment in the East Pasture.

Possible Additional Mitigation Measures: No additional mitigation measures would be performed.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: Projects with the potential to have cumulative effects with this alternative would be the potential commercial-residential development along C Street in Point Reyes Station and a proposed project by Pacific Artisans LLC to develop four homes on a property near Pt. Reyes Petaluma Road and State Route 1. While not even a formal proposal, the former project was considered to be on the outer envelope of reasonably foreseeable, as the highest and best uses of the former dairy facility lands that are owned by the Giacomini Trust would be residential or commercial development. As this alternative would have no direct or indirect impacts on land use policies relative to development, it is unlikely that there would be a cumulative effect on development in the local community. This alternative could enhance the attractiveness of building in the Project Area vicinity to some degree, but this alternative and the others are unlikely to ultimately affect the development future of lands in the Project Area vicinity, as this region is already scenic and highly attractive from a development viewpoint.

However, there could be a cumulative adverse effect on the rural character and functioning of the community. The degree of change that would result from conversion of the dairy to leased grazing or open space, combined with potential development of up to 10 homes on Point Reyes Mesa, would cause a noticeable change, but the likelihood that these changes would cumulatively result in a large enough change to alter the rural character or functioning of the community is low. Even with development of these homes, these projects

would be unlikely to have more than a minor adverse effect on the character and functioning of the community, because they are unlikely to affect the rural character of Point Reyes and the Project Area vicinity. Potential additional residential unit distributions within the town of Point Reyes Station as specified in the Community Plan allows for almost a potential doubling of the number of homes from 362 to 688 within the planning area (Marin County Community Development Agency 2001). The maximum number of CRAB-2 (10,000 square-foot-minimum lots) units that could potentially be built under this plan was listed as 7, with CRAB-3 (Residential Agriculture 20,000 square-foot-minimum lots) having 140 additional potential units (Marin County Community Development Agency 2001). In combination with the proposed project, full build-out of all the residential unit distributions specified within the Community Plan would have a major or substantial impact on the rural character and functioning of the local community, however, it is not reasonably foreseeable that a build-out of this magnitude would occur given the decades-long emphasis on slow or no residential growth.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The impacts of the No Action Alternative would generally range from an adverse minor impact to a beneficial moderate impact on general and park-related land use and land use and development policies in the Seashore and local community. It would have a moderate beneficial effect on natural resources on parklands through a small wetland restoration/mitigation component and the discontinuation of intensive agricultural management practices, if not necessarily grazing. This alternative does have the potential, particularly in combination with some proposed and reasonably foreseeable housing development projects in Point Reyes Station, to have a minor adverse effect on the rural character and functioning of the local community by causing a noticeable change in conditions, but this change would not be expected to noticeably alter the rural nature of the local community and environs.

Alternative A

Analysis: Alternative A would have very similar effects as the No Action Alternative on general and park-related land use and land use and development policies in the Seashore and the local community, with a few exceptions (Table 25). Under Alternative A, the East Pasture would be restored, with new public access facilities limited to the eastern and southern perimeters of the East Pasture. There would be no restoration or construction of new public access facilities in the West Pasture or Olema Marsh. The increase in scale of restoration efforts under Alternative A would elevate the potential intensity of effects on CCC policies regarding modification of natural resources on parklands from beneficial and moderate under the No Action Alternative to major and beneficial under Alternative A.

As with the No Action Alternative, Alternative A would have no impact on most of the LCP, Marin County, and Point Reyes Station Community Plan policies relating to development and would have only a negligible/minor effect on County Land Use policies such that land use in the Giacomini Ranch would be changed from a dairy to open space. This issue is discussed further under Land Use and Planning – Agricultural Land Use. As under the No Action Alternative, the close of the dairy would result in the loss of worker housing located adjacent to Tomasini Creek and in Inverness Park, which would have a negligible adverse effect on housing. This alternative would have the potential to affect County environmental plans and policies, but actions would be expected to be consistent, and, so, therefore, impacts would be negligible/minor.

Conversion of the dairy to open space would have the potential to have a minor effect or alteration of the character or functioning of the Point Reyes Station community or the present or planned future use of an area. This effect would be expected to be potentially slightly more noticeable than under the No Action Alternative due to the fact that there would be no potential for leased grazing that would have retained some of the agricultural character of the Giacomini Ranch. However, the removal of the dairy and conversion to tidal marsh and uplands would not be expected to alter the rural character or functioning of the community, and from public comments made during scoping, workshop, and other meetings, it is apparent that many in the local community would welcome removal of the truck-related noise and odors of the dairy.

Unlike the No Action Alternative, this alternative would not conflict with policies stated in the Point Reyes Station Community Plan that call for restoration of the former tidal marshes at the headwaters of Tomales Bay

to natural conditions, although it would not restore Tomasini Creek to its historic alignment as was identified in one of the other Community Plan policies.

Possible Additional Mitigation Measures: No additional mitigation measures would be performed.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The impacts of Alternative A would generally range from minor adverse to beneficial major impacts on general and park-related land use and land use and development policies in the Seashore and local community. It would have a major beneficial effect on natural resources on parklands through restoration of the East Pasture, discontinuation of agricultural management practices and grazing, and removal of agricultural infrastructure. As with the No Action Alternative, this alternative does have the potential, particularly in combination with some proposed and reasonably foreseeable housing development projects in Point Reyes Station, to have a minor adverse effect on the rural character and functioning of the local community by causing a noticeable change in conditions, but this change would not be expected to fundamentally alter the rural nature of the local community and environs.

Alternative B

Analysis: Alternative B would have identical similar effects as Alternative A on general land use and land use policies in the Seashore and the local community (Table 25).

Possible Additional Mitigation Measures: No additional mitigation measures would be performed.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Alternative B would generally have identical impacts as Alternative A on general and park-related land use and land use and development policies in the Seashore and local community, with the intensity of effects ranging from no impact to major beneficial. It would have a major beneficial effect on natural resources on parklands through restoration of the East and West Pastures, discontinuation of agricultural management practices and grazing, and removal of agricultural infrastructure. As with Alternative A, this alternative does have the potential, particularly in combination with some proposed and reasonably foreseeable housing development projects in Point Reyes Station, to have a minor adverse effect on the rural character and functioning of the local community by causing a noticeable change in conditions, but this change would not be expected to fundamentally alter the rural nature of the local community and environs.

Alternative C

Analysis: Alternative C would have almost identical effects as Alternative A on general and park-related land use and land use policies in the Seashore and the local community, with one exception (Table 25).

Unlike the No Action Alternative and Alternatives A and B, this alternative would involve restoration of at least a portion of Tomasini Creek within the Project Area to one of its historic alignments, as well as restoring former tidal marshes at the headwaters of Tomales Bay to natural conditions. Both of these objectives are

incorporated into the Point Reyes Station Community Plan (Marin County Community Development Agency 2001).

Possible Additional Mitigation Measures: No additional mitigation measures would be performed.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: Cumulative effects would be the same as described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Alternative C would generally have almost identical effects to Alternative A on general and park-related land use and land use and development policies in the Seashore and local community, with the intensity of effects ranging from minor adverse to major beneficial. It would have a major beneficial effect on natural resources on parklands through restoration of the East Pasture and West Pasture and Olema Marsh, discontinuation of agricultural management practices and grazing, and removal of agricultural infrastructure. Unlike the No Action and Alternatives A and B, this alternative would at least partially comply with objectives stated in the Point Reyes Station Community Plan regarding realignment of Tomasini Creek in the Project Area into its historic alignment, as well as restoration of former tidal marshes at the head of Tomales Bay. As with Alternative A, this alternative does have the potential, particularly in combination with some proposed and reasonably foreseeable housing development projects in Point Reyes Station, to have a minor adverse effect on the rural character and functioning of the local community by causing a noticeable change in conditions, but this change would not be expected to fundamentally alter the rural nature of the local community and environs.

Alternative D

Analysis: Alternative D would have almost identical effects as Alternative C on general and park-related land use and land use policies in the Seashore and the local community, with one exception (Table 25).

Unlike Alternative C, this alternative would involve restoration of the entire portion of Tomasini Creek within the Project Area to one of its historic alignments, as well as restoring former tidal marshes at the headwaters of Tomales Bay to natural conditions. Both of these objectives are incorporated into the Point Reyes Station Community Plan (Marin County Community Development Agency 2001).

Possible Additional Mitigation Measures: No additional mitigation measures would be performed.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: Cumulative effects would be the same as described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Alternative D would generally have almost identical effects to Alternatives A, B, and C on general and park-related land use and land use and development policies in the Seashore and local community, with the intensity of effects ranging from minor adverse to major beneficial. It would have a major beneficial effect on natural resources on parklands through restoration of the East Pasture and West Pasture and Olema Marsh, discontinuation of agricultural management practices and grazing, and removal of agricultural infrastructure. Unlike Alternative C, this alternative would wholly comply with objectives stated in the Point Reyes Station Community Plan regarding realignment of Tomasini Creek in the Project Area into its historic alignment, as well as restoration of former tidal marshes at the head of Tomales Bay. As with Alternative A, this alternative does have the potential, particularly in combination with some proposed and reasonably foreseeable housing development projects in Point Reyes Station, to have a minor adverse effect

on the rural character and functioning of the local community by causing a noticeable change in conditions, but this change would not be expected to fundamentally alter the rural nature of the local community and environs.

Land Use and Planning – Agricultural Land Use

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

Farmland is protected under various federal, state, and local laws, regulations, and policies. At a federal level, the Farmland Protection Policy Act is intended to minimize the impact federal programs have on the unnecessary conversion of farmland to non-agricultural uses. Because of the value of agriculture to Marin's economy and its scenic pastoral landscape, the County and Coastal Zone LCP (Marin County Comprehensive Planning Department 1981) have both identified maintenance of agriculture as a high priority. A more detailed description of federal and county agricultural land use policies can be found under Land Use and Planning in Chapter 3.

The LCP for Zone II (Marin County Community Development Agency 1981), which includes the Project Area, incorporates several agricultural-related policies for both federal parklands and state, local, and private lands. One of these policies concerns potential changes to lands zoned as Agricultural Production Zone. LCP policies strive to protect and enhance continued agricultural use and to contribute to agricultural viability within the region (Marin County Community Planning Agency 1981). Development of these lands must conform to either permitted or conditional uses specified in the LCP for Agricultural Production Zone lands. Permitted uses include livestock and poultry; horses; dairy and poultry farming; vegetable, fruit, nut, and field crops; nursery products; and single family dwelling. Conditional uses include land divisions, fish hatcheries, greenhouses, game or nature preserve or refuge, public or private recreational activities such as hunting, fishing, and camping. One of the conditions of development is that the proposed land division or development would not conflict with the continuation of agriculture on adjacent parcels and that the proposed development would have no significant adverse impacts on environmental quality or natural habitats, including stream and riparian habitats and scenic resources.

State and local agencies have developed significance criteria under CEQA that address impacts to agricultural resources such as soils, operations, and contracts such as the Williamson Act contracts, which provides lower property tax assessments to farmers in exchange for limiting land use to agricultural or open space-related purposes. Under Public Resources Code Section 21060.1 of CEQA, the Farmland Mapping and Monitoring Program (FMMP) is used to define agricultural land for the purposes of assessing environmental impacts to agricultural lands under CEQA. Impacts to these agricultural lands can be evaluated using a California Agricultural Land Evaluation and Site Assessment (LESA) program, which is the state version of the LESA developed by the National Resources Conservation Service (NRCS) for federal agencies. LESA provides lead agencies with an optional methodology to ensure that potentially significant effects on the environment of agricultural land conversions are quantitatively and consistently considered in the CEQA environmental review process (Public Resources Code Section 21095).

Specific Agricultural Land Use-Related Assumptions

- Because of the importance of agriculture to West Marin and Marin County in general, a number of relevant planning documents have established policies regarding agriculture.
- All potential impacts related to agriculture are evaluated in this section, including impacts to Williamson Tract lands, Prime and Unique Farmland soils, effects on agricultural resources and operations, and adjacent agricultural land use, etc.
- In general, potential impacts to agricultural lands and resources that are protected through federal, state, and local laws, regulations, and policies will be evaluated through use of the California LESA Model analysis, which is recommended by the state.
- Certain CEQA significance criteria that do not appear to be covered by the LESA evaluation are addressed in separate impact indicators below.
- The California Agricultural LESA methodology establishes a series of alternate scores for assessing intensity of impacts to agricultural resources and determining whether they are significant or less-than-significant. For this document, an expanded range of impact thresholds has been developed based on LESA guidelines for evaluation of the intensity of impacts.

- o Ratings are separated into two major categories: Land Evaluation and Site Analysis. Land Evaluation assesses the Land Capability Classification and the Storie Index Ratings, which are two different systems for classifying the agricultural productivity or value of soils. The Site Analysis component focuses on the size of the Project Area; water resources availability; surrounding agricultural land use; and surrounding protected resource land rating.
- o The LESA Instruction Manual (California Department of Conservation 1997) incorporates guidance on the significance of impacts to agricultural resources under CEQA through evaluating total scores for both rating categories, as well as separate consideration of subscores for Land Evaluation and Site Analysis.
- o CEQA guidance only includes scores for those impacts considered "major" or "significant" under CEQA and does not provide detailed impact thresholds for negligible, minor, or moderate effects. An expanded range of impact thresholds was developed by dividing less than significant scores equally, when possible.

- Depending upon the policy, either an expanded range of impact thresholds is provided (e.g., negligible through major criteria), or, for policies that appear to involve strictly compliance or no compliance, the range is condensed into two or three thresholds such as 1) no impact, 2) negligible/minor, and 3) moderate/major.

TABLE 26. LAND USE AND PLANNING - AGRICULTURAL LAND USE

Source: Seashore/north district GGNRA General Management Plan, LCP Zone II/CCC, Marin CEQA guidelines, Community Plan Nature: Beneficial, Adverse Context: Regional Duration: Long-Term		
Seashore/north district GGNRA General Management Plan Context: Regional (Park Service lands)		
Would conflict with general policies of the GMP regarding agriculture or agricultural land uses or constitute an impairment of agricultural resources identified in enabling legislation.	No Impact/ Not Applicable	The proposed project would NOT affect GMP policies regarding agriculture or agricultural land uses.
	Negligible/ Minor/ Moderate	The proposed would NOT conflict with general policies of GMP regarding agriculture or agricultural land uses.
	Major	The proposed project would conflict with general policies of GMP regarding agricultural or agricultural land uses.
Local Coastal Program Context: Regional (Zone II; Park Service, State, Local, and Privately Owned Lands)		
Would discontinue agricultural land uses in the GGNRA and Seashore or would continue them at a level which is not compatible with protection of natural resources and public recreational uses?	No Impact/ Not Applicable	The proposed project would NOT affect agricultural lands in the GGNRA or the Seashore
	Negligible	*Beneficial*: The intensity of agricultural management on park lands would be reduced slightly to increase compatibility of agricultural land use with resource protection. *Adverse*: The intensity of agricultural management on park lands would be increased slightly where agriculture is NOT compatible with resource protection; OR would be reduced slightly where agriculture land use is compatible with resource protection.
	Minor	*Beneficial*: The intensity of agricultural management on park lands would be reduced measurably where agricultural land use is NOT compatible with resource protection. *Adverse*: The intensity of agricultural management on park lands would be increased measurably where agriculture is NOT compatible with resource protection; OR would be reduced measurably where agriculture land use is compatible with resource protection.

TABLE 26. LAND USE AND PLANNING - AGRICULTURAL LAND USE

	Moderate	*Beneficial*: The intensity of agricultural management on park lands would be reduced appreciably where agricultural land use is NOT compatible with resource protection. *Adverse*: The intensity of agricultural management on park lands would be increased appreciably where agriculture is NOT compatible with resource protection; OR would be reduced appreciably where agriculture land use is compatible with resource protection.
	Major or Substantial	*Beneficial*: Agricultural management on park lands would be discontinued where agriculture is NOT compatible with resource protection. *Adverse*: The intensity of agricultural management on park lands would be increased substantially where agriculture is NOT compatible with resource protection; OR would be discontinued where agriculture land use is compatible with resource protection.
Would affect the use of lands in the Agricultural	No Impact/ Not Applicable	The proposed project would NOT affect agricultural lands in the Agricultural Production Zone.
Production Zone (e.g., lands zoned A-60) and not be either	Negligible	The proposed project would affect the use of lands in the Agricultural Production Zone, but would be a permitted use.
a permitted or conditional use?	Minor/ Moderate	The proposed project would affect the use of lands in the Agricultural Production Zone and would be a conditional use.
	Major or Substantial	The proposed project would affect the use of lands in the Agricultural Production Zone and not be either a permitted or conditional use.
Coastal Resources and Planning Management Policies Context: Regional (Coastal Zone; Park Service, State, Local, and Privately Owned Lands)		
Would conflict with general policies on agriculture in the Coastal Zone, specifically on agricultural conversions (Article 5. Sections 30241, Sections 30242)?	No Impact/ Not Applicable	Would NOT affect agricultural lands in the Coastal Zone.
	Negligible/ Minor/ Moderate	Would affect agricultural lands in the Coastal Zone, but would comply with general policies on conversion of agricultural lands.
	Major or Substantial	Would affect agricultural lands in the Coastal Zone and conflict with general policies on conversion of agricultural lands.
Point Reyes Station Community Plan/Marin Countywide Plan Context: Local Community, Regional (Marin County; State, Local, and Privately Owned Lands)		
Affect agricultural or open space contracts (e.g., conflicts with Williamson Act contracts)?	No Impact/ Not Applicable	Would NOT affect agricultural or open space contracts.
	Negligible/ Minor/ Moderate	Would affect contracts, but would maintain use within the range of acceptable uses within the contract (e.g., switch from agricultural to open space lands).
	Major or Substantial	Would adversely affect agricultural and open contracts by converting to use or uses that are NOT within the range of acceptable uses.
Affect agricultural resources (e.g., impacts to productive agricultural soils; lands with sufficient water resources; and from incompatible land uses with adjacent protected lands)? LESA Analysis	No Impact/ Not Applicable	There would be no potential for an impact to agricultural resources.
	Negligible	There would be a barely detectable effect on agricultural resources such that the LESA score would total ≤20 points.
	Minor	There would be a measurable effect on agricultural resources such that: 1) the LESA score would total between 20 and 49 points; *OR* 2) the LESA score would be between 20 and 39 points if the Land Evaluation OR Site Analysis subscores ≥ 20 points.

TABLE 26. LAND USE AND PLANNING - AGRICULTURAL LAND USE

	Moderate	There would be an appreciable effect on agricultural resources such that: 1) the LESA score would total between 50 and 79 points; *OR* 2) the LESA score would be between 40 and 59 points if the Land Evaluation OR Site Analysis subscores ≥ 20 points.
	Major or Substantial	There would be a substantial or major effect on agricultural resources such that: 1) the LESA score would total between 80 and 100 points; *OR* 2) the LESA score would be between 60 and 79 if the Land Evaluation OR Site Analysis subscores ≥ 20 points; *OR* 3) the LESA score would be between 40 to 59 points if the Land Evaluation AND Site Analysis subscores ≥ 20 points.

Impact Analysis

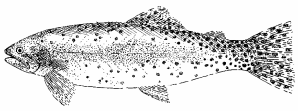
TABLE 27. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR LAND USE AND PLANNING - AGRICULTURAL LAND USE
All impacts assumed to be Adverse unless otherwise stated, Short-Term/Long-Term, and Local Community (Point Reyes) or Regional (LCP Zone II, Marin County, or Seashore/north district of the GGNRA).

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Conflict with GMP Policies on Agriculture or Agricultural Land Uses	No Impact	No Impact	No Impact	No Impact	No Impact
Discontinue Agriculture on Parklands or Continue at Level Not Compatible with Natural or Public Access Resources	Beneficial Minor/ Moderate	Beneficial Major	Beneficial Major	Beneficial Major	Beneficial Major
Affect Use of Lands in Agricultural Production Zone	Negligible/ Minor	Minor	Minor	Minor	Minor
Conflict with Policies on Agriculture in Coastal Zone	Negligible/ Minor	Negligible/ Minor	Negligible/ Minor	Negligible/ Minor	Negligible/ Minor
Affect Agricultural or Open Space Contracts	Negligible/ Minor	Negligible/ Minor	Negligible/ Minor	Negligible/ Minor	Negligible/ Minor
Affect Agricultural Resources, Operations, or Adjacent Agricultural Land Uses (LESA Analysis)	Negligible/ Minor	Minor	Minor	Minor	Minor

No Action Alternative

Analysis: The effects of the No Action Alternative on agricultural lands and federal, state, and local agricultural land use policies would generally range from negligible/minor adverse to beneficial minor/moderate (Table 27). The Giacomini Ranch East and West pastures are currently zoned Agricultural Production Zone (APZ-60) and are covered under a Williamson Act Contract. The portion of Olema Marsh owned by Audubon Canyon Ranch is zoned Open Area, while the portion owned by the Seashore is zoned Agricultural, Residential, Planned. Neither parcel is covered under the Williamson Act or other agricultural or open space contract.

Under the terms of the existing purchase agreement, the Project Area will convert from a dairy in early 2007 to lands that would be largely managed as open space, although there is a potential for leased grazing. The purchase agreement signed in 2000 included a 7-year Reservation of Use Agreement during which time the dairy could continue to be operated until agreement expires in March 2007. At that time, the Park Services assumes full management of the East and West Pastures and a portion of the dairy facility on the Point Reyes Mesa, which includes the old calf barn, manure ponds, and half of the milking barn. The remainder of the dairy facility remains in Giacomini Trust ownership as it was not part of the purchase agreement, thereby effectively splitting the dairy facility operations in half and precluding continued operation of the Giacomini Ranch as a dairy. Portions of the pastures could potentially be leased for grazing of dairy heifers (young cows) or beef cattle through a separate environmental review process. Under this alternative, the scale of agricultural operations relative to baseline conditions, under which the Giacomini Ranch has been operated as a full-scale dairy operation, would either be reduced or eliminated altogether. A reduction in agricultural operations would result if, after the dairy is closed, lands are leased for grazing, because grazing is typically



less intensive. In addition, the Seashore is likely to institute restrictions on leased grazing relating to resource setbacks, stocking density, and duration and timing of grazing. Approximately 11 acres of the East Pasture would be restored to wetlands and would be off limits to grazing cattle.

The potential for either a reduction or discontinuation in agricultural land uses would have a negligible or minor effect on agricultural contracts, as Williamson Act covers agricultural and open space land uses, and on use of lands in the Agricultural Production Zone (APZ). Dairy and livestock operations are both permitted uses under the APZ, while game and nature preserves or refuges are considered conditional uses. There would be no conflict with GMP policies on agriculture or agricultural-related resources.

More than 90 percent of the Giacomini Ranch is wetland and has been impacted by intensive management as a dairy since these historic tidal marsh lands were leveed in the 1940s. These impacts have reduced the quality of wetland conditions in the Giacomini Ranch and have reduced functionality of wetlands that might otherwise play a vital role in improving quality of Tomales Bay, which has been declared impaired by the Regional Water Quality Control Board (RWQCB) for poor water quality. The extensive amount of wetlands present, combined with the frequency of large-scale flooding and prolonged inundation due to its location in the bottomlands of an alluvial valley just downstream of the confluence of several major creeks, lessens the long-term suitability and viability of these lands for agriculture. During its operation as a dairy, the Giacomini family has been required to intensively manage these lands through levees, tidegates, culverts, ditching and dredging, pumping, and irrigation to maintain a viable dairy operation. Continuation of agricultural uses and these types of management practices would not be compatible with resource protection. Therefore, under this alternative, there would be potentially minor to moderate beneficial impacts (depending on potential for leased grazing) impacts to LCP policies regarding discontinuation or continuation of agriculture in federal parklands at levels that are not compatible with resource protection, because agricultural uses would either be reduced or discontinued. For this reason, it would also have only a negligible/minor adverse effect on LCP policies regarding conversion of agricultural lands. Even though lands would be converted from agriculture to open space, it would comply with the general policies regarding conversions, specifically that lands were not suited for agriculture prior to the conversion of agricultural lands (Section 30241 (c)).

An analysis of the potential effects of agricultural land conversion using the LESA model (1997) developed by the California Department of Conservation leads to the conclusion that the effects of converting the Giacomini Ranch from a dairy to leased grazing or open space are either negligible or minor. If leased grazing were permitted in the future, this alternative would result in only a negligible conversion of agricultural land to non-agricultural uses based on a LESA score of less than or equal to 20: the only conversion that would occur would be the approximately 11 acres where the wetland restoration/mitigation component would be performed. If leasing grazing were not permitted, this alternative would have a minor effect on agricultural lands in the Project Area vicinity based on a LESA score of 33.74 points and Site Analysis subscore of 25.18 points. As outlined in Table 27, based on CEQA significance criteria developed by the California Department of Conservation, a significant impact under CEQA would require a LESA score between 80 to 100 points; OR a score between 60 and 79 points if either the Land Evaluation or Site Analysis subscores were greater than or equal to 20 points; OR a LESA score between 40 and 59 points if both the Land Evaluation and Site Analysis subscores were greater than or equal to 20 points. For the more detailed analysis of impact intensity required by the Park Service, the California Department of Conservation significance threshold was broken down into five categories, including No Impact.

Most of the Project Area has soils with a somewhat lower Land Capability Classification Rating of Class IV-VIII, although there was a smaller component where Farmland of Statewide Importance soils occur of LCC Class III. In the immediate vicinity of the Project Area, only 21 percent of the lands were being farmed, with 50 percent protected as resource lands and the rest being commercially or residentially developed. Approximately 26 percent is currently irrigated with either waters obtained from North Marin Water District (NMWD) or direct pumping, but the agreement with NMWD for provision of irrigation waters from the Downey Well would expire in 2007 when the dairy closes, and the potential for provision of -- and viability of obtaining --irrigation waters from NMWD in the future is both physically and economically uncertain. The Park Service does not plan to continue irrigation once it assumes full management of the Giacomini Ranch.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Projects with potential cumulative impacts would be those that would involve conversion of agricultural lands or discontinuation of agriculture on Park Service and private and other public lands in the local community or West Marin region. It would also include projects that would affect agricultural resources, operations, or adjacent land uses. None of the projects in Table 23 would have substantial enough effects on agriculture that the cumulative impacts of those projects with the proposed project would be considered major or substantial and significant under CEQA, with any potential effects from projects considered negligible in intensity. However, dairies and ranches continue to close down in West Marin due to problems with economic viability and other factors. The closure of ranches in the future combined with the shift in use from full-scale dairy operation to open space and limited grazing would constitute potentially a minor to moderate impact on agricultural economic viability of West Marin agriculture.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The impacts of the No Action Alternative on agricultural lands and federal, state, and local agricultural land use policies would generally range from negligible/minor adverse to minor/moderate beneficial. This conversion would comply with local policies on conversion of agricultural lands and lands protected under the Williamson Act, because it would either be retained as grazing land or converted to open space, which is an approved or conditional use of agricultural lands, or because it would comply with exemptions for conversions of lands that were not suited for agriculture prior to the conversion of agricultural lands (Section 30241 (c)). Based on results from the LESA analysis, conversion of the Giacomini Ranch would represent only a negligible or minor adverse impact on agricultural land use in the local community, depending on whether leased grazing is approved. However, cumulative effects of other ranches closing could elevate the impacts from loss of the dairy and conversion to grazing land or open space to the agricultural economic viability of West Marin agriculture to moderate. There would be potentially minor/moderate beneficial impacts relative to LCP policies regarding discontinuation or continuation of agriculture in federal parklands at levels that are not compatible with resource protection, because agricultural uses would either be reduced or discontinued in area that is more than 90 percent wetland. Agricultural management has reduced the quality of wetland conditions in the Giacomini Ranch and functionality of wetlands that might otherwise play a vital role in improving quality of Tomales Bay, which has been declared impaired by the Regional Water Quality Control Board (RWQCB) for poor water quality.

Alternative A

Analysis: The impacts of Alternative A on federal and local agricultural land use policies would generally range from minor adverse to major beneficial (Table 27). As noted under No Action, the Giacomini Ranch East and West pastures are currently zoned Agricultural Production Zone (APZ-60) and are covered under a Williamson Act Contract, while Olema Marsh is zoned Open Area and Agricultural, Residential, Planned and is not covered under the Williamson Act or other agricultural or open space contract. Under this alternative, the Project Area would be maintained as open space, with agricultural uses discontinued. Because open space is an allowable use under the Williamson Act Contract, this alternative would have only negligible/minor effect on agricultural contracts and minor effects on use of lands in the Agricultural Production Zone. Under the APZ, the proposed project would represent a shift from a permitted use (dairying and livestock) to a conditional use – game or nature preserve or refuge. There would be no conflict with GMP policies on agriculture or agricultural-related resources. Based on results of the LESA analysis discussed under the No Action Alternative, the conversion of the Giacomini Ranch would represent a minor impact to agricultural lands in the Project Area vicinity and local community.

With discontinuation of agriculture, there would be potentially major beneficial effects on LCP policies regarding discontinuation or continuation of agriculture in federal parklands at levels that are not compatible with resource protection, because continuation of agricultural uses at baseline conditions would not be compatible with resource protection. More than 90 percent of the Giacomini Ranch is wetland and has been impacted by intensive management as a dairy since these historic tidal marsh lands were leveed in the 1940s. These impacts have reduced the quality of wetland conditions in the Giacomini Ranch and have reduced functionality of wetlands that might otherwise play a vital role in improving the health of Tomales Bay, which has been declared impaired by the Regional Water Quality Control Board (RWQCB) for poor water quality. The

extensive amount of wetlands present, combined with the frequency of large-scale flooding and prolonged inundation due to its location in the bottomlands of an alluvial valley just downstream of the confluence of several major creeks, also lessens the long-term suitability and viability of these lands for agriculture. During its operation as a dairy, the Giacomini family has been required to intensively manage these lands through levees, tidegates, culverts, ditching and dredging, pumping, and irrigation to maintain a viable dairy operation. For this reason, this alternative would have only a negligible/minor on LCP policies regarding conversion of agricultural lands. Even though lands would be converted from agriculture to open space, it would comply with the general policies regarding agricultural land conversions, specifically that lands were not suited for agriculture prior to the conversion of agricultural lands (Section 30241 (c)). .

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: As with the No Action Alternative, projects with potential cumulative impacts would be those that would involve conversion of agricultural lands or discontinuation of agriculture on Park Service and private and other public lands in the local community or West Marin region. It would also include projects that would affect agricultural resources, operations, or adjacent land uses. None of the projects in Table 23 would have substantial enough effects on agriculture that the cumulative impacts of those projects with the proposed project would be considered major or substantial and significant under CEQA, with any potential effects from projects considered negligible in intensity. However, dairies and ranches continue to close down in West Marin due to problems with economic viability and other factors. The closure of ranches in the future combined with the shift in use from full-scale dairy operation to open space would constitute potentially a moderate impact on agricultural economic viability of West Marin agriculture.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The impacts of Alternative A on agricultural lands and federal, state, and local agricultural land use policies would generally range from minor adverse to major beneficial. This conversion would comply with local policies on conversion of agricultural lands and lands protected under the Williamson Act or Agricultural Production Zone zoning, because it would be converted to open space or a wildlife refuge, which is either an approved or conditional use for these types of agricultural lands. It would also comply with exemptions in LCP agricultural land use policies for conversions of lands that were not suited for agriculture prior to the conversion of agricultural lands (Section 30241 (c)). Based on results from the LESA analysis, conversion of the Giacomini Ranch would represent only a minor adverse impact on agricultural land use in the local community. However, cumulative effects of other ranches closing could elevate the impacts from loss of the dairy and conversion to grazing land or open space to the agricultural economic viability of West Marin agriculture to moderate. There would be major beneficial effects relative to LCP policies regarding discontinuation or continuation of agriculture in federal parklands at levels that are not compatible with resource protection, because agricultural uses would either be reduced or discontinued in area that is more than 90 percent wetland. Agricultural management has reduced the quality of wetland conditions in the Giacomini Ranch and functionality of wetlands that might otherwise play a vital role in improving quality of Tomales Bay, which has been declared impaired by the Regional Water Quality Control Board (RWQCB) for poor water quality.

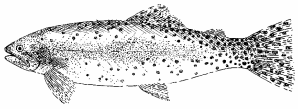
Alternative B

Analysis: Alternative B would have identical impacts to those described under Alternative A (Table 27).

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: Cumulative impacts would be the same as discussed under Alternative A.



Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Alternative B would have identical impacts to those described under Alternative A.

Alternative C

Analysis: Alternative C would have identical impacts to those described under Alternative A (Table 27). The impacts of Alternative C on federal and local agricultural land use policies would generally range from minor adverse to major beneficial (Table 27). As noted under No Action, the Giacomini Ranch East and West pastures are currently zoned Agricultural Production Zone (APZ-60) and are covered under a Williamson Act Contract, while Olema Marsh is zoned Open Area and Agricultural, Residential, Planned and is not covered under the Williamson Act or other agricultural or open space contract. Under this alternative, the Project Area would be maintained as open space, with agricultural uses discontinued. Because open space is an allowable use under the Williamson Act Contract, this alternative would have only negligible/minor effect on agricultural contracts and minor effects on use of lands in the Agricultural Production Zone. Under the APZ, the proposed project would represent a shift from a permitted use (dairying and livestock) to a conditional use – game or nature preserve or refuge. There would be no conflict with GMP policies on agriculture or agricultural-related resources. Based on results of the LESA analysis discussed under the No Action Alternative, the conversion of the Giacomini Ranch would represent a minor impact to agricultural lands in the Project Area vicinity and local community.

With discontinuation of agriculture, there would be potentially major beneficial effects on LCP policies regarding discontinuation or continuation of agriculture in federal parklands at levels that are not compatible with resource protection, because continuation of agricultural uses at baseline conditions would not be compatible with resource protection. More than 90 percent of the Giacomini Ranch is wetland and has been impacted by intensive management as a dairy since these historic tidal marsh lands were leveed in the 1940s. These impacts have reduced the quality of wetland conditions in the Giacomini Ranch and have reduced functionality of wetlands that might otherwise play a vital role in improving the health of Tomales Bay, which has been declared impaired by the Regional Water Quality Control Board (RWQCB) for poor water quality. The extensive amount of wetlands present, combined with the frequency of large-scale flooding and prolonged inundation due to its location in the bottomlands of an alluvial valley just downstream of the confluence of several major creeks, also lessens the long-term suitability and viability of these lands for agriculture. During its operation as a dairy, the Giacomini family has been required to intensively manage these lands through levees, tidegates, culverts, ditching and dredging, pumping, and irrigation to maintain a viable dairy operation. For this reason, this alternative would have only a negligible/minor on LCP policies regarding conversion of agricultural lands. Even though lands would be converted from agriculture to open space, it would comply with the general policies regarding agricultural land conversions, specifically that lands were not suited for agriculture prior to the conversion of agricultural lands (Section 30241 (c)).

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: Cumulative impacts would be the same as discussed under Alternative A.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Alternative C would have identical impacts to those described under Alternative A. The impacts of Alternative C on agricultural lands and federal, state, and local agricultural land use policies would generally range from minor adverse to major beneficial. This conversion would comply with local policies on conversion of agricultural lands and lands protected under the Williamson Act or Agricultural Production Zone zoning, because it would be converted to open space or a wildlife refuge, which is either an approved or

conditional use for these types of agricultural lands. It would also comply with exemptions in LCP agricultural land use policies for conversions of lands that were not suited for agriculture prior to the conversion of agricultural lands (Section 30241 (c)). Based on results from the LESA analysis, conversion of the Giacomini Ranch would represent only a minor adverse impact on agricultural land use in the local community. However, cumulative effects of other ranches closing could elevate the impacts from loss of the dairy and conversion to grazing land or open space to the agricultural economic viability of West Marin agriculture to moderate. There would be major beneficial effects relative to LCP policies regarding discontinuation or continuation of agriculture in federal parklands at levels that are not compatible with resource protection, because agricultural uses would either be reduced or discontinued in area that is more than 90 percent wetland. Agricultural management has reduced the quality of wetland conditions in the Giacomini Ranch and functionality of wetlands that might otherwise play a vital role in improving quality of Tomales Bay, which has been declared impaired by the Regional Water Quality Control Board (RWQCB) for poor water quality.

Alternative D

Analysis: Alternative D would have identical impacts to those described under Alternative C (Table 27).

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: Cumulative impacts would be the same as discussed under Alternative A.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Alternative D would have identical impacts to those described under Alternative C.

Geologic Resources

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

Within California, there are two primary legislative acts that govern construction in areas prone to geologic hazards. California's Alquist-Priolo Earthquake Fault Zoning Act (California Public Resources Code Section 2621 et seq.) prohibits the location across the traces of active faults of most types of structures intended for human occupancy and strictly regulates construction of these types of structures in corridors along active faults (earthquake fault zones). The San Andreas Fault Zone (SAFZ) is the only zoned fault within the boundaries of Marin County (Snyder and Smith Associates and Nichols-Berman 2002), and it runs through the center of the Project Area.

While the Alquist-Priolo Act specifically addresses hazards associated with surface fault rupture, the Seismic Hazards Mapping Act of 1990 (California Public Resource Code Sections 2690-2699.6) specifically focuses on other hazards related to earthquakes such as ground shaking, liquefaction, and seismically induced landslides. In unincorporated areas, counties such as Marin are required to regulate development in mapped Seismic Hazard Zones or "zones of required investigation" through requiring appropriate site geologic and soil investigations and mitigation measures as part of permit review. Seismic Hazard Zone maps have only been prepared so far for a few Bay area and southern California counties, and Marin County is not one of these. However, information from state and federal geologic surveys has been used to develop various maps that assess susceptibility to earthquake-related hazards such as ground shaking, liquefaction, and landslides. Some of these maps are presented in Chapter 3 under Geologic Resources.

Local policies such as the LCP and the Point Reyes Station Community Plan emphasize the need for proper planning in known geologic hazard zones to "minimize risks to life and property in areas of high geologic…hazard" (LCP Section 30253). A more detailed description of state and local laws pertaining to geologic resources and hazards can be found under Geologic Resources in Chapter 3.

Under CEQA, the state and county require analysis of the impacts each alternative may have on exposing people to active or potentially active fault zones; landslides or mudslides; slope instability or ground failure; subsidence; expansive soils; liquefaction; tsunami; or similar hazards. In addition, it focuses on substantial changes in topography from excavation, grading, or fill, including, but not limited to, ground surface relief features; geologic substructures or unstable soil conditions; and unique geologic or physical features. In addition to these geologic hazards, the LCP for Zone II requires analysis of impacts to bluff areas that would diminish the stability of a bluff area or require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs.

General Assumptions and Methodologies

- Almost all (>90 percent) of the Project Area is located in the Alquist-Priolo Fault Zone, because the San Andreas Fault runs through the center of the Project Area in a southerly to northerly direction (Figure 19). However, the proposed project does not include construction of any habitable structures.
- Seismic Hazard Zone mapping has not been conducted for Marin County, but it is assumed that the Project Area would be mapped as a Seismic Hazard Zone or "zone of required investigation" because it incorporates the seismically active San Andreas Fault.
- All of the Project Area has been rated by the California Geological Survey as having the highest earthshaking and liquefaction potential.
- Based on its sheltered location at the very southern end of Tomales Bay, the potential for hazards associated with tsunami is assumed to be universally non-existent to negligible and, therefore, is not evaluated in this document.
- Most of the Project Area is located in the San Andreas rift valley and are lowlands or alluvial areas that are not topographically elevated or located on hillsides. A small proportion of the Project Area is located on the lower elevation portions of the coastal marine terrace that borders the Giacomini Ranch pastures to the east and the location of the town of Point Reyes Station. Hillsides within the Project Area do not exceed 35 percent or are in areas with high landslide potential, and the proposed project is not expected to affect the potential for landslides. Therefore, the potential for hazards associated with landslides is assumed to be non-existent and, therefore, is not evaluated in this document.
- Because the Project Area does incorporate some of the coastal marine terrace on the east side of the Giacomini Ranch pastures, there is a potential for changes to bluffs along the Point Reyes Mesa terrace. Because of the importance of agriculture to West Marin and Marin County in general, a number of relevant planning documents have established policies regarding agriculture.
- The potential impacts of the proposed project on geologically related wetland functions such as groundwater discharge and recharge will be evaluated under the Water Supply and Distribution section of Public Health and Services focused impact topic, because of its pertinence to the municipal groundwater supply for the local community.

Described below are methodologies for significance criteria related to geologic resources, including any specific assumptions or details on methodologies (Tables 28-32).

TABLE 28. UNIQUE GEOLOGIC RESOURCES

Source: NPS Management Policies, Marin CEQA guidelines Nature: Adverse Context: Project Area, Region (Point Reyes/San Andreas Fault Area) Duration: Long-Term	
No Impact	There would be no impact to unique geologic resources associated with the proposed project in the Project Area.
Negligible	There would be a negligible impact (< 1 percent) to the areal extent of unique geologic or physical resources in the Project Area such as features associated with strike slip faults (e.g., shutter ridge, fault sag ponds, fault trenches); coastal marine terraces; or other features.
Minor	There would be a minor impact (> 1 percent and ≤ 5 percent) in the extent of unique geologic or physical resources in the Project Area such as features associated with strike slip faults (e.g., shutter ridge, fault sag ponds, fault trenches); coastal marine terraces; or other features.

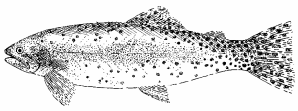


TABLE 28. UNIQUE GEOLOGIC RESOURCES

Moderate	There would be a moderate impact (>5 percent and ≤ 10 percent) in the extent of unique geologic or physical resources in the Project Area such as features associated with strike slip faults (e.g., shutter ridge, fault sag ponds, fault trenches); coastal marine terraces; or other features.
Major or Substantial	There would be a substantial change (> 10 percent) in the extent of unique geologic or physical resources in the Project Area such as features associated with strike slip faults (e.g., shutter ridge, fault sag ponds, fault trenches); coastal marine terraces; or other features.

Topographic Resources: Changes in topographic resources focus on substantial changes in topography from excavation, grading, or fill, including ground surface relief features and unique physical features (Table 29). Impact thresholds focus on the extent of area affected by substantial changes in topography. There is no guidance under CEQA on how much excavation, grading, or fill constitutes a "substantial" change in topography and would, thereby, be considered significant. However, the Corps has issued some guidance for excavation in wetlands that contrasts plowing and deep ripping during agricultural operations, with plowing defined as "not to include the redistribution of surface material in a manner which converts wetlands areas to uplands [See 40 CFR 233.35(a)(1)(iii)(D)]." According to U.S. Department of Agriculture, plowing depths rarely exceed one foot into the soil and not deeper than 16 inches. In addition, guidance on changes in topographic resources can be drawn from construction standards: most grading equipment cannot accurately create or rework topography in increments of less than 0.5 feet. For the purposes of this analysis, major or substantial changes in topographic resources are considered to exceed 0.5 feet, with changes less than 0.5 feet not considered to substantially alter topography.

TABLE 29. TOPOGRAPHIC RESOURCES

Source: Marin CEQA guidelines Nature: Adverse Context: Project Area Duration: Long-Term	
No Impact	There would be no impact to topographic resources in the Project Area.
Negligible	There would be a negligible or barely detectable effect on topographic resources in the Project Area from excavation, grading, or fill activities resulting in topographic changes within ≤ 10 percent of the Project Area.
Minor	There would be a minor or measurable effect on topographic resources in the Project Area from excavation, grading, or fill activities resulting in topographic changes within ≤ 25 percent of the Project Area. If areal extent of change <50 percent, change in existing elevation contours would average ≤ 0.25 feet.
Moderate	There would be a moderate or appreciable effect on topographic resources in the Project Area from excavation, grading, or fill activities resulting in topographic changes within ≤ 50 percent of the Project Area. If areal extent of change > 50 percent, change in existing elevation contours would average ≤ 0.5 feet.
Major or Substantial	There would be a substantial or major effect on topographic resources in the Project Area from excavation, grading, or fill activities resulting in topographic changes within > 50 percent of the Project Area, and change in existing elevation contours would average > 0.5 feet.

Geologic Hazards – Surface Fault Rupture: Because the Park Service Management Policies (2001), LCP Zone II Policies (1981), Coastal Resource and Management Policies, and Marin CWP policies stress the importance of minimizing risk to people and property, the potential risk to visitors and residents is evaluated by the number of habitable and non-habitable structures in the Alquist-Priolo Fault Zone within the Project Area (Table 30). While the Alquist-Priolo Fault Zone Mapping Act focuses exclusively on habitable structures, both non-habitable and habitable structures would attract people to the Project Area and potentially increase the risk to public safety should an earthquake occur on the San Andreas Fault, particularly in the generalized vicinity of the Project Area (i.e., within at least 10 to 50 miles of the epicenter). As noted earlier, the San Andreas Fault runs directly through the Project Area. Most of the risk with surface fault ruptures is associated with structures that either straddle or are in close proximity (within 50 feet) to an active fault. Hazards associated with surface fault rupture typically decrease exponentially with distance from an active fault such as the San Andreas Fault. "Most surface faulting is confined to a relatively narrow zone a few feet to tens of feet wide, making avoidance (i.e., building setbacks) the most appropriate mitigation method" (California Geological Survey 2002). However, in some cases, "primary fault rupture along branch faults can be

distributed across zones hundreds of feet wide or manifested as broad warps," which suggests that engineering strengthening or design may be of additional mitigative value (California Geological Survey 2002). Hazards associated with surface fault rupture are also governed by soil substrate, with bedrock magnifying the impact of surface fault ruptures. Lastly, hazards associated with a surface fault rupture are strongly related to the potential for a large earthquake. The probabilities of an earthquake with a magnitude greater than 6.7 between 2000 and 2030 are 21 percent for the San Andreas Fault.

For this analysis, it is assumed that any structure in the fault zone would potentially attract people to a known hazard zone and increase the risk to public safety, even if it is not habitable. Impact thresholds are based on the number of structures proposed under the various alternatives, along with the distance from the fault, because hazards associated with surface fault rupture generally decrease rapidly with distance from an active fault. Impact thresholds were developed on the assumption that the Project Area is not located on bedrock soils, which are associated with magnification of fault rupture impacts. Non-habitable structures evaluated were defined as buildings, including Visitor Centers, bathrooms, and other constructed structures (e.g., education centers, youth hostels) that are open for public use, as well as constructed features of trails such as bridges. Analysis takes into account construction of structures such as bridges as part of the public access component, as well as the potential for the proposed project to increase use of existing structures.

TABLE 30. SURFACE FAULT RUPTURE HAZARDS

Source: NPS Management Policies, Alquist-Priolo Fault Zone Mapping Act (state); CCC/LCP Zone II, Marin CWP Nature: Adverse Context: Project Area Duration: Long-Term	
No Impact	There would be no structures within the Project Area that would attract people to a known hazard area.
Negligible	Habitable structures or a moderate to high number (>1) of non-habitable structures (e.g., centers, bathrooms, bridges) would be at a considerable distance from an active fault (>500 feet); *OR* A low number (≤1) of non-habitable structures would be within 100 to 500 feet of an active fault.
Minor	Habitable structures or a moderate to high number (>1) of non-habitable structures (e.g., centers, bathrooms, bridges) would be within 100-500 feet from an active fault; *OR* A low number (≤1) of non-habitable structures would be within 50 to 100 feet of an active fault.
Moderate	Habitable structures or a moderate to high number (>1) of non-habitable structures (e.g., centers, bathrooms, bridges) would be within 50-100 feet from an active fault; *OR* A low number of non-habitable structures (≤1) would be within 5 to 100 feet of an active fault.
Major or Substantial	Non-exempt habitable structures would be across or within 50 feet of an active fault; *OR* Non-habitable structures (e.g., centers, bathrooms, bridges) would be placed astride or across an active fault trace.

Geologic Hazards – Groundshaking and Liquefaction: Because Park Service Management Policies (2001), LCP Zone II Policies (1981), Coastal Resource and Management Policies, and Marin CWP policies stress the importance of minimizing risk to people and property, the potential risk to visitors and residents from groundshaking and liquefaction is evaluated by the number of structures, facilities, and uses that would attract people to the Project Area, a known hazard area, and potentially increase risk to public safety (Table 31). Hazards associated with groundshaking or liquefaction do not typically decrease as rapidly with distance from an active fault as those associated with surface fault rupture and are more strongly affected by other confounding factors such as soil substrate (i.e., mud versus rock) that can amplify shaking. Based on the scale of the Project Area and the relative homogeneity of the soil substrate, it is assumed that the potential for earthquake shaking and liquefaction does not vary measurably and is the same for the entire Project Area as shown in the California Geological Survey maps. As with surface fault rupture, potential hazards associated with groundshaking and liquefaction are strongly related to the potential for a large earthquake. The probabilities of an earthquake with a magnitude greater than 6.7 between 2000 and 2030 are 21 percent for the San Andreas Fault. The average length of an earthquake is 40 seconds (R. Grasetti, GeoCon, *pers. comm.*).

The number of structures, facilities, and attractions/uses proposed or envisioned under each of the various alternatives has been ranked as low, moderate, and high based on a relative comparison with the total

number of structures, facilities, and attractions/uses currently present in specific destination areas or points in the park (e.g., Tomales Point, Bear Valley, Olema Valley, Limantour, etc.). This ranking system incorporates not only physical structures such as Visitor's Centers and bathrooms, but non-structural attractions/uses, as well, such as bird-watching, kayaking, backpacking, bicycle riding, swimming, and viewpoints. A more detailed description of the system for ranking structures, facilities, and attractions/uses can be found under Visitor and Resident Experience in Chapter 3. Because groundshaking and liquefaction hazards are expected to be universally very high throughout the Project Area, impact thresholds do not include distance from an active fault. This analysis focuses on the number of structures and facilities that would be constructed or operated under Park Service and CSLC lands as part of the proposed project in high to very high hazard zones. In addition, the number of people expected to potentially utilize public access resources in the Project Area vicinity is incorporated into the analysis, using a relatively broad ranking system of low, moderate, and high based on a relative comparison of daily numbers of people visiting other subregions or destinations within the Seashore and north district of the GGNRA. This ranking system is also discussed in more detail under Visitor and Resident Experience in Chapter 3. In assessing risk to public safety, impact thresholds take into account the low probability of a major earthquake along the San Andreas Fault in the vicinity of the Project Area and the short duration of actual earthquake episodes.

TABLE 31. GROUNDSHAKING AND LIQUEFACTION HAZARDS

Source: NPS Management Policies, CCC/LCP Zone II, Marin CWP Nature: Adverse Context: Project Area Duration: Long-Term	
No Impact	There would be no structures, facilities, or uses located in high hazard zones within the Project Area vicinity that would attract people to a known hazard area.
Negligible	There would be only a low number (≤25) of structures, facilities, or attractions/uses located in high hazard zones within the Project Area vicinity that would collectively attract low average numbers (<250 daily) of people to a known hazard area.
Minor	There would be a low number (≤25) of structures, facilities, and attractions/uses located in high hazard zones within the Project Area vicinity that would collectively attract moderate to high average numbers (≥250 daily) of people to a known hazard zone; *OR* A moderate to high number (>25) of structures, facilities, and attractions/uses located in high hazard zones within the Project Area vicinity that would be expected to collectively attract low average numbers (<250 daily) of people to a known hazard area.
Moderate	There would be a moderate number (>25 and ≤40) of structures, facilities, and attractions/uses located in high hazard zones within the Project Area vicinity that would collectively attract moderate to high average (≥250 daily) numbers of people; *OR* A high number of structures, facilities, and attractions/uses (>40) located in high hazard zones within the Project Area vicinity that would be expected to collectively attract moderate average numbers (<1,000 daily) of people to a known hazard area.
Major or Substantial	There would be a moderate number of structures, facilities, and attractions/uses (> 25 and ≤ 40) that would collectively attract very high average numbers (>1,500 daily) of people; *OR* A high number of structures, facilities, and attractions/uses (> 40) that would be expected to collectively attract high to very high average numbers (≥ 1,000 daily) of people to a known hazard area.

Geologic Hazards – Coastal Bluff Stability: LCP Zone II Policies (Marine County Comprehensive Planning Department 1981) require project proponents to ensure that proposed projects would not diminish the stability of a bluff area through development, construction of protective devices, or other factors (Table 32). Within the Project Area, bluffs have been identified in the LCP in Point Reyes Station directly adjacent to the Giacomini Ranch East Pasture.

TABLE 32. COASTAL BLUFF STABILITY

Source: CCC/LCP Zone II Nature: Adverse Context: Project Area Duration: Long-Term	
No Impact	There would be no impact to bluffs associated with implementation of the proposed project.
Negligible/ Minor/ Moderate	The proposed project would affect bluffs, but would NOT develop bluffs or violate the bluff-related policies in the LCP Plan.
Major or Substantial	The proposed project would affect bluffs and would violate the bluff-related policies of the LCP Plan.

Impact Analysis

TABLE 33. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR GEOLOGIC RESOURCES

All impacts are Adverse unless stated otherwise and Project Area and are assumed to be uniform for all duration periods (Construction/Short-Term/Long-Term) unless otherwise noted.

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Unique Geologic Resources	No Impact	No Impact	No Impact	No Impact	No Impact
Topographic Resources	Beneficial - Negligible	Beneficial - Minor	Beneficial - Minor	Beneficial - Moderate	Beneficial - Moderate
Geologic Hazards – Surface Fault Rupture and Impacts on Public Safety	No Impact	Minor	Minor	Minor	No Impact
Geologic Hazards – Groundshaking and Liquefaction and Impacts on Public Safety	Negligible	Minor	Minor	Minor	Minor
Coastal Bluff Stability	No Impact	Negligible/ Minor	Negligible/ Minor	Negligible/ Minor	Negligible/ Minor

No Action Alternative

Analysis: The impacts for the No Action Alternative on geologic and topographic resources and geologic hazards would generally range from negligible adverse to negligible beneficial (Table 33).

Geologic Resources and Coastal Bluff Stability: There are no unique geologic resources within the Project Area. While the San Andreas Fault does run through the Project Area, the best opportunities for geologists and non-geologists to view the fault and fault-associated features occur in the Olema Valley, which is a frequent destination for geology-associated field trips. There would be no potential to impact to coastal bluff stability under this alternative.

Topographic Resources: This alternative would result in only negligible impacts to topographic resources associated with the approximately 11 acres of restoration that would be performed to comply with the Park Service's existing mitigation agreement with CalTrans. This agreement transferred mitigation obligations for wetland impacts caused by CalTrans on Highway 1 in Marin County to the Park Service in exchange for monies to purchase the Giacomini Ranch. Construction of the restoration component would affect topographic resources within a very minor portion of the Project Area (~0.002 percent) and would result, on average, in changes in existing topographic contours or elevations of much less than 0.25 feet. Because this component would involve restoring wetlands through removal of fill, the effects on topographic resources would be characterized as beneficial.

Geologic Hazards: In terms of geologic hazards, there would be no potential impact to public safety related to surface fault rupture, because no construction of habitable or non-habitable structures would occur under this alternative. Potential impacts to public safety relating to groundshaking and liquefaction would be negligible

compared to baseline conditions despite the fact that the Project Area is rated as potentially being subject to the highest liquefaction and groundshaking rates or impacts. Based on California Geological Survey hazard maps, potential Impacts from liquefaction would be restricted to those structures and facilities constructed or operated in lowland or alluvial valley portions of the Project Area, while groundshaking impacts would extend to those structures and facilities constructed or operated along the Point Reyes Mesa terrace and along the low hill or shutter ridge on the east side of Olema Marsh.

This alternative would not involve construction of new public access structures and facilities, but there would be continued use of existing public access facilities. This alternative would have a relatively low number of public access-related structures, facilities, and attractions/uses (26) that would occur in high hazard zones, identical to baseline conditions. The total or collective number of people projected to use these structures and facilities on a daily basis would be expected to continue to be low relative to visitation rates for major destination areas or points within the Seashore and north district of the GGNRA, although numbers may climb slightly with closure of the dairy and assumption of full management of the Giacomini Ranch by the Park Service. Therefore, the low number of public access facilities and projected users, combined with the low probability of a major earthquake along the San Andreas Fault in the vicinity of the Project Area, would suggest that potential impacts from this alternative would be negligible relative to baseline conditions.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: There is only one project that would potentially have a cumulative impact should the No Action alternative be implemented. The proposed Bear Valley Creek Watershed Enhancement Project would replace undersized or otherwise hydraulically limiting stream crossing infrastructure in the middle and upper portions of the watershed. Changes in erosion or sedimentation patterns resulting from this project could have cumulative effects on topographic resources through changing sediment transport patterns in the subwatershed, patterns of deposition and erosion, leading to even further increases in marsh surface elevation. Because of the flat gradient through lower Bear Valley Creek and Olema Marsh, the Bear Valley Creek project is unlikely to increase erosion rates. Therefore, cumulative impacts on topographic resources would be considered to be potentially adverse, though minor in intensity. Other than the Bear Valley Creek project, there are no currently proposed or reasonably foreseeable projects that would have the potential to cause cumulative impacts in the Giacomini Ranch should the No Action Alternative be implemented.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The impacts of the No Action alternative on geologic and topographic resources and geologic hazards would generally range from negligible adverse to negligible beneficial (Table 33). This alternative would result generally in either no to negligible impacts on unique geologic and topographic resources and potentially no to minor impacts on public safety associated with operation of public access structures and facilities in known hazard zones within the Project Area. While the Project Area is located in a geologically volatile area, the San Andreas Fault Zone, the probability of a major earthquake in the vicinity of the Project Area is low, and the total or collective number of people projected to use public access facilities on a daily basis is also low relative to visitation rates for other major destination areas or points within the Seashore and north district of the GGNRA.

Alternative A

Analysis: The impacts of Alternative A on geologic and topographic resources and geologic hazards would generally range from have minor adverse to minor beneficial (Table 33).

Geologic Resources and Coastal Bluff Stability: As discussed under No Action, there are no easily viewable unique geologic resources within the Project Area that would be affected by the proposed project, and the Project Area does not represent the best viewing opportunities for the fault and fault-associated features. This alternative would affect bluffs through removal of invasive vegetation, but slopes would be revegetated with

native vegetation, so these activities would not develop bluffs or violate the bluff-related policies in the LCP Plan. Therefore, this alternative would have only a negligible/minor/moderate effect on coastal bluff stability.

Topographic Resources: This alternative would result in minor impacts to topographic resources. There would be varying degrees of sediment excavation and fill in the Giacomini Ranch East Pasture associated with removal of levees and other agricultural infrastructure, excavation of manure disposal areas and tidal channels, grading of creek banks, filling of drainage ditches and manure ponds, spreading of excess excavated material, creation of trails and viewing areas and platforms, and construction of a bridge. There would be no restoration or public access constructed under this alternative in the Giacomini Ranch West Pasture or Olema Marsh, with the possible exception of the possible future extension of the southern perimeter trail to Inverness Park. The possible future trail extension to Inverness Park could involve widening of the Sir Francis Drake Boulevard road berm through placement of fill by as much as 5 feet in areas, which would change existing topographic resources considerably. While approximately 53 percent of the Project Area would be affected, changes in existing topographic contours would average less than 0.25 feet. Most of the intensive excavation and fill activities (> 1.0 foot) are concentrated within a relatively small area (~ 9 percent) of the East Pasture, with shallow redistribution (~0.1 feet – 0.25 feet) of excess excavated sediments over much larger portions of the East Pasture accounting for most of the changes to existing topographic elevation contours in the East Pasture. This shallow redistribution or loose spreading of excavated sediment is intended to be as shallow as possible to minimize any buildup in elevations that could affect establishment of intertidal or salt marsh communities. Because restoration actions focus on restoring historic marsh conditions prior to diking, changes in topographic resources proposed under this alternative are characterized as beneficial.

Over the long term, topographic resources would continue to undergo changes in the East Pasture, because removal of levees would increase exposure to flood flows, which can alter topography through successive episodes of erosion and sediment deposition. Since the 1860s and the massive influx of sediment that extended the Lagunitas Creek delta considerably out into Tomales Bay, the dominant forces shaping the Project Area have shifted from tidal ones to fluvial or river/creek ones (KHE 2006a). This shift is evident in the absence of complex, highly sinuous tidal creek channels depicted in the 1860s map, the formation of alluvial levees, and the flood-scarred landscape of the southern portion of the East Pasture in the 1940s as documented in aerial photographs taken prior to installation of the levees. The Project Area occurs in a very dynamic hydrologic zone at the confluence of three major creeks where topographic resources are expected to be actively reworked by storm events.

Sediment deposition can, over time, lead to an increase in vertical elevations of the floodplain that could tilt evolutionary trajectory trends towards establishment of uplands. However, within naturally dynamic systems such as estuaries, these trends are often counterbalanced by sea level rise and subsidence (either compaction- or fault-associated) that act to maintain or regenerate wetlands even within depostitional environments. Predicted rates of sea level rise over the next century vary greatly, with recent estimates calling for a substantial increase, but, even using conservative estimates such as somewhere less than 3 feet, the northern two-thirds of the East Pasture would become submerged, leaving only the southern one-third above water. This dramatic change in tidal influence would, in essence, result in tidal influences once again being the dominant force shaping the southern Tomales Bay landscape, much as they did in the 1860s.

Geologic Hazards: In terms of geologic hazards, there would be a potential minor impact to public safety related to surface fault rupture, because construction of non-habitable structures within 100-300 feet of the San Andreas Fault would occur under this alternative. The southern perimeter trail proposed in the Project Area would cross Lagunitas Creek using a bridge that would be approximately 150 feet from the San Andreas Fault. In addition, connecting the East Pasture of Giacomini Ranch to the existing trail in White House Pool County Park could increase use of the White House Pool trail, and there is a very small bridge over the existing Bear Valley Creek channel that is approximately 118 feet from the fault. The Alquist Priolo Fault Zone Mapping Act strongly discourages construction of habitable structures on or within 50 feet of an active fault and requires local agencies to strictly regulate construction of any kind in fault zones. While risks associated with non-habitable structures are less than habitable ones, potential impacts to public safety can still occur if non-habitable structures are located on or near an active fault. In this case, the risk to public safety would be very minor, because the structures are non-habitable and located more than 100 feet from the fault and that the soils are alluvial and less likely to magnify the impact of any earthquake that may occur. In addition, despite the proximity of the San Andreas Fault, the probability of a large earthquake in the vicinity of the Project Area is relatively low.

Potential impacts to public safety relating to groundshaking and liquefaction would be minor despite the fact that the Project Area is rated as having the highest liquefaction and groundshaking potential. As discussed under the No Action Alternative, potential impacts from liquefaction would be restricted to those structures and facilities constructed or operated in lowland or alluvial valley portions of the Project Area, while groundshaking impacts would extend to those structures and facilities constructed or operated along the Point Reyes Mesa terrace and along the low hill or shutter ridge on the east side of Olema Marsh. This alternative would involve both construction of new public access structures and facilities, as well as continued operation and use of existing facilities. While this alternative had a high number of public access-related structures, facilities, and attractions/uses (42) that would occur in high hazard zones, the average number of people projected to collectively use all the public access facilities within the Project Area vicinity is low (<150 people daily) relative to visitation rates for other public access facilities within major destination areas or points of the Seashore and north district of the GGNRA. Therefore, the low number of users, combined with the low probability of a major earthquake along the San Andreas Fault in the vicinity of the Project Area, would suggest that potential impacts from this alternative would be minor. There would be no potential to impact to coastal bluff stability under this alternative.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The impacts of Alternative A on geologic and topographic resources and geologic hazards would generally range from have minor adverse to minor beneficial (Table 33). Alternative A would have no impacts on unique geologic resources and minor beneficial effects on topographic resources, because changes in topographic resources would involve primarily the removal of fill to restore historic marsh conditions with the exception of the eastern perimeter trail and the possible future extension of the southern perimeter trail to Inverness Park. There would be potential minor adverse impacts on public safety related to geologic hazards associated with construction and/or operation of public access structures and facilities in known hazard zones within the Project Area. While the Project Area is located in a geologically volatile area, the San Andreas Fault Zone, the probability of a major earthquake in the vicinity of the Project Area is low, and the total or collective number of people expected to use public access resources in the Project Area vicinity is also low relative to visitation rates for other major destination areas or points within the Seashore and north district of the GGNRA.

Alternative B

Analysis: Alternative B would generally have similar impacts to Alternative A, with impacts ranging in intensity from minor adverse to minor beneficial (Table 33).

Geologic Resources, Geologic Hazards, and Coastal Bluff Stability: As discussed under Alternative A, there would be no impact to unique geologic resources, and geologic hazard and coastal bluff stability impacts would be identical to those discussed under Alternative A.

Topographic Resources: As with Alternative A, this alternative would result in minor impacts to topographic resources in both the Giacomini Ranch East and West Pastures. There would be varying degrees of sediment excavation and fill in the East and West Pastures associated with removal of levees and other agricultural infrastructure, excavation of manure disposal areas and tidal channels, grading of creek banks, filling of drainage ditches, borrow ditches and manure ponds, spreading of excess excavated material, creation of trails and viewing areas and platforms, and construction of a bridge. There would be no restoration or public access constructed under this alternative in the Olema Marsh. While approximately 76 percent of the Project Area would be affected, changes in existing topographic contours would still average less than 0.25 feet. Most of the intensive excavation and fill activities (> 1.0 foot) are concentrated within a relatively small area (~ 9

percent) of the East Pasture and, to a much lesser degree, the West Pasture, with shallow (< 0.1 feet - 0.25 feet) redistribution of excess excavated sediment over much larger portions of the ranch accounting for most of the changes to existing topographic elevation contours. This redistribution or loose spreading of excavated sediment is intended to be as shallow as possible to minimize any buildup in elevations that could affect establishment of intertidal or salt marsh communities. One of the potential mitigation measures for flooding would involve possible construction of a levee or levees around private properties on the east side of Sir Francis Drake Boulevard in Inverness Park, specifically lower elevation properties that would be potentially more subject to flooding. This could involve placement of approximately 2-3 vertical feet of fill in existing pastures along private property boundaries. In Alternative B, both the East and West Pastures would be subject to flood flows that would alter topography through erosion and sediment deposition, as well as vulnerable to sea level rise.

Because restoration actions focus primarily on restoring historic marsh conditions prior to diking, changes in topographic resources proposed under this alternative would be characterized as beneficial. Earthmoving associated with public access would be greatly reduced under Alternative B relative to Alternative A, because the eastern perimeter trail would involve construction of a boardwalk rather than importation of fill for a culverted dirt trail. However, as part of the possible future extension of the southern perimeter trail to Inverness Park, there would still be the potential for placement of fill to widen the Sir Francis Drake Boulevard road berm by as much as 5 feet in areas, which would change existing topographic resources considerably.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Alternative B would generally have similar impacts to Alternative A, with impacts ranging in intensity from minor adverse to minor beneficial (Table 33). Alternative B would have no impacts on unique geologic resources and minor beneficial effects on topographic resources, because changes in topographic resources would involve primarily the removal of fill to restore historic marsh conditions with the exception of the possible future extension of the southern perimeter trail to and construction of levees around lower-elevation homes on the east side of Sir Francis Drake Boulevard in Inverness Park. There would be potential minor adverse impacts on public safety related to geologic hazards associated with construction and/or operation of public access structures and facilities in known hazard zones within the Project Area. While the Project Area is located in a geologically volatile area, the San Andreas Fault Zone, the probability of a major earthquake in the vicinity of the Project Area is low, and the total or collective number of people expected to use public access resources in the Project Area vicinity is also low relative to visitation rates for other major destination areas or points within the Seashore and north district of the GGNRA. This alternative would affect bluffs through removal of invasive vegetation, but slopes would be revegetated with native vegetation, so these activities would not develop bluffs or violate the bluff-related policies in the LCP Plan.

Alternative C

Analysis: Alternative C would generally have very similar impacts to Alternative B, with a few exceptions (Table 33).

Geologic Resources, Geologic Hazards, and Coastal Bluff Stability: Similar to Alternatives A and B, Alternative C would have no impacts on unique geologic resources and negligible/minor/moderate impacts on coastal bluff stability. There would be potential minor adverse impacts on public safety related to geologic hazards associated with construction and/or operation of public access structures and facilities in known hazard zones within the Project Area.

Topographic Resources: This alternative would result in moderate impacts on topographic resources in the Giacomini Ranch East and West Pastures and Olema Marsh. There would be varying degrees of sediment excavation and fill in the Giacomini Ranch associated with removal of levees and other agricultural infrastructure, excavation of manure disposal areas and tidal channels, grading of creek banks, filling of drainage ditches, borrow ditches and manure ponds, spreading of excess excavated material, creation of trails and viewing areas and platforms, and construction of a bridge. In addition, in Olema Marsh, there would be excavation of a small berm and a more defined creek channel, as well as potentially future replacement of one or both of the Levee Road and Bear Valley Road culverts through an adaptive restoration approach.

Under this alternative, the extent of area affected by changes in existing topographic contours would increase from approximately 76 percent under Alternative B to approximately 90 percent under Alternative C. In general, changes in existing topographic contours would climb from less than 0.25 feet under Alternatives A and B to less than 0.5 feet. The extent of area affected by intensive excavation and fill (> 1.0 foot) activities would climb from approximately 9 percent under Alternative B to 16 percent of the Project Area, with shallow (< 0.1 feet - 0.25 feet) redistribution of excess excavated sediment over much larger portions of the ranch accounting for most of the changes to existing topographic elevation contours. This redistribution or loose spreading of excavated sediment is intended to be as shallow as possible to minimize any buildup in elevations that could affect establishment of intertidal or salt marsh communities. As with Alternative B, there would still be the potential for construction of a levee or levees around lower-elevation private properties on the east side of Sir Francis Drake Boulevard in Inverness Park as a possible flood control –related mitigation measure (see Public Heatlh and Safety – Flooding). This could involve placement of approximately 2-3 vertical feet of fill in existing pastures along private property boundaries.

Most of the increase in intensive excavation or fill under Alternative C comes from projected impacts to topography associated with excavation of the small berm near the mouth of Bear Valley Creek in Olema Marsh and possible future replacements of the culverts. The small berm at the mouth of Bear Valley Creek adjacent to Levee Road, along with culvert under Levee Road, appear to be substantially limiting drainage of Bear Valley Creek waters that flow under Bear Valley Road into Olema Marsh (KHE 2006a). Poor drainage has converted Olema Marsh into an extensive vegetated and open water pond with an essentially flat water surface slope and almost no gradient, and there is some evidence that water levels are continuing to increase over time (KHE 2006a). Under this alternative, a small berm in the marsh that strongly limits drainage of waters into Bear Valley Creek would be removed, and the Bear Valley Creek channel, which is currently choked with vegetation in Olema Marsh, would be shallowly excavated to improve the hydraulic flow gradient. In future years, should these restoration actions not appear to lead to the desired degree of restoration, the Park Service, CSLC, and Audubon Canyon Ranch (ACR) would consider replacement of the culverts at Levee Road or Bear Valley Road or both culverts.

Because excavation and/or culvert replacement would be expected to substantially improve hydraulic connectivity of Olema Marsh and Lagunitas Creek and decrease drainage of ponded waters, water surface elevations within Olema Marsh would drop, exposing the thick layer of peat or organic rich-soils to air. Aeration of the underlying peat materials would cause rapid decomposition or breakdown of organic materials, which would start to drop the topographic surface elevation of the marsh relative to existing topographic conditions. The expected range of water surface level change would range from 4 feet with removal of the berm and shallow excavation of the channel up to 6 feet with replacement of the Levee Road culvert (KHE 2006a). Excavation of the berm and channel and replacement of the culverts would decrease permanently impounded areas in Olema Marsh from 37.4 acres to 16 to 2.2 acres (KHE 2006a), thereby leaving the remainder of the marsh vulnerable to oxidation and marsh surface subsidence. In Connecticut, a lowering of the water table by almost 3 feet following draining of ponded waters resulted in rapid decomposition and loss of peat, causing the marsh surface to drop or subside by at least 2 feet relative to its former elevation (Rozsa 1997). Marsh surface elevations are approximately 1- 2 feet higher than the culvert invert elevation, which suggests that compaction could range anywhere from 1 to 4.5 feet depending on the adaptive restoration elements implemented. The adaptive restoration approach proposed would enable changes in surface topography to occur more gradually than if all the proposed restoration elements were implemented simultaneously.

Ultimately, this change in existing topographic conditions, as with the changes in Giacomini Ranch, would be considered beneficial, because increases in water surface levels -- and potentially surface elevations through continual build-up of undecomposed peat material -- continues to drive Olema Marsh even further away from its historic condition as an intertidal marsh, with water and ground surface elevations currently precluding almost all tidal influence. More information on the hydrologic, biogeochemical, and biological effects of this

change in drainage and water impoundment conditions is presented in subsequent sections of this chapter. Over the long-term, subsidence leaves the marsh more vulnerable to sea level rise, but, to some extent, the levee and culvert system would provide a buffer that might slightly reduce impacts.

Several other changes occur under Alternative C relative to Alternative B. One is that, for California red-legged frog mitigation purposes, several ponds totaling approximately 2 acres in size would be created in the adjacent Olema Creek watershed. Excavation in this area would vary and range from less than 0.5 foot to several feet in depth to create depressional features with various ponding depths. The second is that, if the Levee Road culvert was replaced through adaptive restoration, the existing bridge over the Bear Valley Creek outlet would need to be replaced with either a pedestrian causeway along Levee Road or a new bridge closer to Lagunitas Creek. As with the old bridge, the new bridge or causeway would be within approximately 125 feet of the San Andreas Fault trace.

Possible Additional Mitigation Measures: No mitigation measures are proposed.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

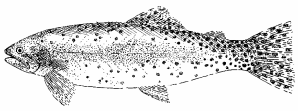
Cumulative Impacts: As was discussed under the No Action Alternative, there is at least one project that could potentially cause cumulative impacts with the proposed project. The proposed Bear Valley Creek Watershed Enhancement Project would replace undersized or otherwise hydraulically limiting stream crossing infrastructure in the middle and upper portions of the watershed. Changes in erosion or sedimentation patterns resulting from this project could have cumulative effects on topographic resources through changing sediment transport patterns in the subwatershed, patterns of deposition and erosion. Should the Bear Valley Creek project increase sediment transport to the lower reaches of Bear Valley Creek, subsidence within Olema Marsh induced by oxidation could be tempered to some degree. Because of the flat gradient through lower Bear Valley Creek and Olema Marsh, the Bear Valley Creek project is unlikely to increase erosion rates. Therefore, cumulative impacts on topographic resources under Alternative C from the Bear Valley Creek Watershed Enhancement Project would be considered to be beneficial and minor to moderate in intensity. Other than the Bear Valley Creek project, there are no currently proposed or reasonably foreseeable projects that would have the potential to cause cumulative impacts in the Giacomini Ranch should Alternative C be implemented.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Impacts under Alternative C would be generally similar to those under Alternative B, with a few exceptions. Similar to Alternatives A and B, Alternative C would have no impacts on unique geologic resources, and there would be potential minor adverse impacts on public safety related to geologic hazards associated with construction and/or operation of public access structures and facilities in known hazard zones within the Project Area. The most apparent change in Alternative C relative to Alternative B is the appreciable increase in areal extent of changes in topographic conditions, as well as the extent of area that would be subjected to more intensive excavation and fill activities (> 1.0 foot). Most of this increase would come from changes in Olema Marsh, which would subside as a result of improved hydraulic connectivity and drainage of waters afforded by the proposed restoration activities, as well as possible construction of levees to protect private property. The adaptive restoration approach proposed could result in anywhere form 0.66 to 3 feet of surface elevation lowering or subsidence from oxidation and decomposition of extensive peat material present in Olema Marsh. This alternative would affect bluffs through removal of invasive vegetation, but slopes would be revegetated with native vegetation, so these activities would not develop bluffs or violate the bluff-related policies in the LCP Plan. Therefore, this alternative would have only a negligible/minor/moderate effect on coastal bluff stability.

Alternative D

Analysis: Alternative D would generally have very similar impacts to Alternative C, except for potential impacts to public safety associated with surface fault rupture (Table 33).



Geologic Hazards: This alternative would have no potential impacts to public safety associated with geologic hazards such as surface fault rupture, because no bridge would be constructed along the southern perimeter of the Giacomini Ranch as part of the public access component. There would be no potential changes in topographic resources associated with public access, because there would be no through-trail component on the eastern perimeter or future extension of the southern perimeter trail to Inverness Park. Visitation rates could increase slightly in White House Pool County park, simply because of public interest in viewing the restoration project, but these increases would be low enough that they would probably not be detectable.

Topographic Resources: Potential impacts to existing topographic resources would still be characterized as moderate for restoration and public access components in the Giacomini Ranch East and West Pastures and Olema Marsh. The largest change in Alternative D relative to Alternative C is some limited grading in the southwestern portion of the East Pasture to bring the higher elevation areas down to intertidal elevations that would be affected by tides either daily or on higher high tides.

Under this alternative, the extent of area affected by changes in existing topographic contours would increase very slightly from approximately 90 percent under Alternative C to approximately 91 percent under Alternative D. Changes in existing topographic contours would average slightly higher than Alternative C, but still be less, on average, than 0.5 feet. The extent of area affected by intensive excavation and fill (> 1.0 foot) activities would increase slightly from approximately 16 percent under Alternative C to 17 percent of the Project Area under Alternative D, with shallow (< 0.1 feet - 0.25 feet) redistribution of excess excavated sediment over much larger portions of the ranch again accounting for most of the changes to existing topographic elevation contours. As with Alternatives B and C, there would still be the potential for construction of a levee or levees around lower-elevation private properties on the east side of Sir Francis Drake Boulevard in Inverness Park as a possible flood control–related mitigation measure (see Public Heatlh and Safety – Flooding). Because restoration actions focus on removing fill and other legacies of 60 years of agricultural management, changes in topographic resources proposed under this alternative are characterized as beneficial.

Possible Additional Mitigation Measures: No additional mitigation measures would be proposed.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: Cumulative impacts would the same as discussed under Alternative C.

Conclusions: Alternative D would generally have very similar impacts to Alternative C, except for potential impacts to public safety associated with surface fault rupture (Table 33). Similar to Alternative C, this alternative would have no impact on unique geologic resources; negligible/minor/moderate impacts on coastal bluff stability; beneficial moderate effects on topographic resources, and potential minor adverse impacts to public safety associated with geologic hazards such as groundshaking and liquefaction. The most substantial change in Alternative D relative to Alternative C is the removal of the bridge under the public access component, which reduces, if not eliminates, potential threats to public safety from geologic hazards such as surface fault ruptures. The other change is the excavation of the southeastern portion of the East Pasture to intertidal elevations, which causes a slight increase in areal extent and average depth of fill or excavation relative to Alternative C.

Soil Resources

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

Soils are regulated either as a unique resource or a possible source of contamination. Soils that are believed to have high value for agriculture are seen as a unique resource and are subject to the federal Farmland Protection Policy Act (FPPA). Highly publicized efforts to clean up Superfund sites and landfills over the past 30 years underscore how soils can also become a source of contamination and a hazard to public health. In general, sediment contamination is linked for regulatory purposes to water quality under Section 401 and Section 303(d) of the Clean Water Act. The San Francisco RWQCB has standards for turbidity or the amount of suspended sediment in waters, and suspended sediment often is bound to nutrients, pathogens, and contaminants such as mercury. The Basin Plan (RWQCB 1995a) requires that the suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

In addition, "controllable water quality factors shall not cause a detrimental increase in the concentrations of toxic pollutants in sediments or aquatic life" (RWQCB 1995a). Should soil contamination reach high enough levels, federal legislation such as the Resource Conservation and Recovery Act (42 U.S.C. 6901 et seq. -- 1976) and Comprehensive Environmental Response, Compensation, and Liability Act (42 (U.S.C. 9601 et seq. -- 1980), also known as Superfund, are triggered, which regulate transport and disposal of hazardous waste and require clean-up of toxic areas. While not directly regulated, soils can also become a contaminant source through uptake of extremely high levels of nutrients from activities such as concentrated cattle or horse grazing or manure spreading. These nutrients can later be potentially released from soils to surface or ground waters through erosion, resuspension of bound forms back into solution, and/or release of nitrogen through volatilization to the atmosphere.

Significance criteria developed by the state and county for CEQA mainly focus on the potential for erosion or siltation through wind and water forces, the latter of which is addressed under Water Resources.

General Assumptions and Methodologies

- Impacts to Prime and Unique Farmland Resources are evaluated under the Land Use and Planning – Agricultural Land Use section.
- Potential water quality impacts in the Project Area or watershed associated with erosion of soils or flux of nutrient or contaminants from soils into overlying surface waters during and shortly after construction, as well as over the long-term, are evaluated under Water Resources – Water Quality focused impact topic.
- Changes in the quality of sediments in the Project Area associated with implementation of the proposed project are assessed separately for 1) nutrients (assumed to be a combination of nitrates, ammonium, and phosphates) and 2) contaminants (principally metals).
- Short-Term under this impact topic refers to a period of approximately 10 years.

Described below are methodologies for impact indicators related to soils resources, including any specific assumptions or details on methodologies used to develop impact thresholds (Tables 34-35).

Sediment Quality – Nutrients: While nutrient dynamics in Tomales Bay is largely driven by loading from upstream portions of the watershed, the quality of the sediment in most of the Project Area is currently affected primarily by agricultural management practices such as cattle grazing and varying degrees of manure spreading within the pastures. With restoration, these soils could be subject to erosion and transported downstream into Lagunitas Creek and the southern portion of Tomales Bay. Because there are no specific regulations regarding nutrient concentrations in sediment despite its potential to affect water quality through erosion or release or flux of nutrients from soils into overlying waters, analysis relies on establishing a relatively broad range of impact thresholds in sediment quality conditions using baseline data collected on sediments in the Project Area (NPS, unpub. data; Table 34). Impact thresholds are based on the natural range of variability in nutrient concentrations (specifically total organic and inorganic nitrogen or TKN) observed in baseline or reference wetlands, lightly managed pastures with cattle grazing but no manure spreading, heavily managed pastures with higher levels of cattle grazing and light manure spreading, and pastures repeatedly subjected to heavy manure spreading. TKN (inorganic and organic nitrogen) was selected as the representative nutrient parameter, because TKN does not vary as widely over short time scales as do other nutrient parameters such as nitrates (J. Callaway, wetlands ecology professor, University of San Francisco, *pers. comm*.).

Changes in soil nutrient concentrations were not modeled for the proposed project, so impact thresholds are intended to provide a very rough semi-quantitative tool for assessing relative degree of impact. Projected future changes in sediment nutrient concentrations under the various alternatives are estimated using qualitative assumptions on the rate of decline in existing nutrient loads due to removal of cattle in addition to expected future nutrient loading from creek or fluvial sediment transport processes such as overbank flooding, estuarine sediment transport processes, and use of the Project Area by wildlife.

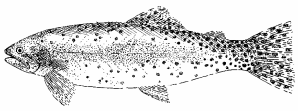


TABLE 34. SEDIMENT QUALITY - NUTRIENTS

Source: RWQCB Basin Plan Nature: Beneficial, Adverse Context: Project Area, Watershed Duration: Short-Term, Long-Term	
No Impact	There would be no change in nutrient concentrations within sediment in the Project Area.
Negligible	Estimated changes in the concentration of nutrients (i.e., TKN) within sediment would be negligible and remain within the range of natural variability in natural wetlands (± 50 percent relative to baseline concentrations).
Minor	Estimated changes in the concentration of nutrients (i.e., TKN) within sediment would be minor (± 51 -100 percent relative to baseline concentrations). For adverse impacts, change would be roughly equivalent to introducing light grazing to natural wetland.
Moderate	Estimated changes in the concentration of nutrients (i.e., TKN) within sediment would be moderate (± 101 - 200 percent relative to baseline concentrations). For adverse impacts, change would be roughly equivalent to introducing heavy grazing and manure disposal to natural wetland.
Major or Substantial	Estimated changes in the concentration of nutrients (i.e., TKN) within sediment would be major (± > 200 percent relative to baseline concentrations). For adverse impacts, change would be roughly equivalent to converting into manure disposal area.

Sediment Quality – Contaminants: Tomales Bay has not been impacted by the number of contaminants and degree of contamination as has highly urbanized watersheds such as San Francisco Bay, but it still has been affected by contamination, principally by metals. Within the Project Area and southern portion of Tomales Bay, the contaminants of concern appear largely to be mercury from the Gambonini mine in the Walker Creek watershed; lead from decades of hunting within and adjacent to the Project Area; and contaminants from possible leaching of the now-closed West Marin Landfill in the Tomasini Creek watershed directly upstream of the Project Area (Parsons and Allen 2004a). Through restoration of hydrologic connectivity, the proposed project has the potential to affect concentration and/or distribution of contaminants in the Project Area, as well as outside of the Project Area.

Impact thresholds are based on semi-quantitatively estimating the potential for change in average concentrations for any contaminants of concern identified for the Project Area and vicinity. The analysis takes into account known or estimated existing or baseline contaminant concentrations in the Project Area and immediate vicinity, including any localized "hotspots," as well as anticipated changes in the future through potential influx of contaminants from flooding and creek or fluvial sediment transport processes, as well as from estuarine sediment transport processes. Impact thresholds are based on several sediment quality guidelines that have been developed, including the Effects Range sediment quality guidelines by the National Oceanic and Atmospheric Administration.

The Effects Range sediment quality guidelines identify which concentrations of contaminants have been associated with biological effects in laboratory, field, or modeling studies. Effects Range-Low (ERL) is "rarely" associated with adverse effects, while Effects Range-Median (ERM) is "occasionally" associated with adverse effects: those above the ERM are "frequently" associated with adverse effects. Some metals are naturally high in the San Francisco Bay region due to the presence of certain minerals and ultramafic rocks such as serpentine (Hornberger et al. 1999)with background (pre-industrialization) concentrations actually exceeding thresholds of the Effects Range guidelines (Gandesbery et al. 1999). An Ambient Sediment Criteria (ASC) has been developed for the San Francisco Bay region to reflect these regional anomalies (Gandesbery et al. 1999).

The standardized percent change used in the impact threshold criteria (±80 percent) represents roughly the mean or average percent change between the different standards: 1) ASC or background/regional ambient conditions, 2) ERL, and 3) ERM concentrations for all the contaminants of concern (e.g., lead, mercury, cadmium; Table 35). Because changes in sediment contaminant concentrations were not modeled using computers, impact thresholds are intended to provide only a very rough semi-quantitative tool for assessing the relative degree of change or impact.

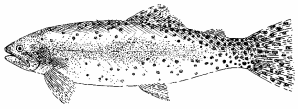


TABLE 35. SEDIMENT QUALITY – CONTAMINANTS

Source: RWQCB Basin Plan, RCRA Nature: Beneficial, Adverse Context: Project Area, Watershed Duration: Long-Term	
No Impact	There would be no change in contaminant concentrations within sediment in the Project Area.
Negligible	Estimated changes in the concentration of contaminants of concern within sediment would be negligible (± 80 percent relative to baseline conditions). For natural, relatively unpolluted wetlands, there would be a barely detectable change in concentrations, with concentrations remaining within the range of ambient sediment concentrations or ASC.
Minor	Estimated changes in the concentration of contaminants of concern within sediment would be minor (± 81 -160 percent relative to baseline conditions). For adverse impacts to natural, relatively unpolluted wetlands, there would be a measurable change that would increase concentrations, but levels would be maintained below the ERL.
Moderate	Estimated changes in the concentration of contaminants of concern within sediment would be moderate (± 161-240 percent relative to baseline conditions). For adverse impacts to natural, relatively unpolluted wetlands, there would be an appreciable change that would increase concentrations above the ERL, but maintain below the ERM.
Major or Substantial	Estimated changes in the concentration of contaminants of concern within sediment would be moderate (± > 240 percent relative to baseline conditions). For adverse impacts to natural, relatively unpolluted wetlands, there would be a highly striking change that would increase concentrations above the ERM.

Impact Analysis

TABLE 36. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR SOIL RESOURCES

All impacts are analyzed for the Project Area and Watershed. Potential watershed effects are analyzed under Water Resources – Water Salinity and Quality.

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	*Intensity, Nature, Type, Duration, and Context of Impact*				
Sediment Nutrients – Project Area Short-Term	Beneficial – Negligible	Beneficial – Negligible	Beneficial – Negligible	Adverse - Negligible	Adverse - Negligible
Long-Term	Beneficial – Minor	Beneficial – Moderate	Beneficial – Moderate	Beneficial – Moderate	Beneficial – Moderate
Sediment Nutrients – Watershed Short-Term	No Impact	Beneficial – Negligible	Beneficial – Negligible	Beneficial – Negligible	Beneficial - Negligible
Long-Term	Beneficial – Negligible/ Minor	Beneficial – Negligible/ Minor	Beneficial – Negligible/ Minor	Beneficial – Negligible/ Minor	Beneficial – Negligible/ Minor
Sediment Contaminants – Project Area	Adverse - Negligible	Adverse - Negligible	Adverse - Negligible	Adverse - Minor	Adverse - Minor
Sediment Contaminants – Watershed Short-Term	No Impact	Beneficial – Negligible	Beneficial – Negligible	Beneficial – Negligible	Beneficial - Negligible
Long-Term	Beneficial – Negligible	Beneficial – Negligible	Beneficial – Negligible	Beneficial – Negligible	Beneficial – Negligible

No Action Alternative

Analysis: The impacts of the No Action Alternative on soil resources would generally range from have negligible to minor effects on soil resources in the Project Area (Table 36). Under the No Action Alternative, levees, tidegates, and culverts in the Giacomini Ranch are not breached or removed, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. (The Park Service is required under

its existing agreement with CalTrans to restore wetlands as mitigation for impacts caused by CalTrans to aquatic habitat from a road repair on State Route 1 in Marin County in exchange for the Park Service receiving monies to purchase and restore the Giacomini Ranch.) The remainder of the levee would not be deconstructed, although there would be no levee maintenance. Under the terms of the existing purchase agreement, the Project Area will convert from a dairy in early 2007 to lands that would be largely managed as open space, although there is a potential for leased grazing for dairy heifers (young cows) or beef cattle through a separate environmental review process. When the dairy closes in 2007, most of the agricultural management practices associated with dairying will cease, including light and intensive spreading of manure; irrigation; and annual mowing.

Nutrients: Under this alternative, changes in soil nutrient conditions would be expected primarily in the Giacomini Ranch, with any change in Olema Marsh expected to remain within the range of natural variability. Over the short-term, the reduced scale of agricultural operations and management would be expected to have only negligible beneficial effects on sediment nutrient concentrations, because, while there may be some short-term fluctuations in levels of nitrates, ammonium, or phosphates, the nutrient "pool" within sediments is generally stable from year-to-year and responds slowly to change. Any changes within the first 10 years following closure of the dairy would be expected to fall within the rather large range of natural variability characteristic of sediments in wetland and agricultural areas. Olema Marsh is not grazed by cattle, so the nutrient cycle within this portion of the Project Area is affected more by nutrient loading from upstream sources and limitations on nutrient processing once nutrients have entered the marsh, with the lack of oxygen within the permanently impounded sediment hampering breakdown of organic matter and conversion to inorganic nutrients.

Over the long-term, this alternative would be expected to result in minor beneficial effects on soil nutrients in the Giacomini Ranch through the reduction in grazing intensity typically associated with beef cattle or heifer grazing and elimination of agricultural management practices such as light or heavy application of manure to pastures. Grazing dairy cattle can generate as much as 0.65 to 0.9 pounds of nitrogen in excreted waste per day depending upon the amount of time that cattle are kept in pastures (Van Horn et al. 1999 *in* (Downing 2001). Because no effort would be made to remove manure disposal areas in the Giacomini Ranch East Pasture, nutrient levels in this 13-acre area would be expected to decrease, but remain high relative to natural wetland and even to moderately grazed lands for the foreseeable future. Currently, manure disposal areas have Total Nitrogen levels that are roughly six (6) times that of the heavily grazed or managed pastures in the Giacomini Ranch (NPS, unpub. data). In general, if leased grazing were approved, nutrient concentrations within the currently more highly managed East Pasture would be expected to decrease over time, dropping slightly to levels consistent with lightly managed agricultural lands such as the West Pasture. Ambient nutrient concentrations in the East Pasture would be slightly more than double that of the West Pasture (NPS, unpub. data). Nutrient concentrations within the lightly managed West Pasture would be expected to remain stable. Nutrient concentrations, on the other hand, in sediments of Lagunitas Creek within the Project Area would be expected to drop substantially due to the elimination of cattle from Lagunitas Creek. Dairy cattle currently access the West Pasture by crossing the creek just downstream of White House Pool. Should grazing be removed entirely, the amount of reduction in sediment nutrient concentrations within the Giacomini Ranch would be expected to increase slightly over the long-term, although manure disposal areas or pastures would remain high for the foreseeable future.

Within the East Pasture, the rate of change might be highest in the 11-acre restored area in the northwestern corner of the East Pasture. This area would be restored through removing the existing levees and reestablishing a tidal connection for the now hydrologically isolated northern end of the East Pasture Old Slough. (A new levee would be constructed at the southern end of the 11-acre restoration area.) Through levee removal and hydrologic reconnection, the potential for influxes of nutrients from both fluvial/creek and tidal sources would increase exponentially, particularly during periods of flooding and extreme high tides. Natural wetlands are believed to remove as much as 50 percent of ammonium, 50 percent of Total Nitrogen, 20- 45 percent of Total Phosphates, and more than 90 percent of fecal coliform from municipal wastewaters or stormwaters or from natural waters with high concentrations of nutrients, pathogens, and contaminants (Kadlec and Knight 1996; van der Lee et al. 2004) CH2M Hill *in* Kadlec and Knight 1996). These nutrients are uptaken by plants, stored long-term in sediment, or, for nitrogen, potentially released to the atmosphere through volatilization. Based on water quality sampling in the adjacent portion of Lagunitas Creek, the potential for substantial nutrient influxes to this relatively small portion of the Project Area would be extremely negligible.

Contaminants: Changes in sediment contaminant concentrations in the Project Area under this alternative would be expected to be extremely negligible, with the only real potential for impact in the 11-acre restored area. A sediment screening evaluation was conducted as part of baseline studies for the Project Area, with the potential contaminants of concern being lead shot from decades of hunting on the Giacomini Ranch and mercury from redistribution of contaminated sediments near the outer portion of Tomales Bay eventually into the southern portion of the watershed. The only contaminant detected in the Project Area was cadmium, which actually occurred outside the Giacomini Ranch in Tomasini Creek directly upstream of Mesa Road (Parsons and Allen 2004a). Mercury, methylated mercury, and lead were not detected in the Project Area – even, in the case of methylated mercury, with extremely low detection limits. However, mercury, in particular, continues to be a concern, because of its longevity in the environment, its propensity to be transformed in wetlands soils to an even more toxic form (methylmercury), and its ability to move within aquatic environments through frequent sediment suspension and redistribution. Studies conducted in Tomales Bay in the 1990s showed that mercury concentrations followed somewhat of a bell curve distribution, with the lowest concentrations occurring at the furthest northern and southern ends of the Bay (D. Whyte, RWQCB, *pers. comm*.).

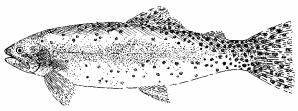
Changes to sediment contaminants in the Project Area under this alternative would be considered to be extremely negligible, because this alternative would involve very limited levee removal for the 11-acre mitigation area, leaving the rest of the Giacomini Ranch and Olema Marsh isolated from Lagunitas Creek. In addition, there would be no change in the channel alignment or flow pattern of Tomasini Creek that would increase its influence on the Giacomini Ranch. Currently, Tomasini Creek only tops its levees and floods into the East Pasture during large flood events such as the late 2005 30-year flood event, although the creek is known to have at least one connection with the East Pasture via a culvert that allows high tide waters to flood into the shallowly flooded area that attracts moderate numbers of waterfowl and shorebirds during the winter. The potential risk for contaminant influx into the Project Area could increase over the long-term because of levee degradation and the increased connectivity between the Giacomini Ranch and potential contaminant sources in bay and creek waters. It could also increase, because of increased tidal inundation within the Project Area due to sea level rise, which appears to be increasing at a much higher rate than originally predicted based on recently published studies (Overpeck et al. 2006).

Watershed: From a watershed perspective, the No Action Alternative would have no impacts to very negligible beneficial effects on sediment nutrient and contaminant concentrations over the short-term. The levees effectively keep most, if not all, of the nutrients and contaminants present in the Giacomini Ranch on-site, while also preventing influx of nutrient and contaminants from upstream sources onto floodplains during flood events that could improve downstream water quality. Over the long-term, degradation of the levees could increase the ability of the Giacomini Ranch to improve the quality of downstream sediment resources in the southern portion of Tomales Bay by retaining many of the nutrients, contaminants, and other pollutants present in flood flows from Lagunitas, Olema, and Tomasini Creeks. This subject is discussed in more detail under Water Resources. If so, this alternative could ultimately have a negligible to minor beneficial effect on sediment nutrients and contaminants within the southern portion of the watershed.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: There is only one project that would potentially have a cumulative impact should the No Action alternative be implemented. The proposed Bear Valley Creek Watershed Enhancement Project would replace undersized or otherwise hydraulically limiting stream crossing infrastructure in the middle and upper portions of the watershed. Changes in erosion or sedimentation patterns resulting from this project could have cumulative effects on soil resources through changing sediment transport patterns in the subwatershed and patterns of deposition and erosion, leading to possible changes in levels of sediment nutrients and contaminants in both Olema Marsh and Lagunitas Creek. Changes in erosion or sedimentation patterns resulting from this project could have cumulative effects on nutrients in sediments, because nutrients and contaminants are often bound to sediment. Because of the flat gradient through lower Bear Valley Creek and Olema Marsh, the Bear Valley Creek project is unlikely to increase erosion rates. Therefore, cumulative impacts on soil resources would be considered to be potentially adverse, though minor in intensity.



Other than the Bear Valley Creek project, there are no currently proposed or reasonably foreseeable projects that would have the potential to cause cumulative impacts in the Giacomini Ranch should the No Action Alternative be implemented. The RWQCB instituted a clean-up of the Gambonini mine that dramatically reduced the potential for additional mercury to enter Tomales Bay, but it did not address mercury that had already entered the Bay and that is being stored and redistributed in estuarine sediments. The RWQCB had also been attempting to force the owners of the West Marin Landfill in the Tomasini Creek watershed to perform some remedial clean-up that would decrease documented problems with leaching of landfill materials into the creek, but a Marin County judge dismissed the case (D. Elias, RWQCB, *pers. comm*.). Enforcement action is reportedly being pursued by another agency.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

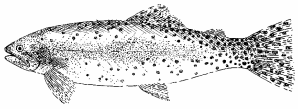
Conclusions: The impacts of the No Action Alternative on soil resources would range from negligible adverse to beneficial minor in the Project Area and from no impact to beneficial negligible in the watershed. The shift from a dairy to either leased grazing and/or open space lands that would occur as part of the Park Service's existing agreement with the Giacomini Trust would result in a long-term minor to moderate reduction in nutrients, because the intensity of any agricultural uses that would be approved through a separate environmental process in the future would be of a much lesser scale and intensity than the current dairy operation, The current dairy operation often disposes of manure through concentrated application in certain pastures with light application elsewhere in the East Pasture. Sediment contaminant concentrations, which appear to be very low currently (Parsons and Allen 2004a), might increase negligibly from removal of levees in the 11-acre mitigation that would be performed in the northwestern portion of the East Pasture to satisfy the Park Service's existing mitigation agreement with CalTrans. Over the long-term, levee degradation would increase both fluvial/creek and tidal influences and thereby potentially increase exposure to contaminants such as mercury that occur in the outer portion of Tomales Bay currently and that is known to actively move within watersheds through sediment resuspension and redistribution. This would be compounded by increased tidal inundation caused by sea level rise.

Alternative A

Analysis: The impacts of Alternative A on soil resources in the Project Area and watershed would generally range from negligible adverse to moderate beneficial (Table 36). Under Alternative A, the East Pasture would be restored. There would be no restoration in the West Pasture or Olema Marsh. The levees along and tidegate/culvert in the West Pasture and Tomasini Creek would be retained. In the East Pasture, restoration would involve breaching of levees in the East Pasture along Lagunitas Creek, and excavation of new tidal channels.

Nutrients: As with the No Action Alternative, changes in soil nutrient conditions would be expected primarily in the Giacomini Ranch, with any change in Olema Marsh expected to remain within the range of natural variability. Soil nutrient conditions would be expected to change in the heavily managed East Pasture, which is being actively restored, but they would also change in the more lightly managed West Pasture through passive removal related to removal of cows. Olema Marsh is not grazed by cattle, so the nutrient cycle within this portion of the Project Area is affected more by nutrient loading from upstream sources and limitations on nutrient processing once nutrients have entered the marsh. The lack of oxygen within the permanently impounded sediment hampers breakdown of organic matter and conversion to inorganic nutrients.

Over the short-term, the conversion from heavily and lightly managed agricultural operations to open space lands would be expected to have only negligible effects on sediment nutrient concentrations, because, while there may be some short-term fluctuations in levels of nitrates, ammonium, or phosphates, the nutrient "pool" within sediments is generally stable from year-to-year and responds slowly to change. Therefore, generally, any change within the first 10 years following closure of the dairy would be expected to be within the rather large range of natural variability observed in sediment in the Project Area and vicinity. There would be some immediate improvement with excavation of 1.5 to 3 feet of the soil surface within the 13-acre manure disposal area, which would be hauled off locally to fill in the manure disposal ponds near the dairy facility. As will be discussed in greater detail under Water Resources – Hydrologic Processes, an increase in the frequency of flooding would bring new sediments that may act to effectively bury some of these high nutrient soils.



Over the long-term, this alternative would be expected to result in moderate beneficial effects on soil nutrient conditions in the Giacomini Ranch, largely because of removal of agricultural operations. Total nutrient concentrations would be expected to decrease relative to both baseline conditions of intensive agricultural management and the No Action Alternative, although the rate of change may remain roughly similar between the two alternatives. Under Alternative A, soil nutrient conditions would be expected to drop substantially over time, eventually reaching levels that are consistent with those observed in natural, undiked marsh soils. Excavation of the nutrient-laden surface soils in the manure disposal area or pasture should hasten reductions in nutrient loads to those observed in highly managed or intensively grazed areas, which can be approximately six (6) times lower than manure disposal areas in terms of Total Nitrogen (NPS, unpub. data). Nutrient concentrations in localized portions of Lagunitas Creek within the Project Area would be expected to drop substantially due to the elimination of Giacomini cattle from Lagunitas Creek, although upstream cattle influences outside of the Project Area would continue to exist. Dairy cattle from the Giacomini Ranch currently access the West Pasture by crossing the creek just downstream of White House Pool. Over time, nutrient concentrations in the East Pasture would be expected to drop to levels similar to those in the less intensively grazed and managed areas such as the West Pasture. Ambient nutrient concentrations in the East Pasture would be slightly more than double that of the West Pasture (NPS, unpub. data). Nutrient concentrations within the lightly managed West Pasture would be expected to decrease slightly.

While removal of cattle and manure would eliminate one large source of nutrients, breaching of levees and hydrologic reconnection of the East Pasture with Lagunitas Creek and Tomales Bay would introduce others -- nutrients carried by fluvial/creek and tidal waters in Lagunitas Creek. In terms of the amount of area exposed, the largest nutrient loading periods would occur during flooding and higher and extreme tide events, although intertidal areas below Mean High Water (MHW) would be exposed to nutrient influx from outside sources on a more regular basis. Water quality sampling conducted over the past four years at the upstream and downstream ends of Lagunitas Creek in the Project Area suggests that concentrations of nutrients such as nitrates within at least this section of the creek are normally moderate (mean concentrations < 1.0 mg/L and mean instantaneous loading <1 mg per second or mg/s), although instantaneous loading rates during a 2.25-year storm event in April 2006 storm climbed as high as approximately 220 mg per second (mg/s; Parsons, *in prep*.). During these types of smaller flood events, approximately 10 percent of Lagunitas Creek floodwaters, which carry sediment, nutrients, pathogens, and contaminants, could flow into the East Pasture (KHE 2006a). Natural wetlands are believed to remove as much as 50 percent of ammonium, 50 percent of Total Nitrogen, 20-45 percent of Total Phosphates, and greater than 90 percent of fecal coliforms from municipal wastewaters or stormwaters or natural waters with high nutrient, pathogen, or contaminant loads that flow onto floodplains or marshplains during flood events (Kadlec and Knight 1996, van der Lee et al. 2004, CH2M Hill *in* Kadlec and Knight 1996). Retention of nitrates in floodplains is considerably lower (~2- 3 percent) due to the fact that these nutrients are not bound to sediment and tend to be transported through floodplains unless waters are detained for a substantial amount of time (van der Lee et al. 2004).

Once deposited, these nutrients are uptaken by plants, stored long-term in sediment, or, for nitrogen, potentially released to the atmosphere as gasses through volatilization depending on soil conditions, particularly the amount of aeration or oxygen in the soils. Breaching of levees not only increases the potential for nutrient influx, but ultimately affects the fate of these newly deposited nutrients, sediments, and contaminants, as well as the rate and exact timeframe over which reductions in agriculturally-related nutrients and pathogens would occur. Nutrients are more efficiently processed in well-aerated soils than in soils that are low in oxygen due to permanent, semi-permanent, or even seasonal inundation or saturation. This is the mechanism by which wetland soils act as such efficient trappers or filters of nutrients and contaminants, with anoxic conditions often limiting processing or conversion and/or causing nutrients and contaminants to become strongly bound or “sorbed” to soils, metals, and minerals. In less frequently inundated areas such as the higher intertidal zones or upland areas, sediment-associated nutrients such as ammonium and organic nitrogen would tend to be released and rapidly converted into oxygenated forms of nitrates such as nitrates that would either be uptaken by plants or lost to the atmosphere as nitrogen gas. In more frequently inundated areas where soils remain anoxic, conversion to nitrates would be reduced, and nutrients such as ammonium would remain strongly sorbed to soils. Phosphorous follows a somewhat different trajectory than many other nutrients and contaminants, such that oxygenated soil conditions enhance retention of phosphorous. Soils where even the soil-water interface zone becomes anoxic or depleted of oxygen often release phosphorous into overlying waters. Some managed wetlands have pulses of phosphates during periods of high productivity such as the spring and summer, when oxygen in overlying waters drop to no or very low levels at night because of high respiration or oxygen demand (Parsons and Martini-Lamb 2003). Former agricultural soils often show pulses of phosphorous in restoration situations where soils are either

temporarily flooded or dried because of release of iron-bound phosphorous or conversion of organic to inorganic phosphorous, respectively (Aldous et al. 2005).

In certain areas of the Giacomini Ranch and certainly in Olema Marsh, inundation and saturation conditions have actually been exacerbated to varying degrees by the tendency of levees to impound waters. In addition, the Giacominis flood and spray irrigated most of the East Pasture during the summer, thereby prolonging the period of inundation or saturation. Without irrigation, some of the higher areas would actually become drier under undiked conditions. Based on estimates from hydraulic modeling, upland and higher intertidal elevations would represent approximately 86 percent of the West Pasture and 47 percent of the East Pasture (KHE 2006a). Therefore, breaching of levees may not only increase the potential for influx, but the potential for efflux through either more efficient processing of organic matter and inorganic nutrients or through release into overlying waters.

Contaminants: Changes in sediment contaminant concentrations under this alternative would be expected to be negligible, with the potential for change restricted to the 350-acre East Pasture. A sediment screening evaluation was conducted as part of baseline studies for the Project Area, with the potential contaminants of concern being lead shot from decades of hunting on the Giacomini Ranch and mercury from redistribution of contaminated sediments near the outer portion of Tomales Bay eventually into the southern portion of the watershed. The only contaminant detected in the Project Area was cadmium, which actually occurred outside the Giacomini Ranch in Tomasini Creek directly upstream of Mesa Road (Parsons and Allen 2004a). Mercury, methylated mercury, and lead were not detected in the Project Area – even, in the case of methylated mercury, with extremely low detection limits. However, mercury, in particular, continues to be a concern, because of its longevity in the environment, its propensity to be transformed in wetlands soils to an even more toxic form (methylmercury), and its ability to move within aquatic environments through frequent sediment suspension and redistribution. Studies conducted in Tomales Bay in the 1990s showed that mercury concentrations followed somewhat of a bell curve, with the lowest concentrations the furthest northern and southern ends of the Bay (D. Whyte, RWQCB, *pers. comm*.).

Changes to sediment contaminants under this alternative would be considered to be negligible, because potential exposure to Bay, or creek, sources of contaminants would be restricted largely to the breached East Pasture, and the risk that sediments within the East Pasture would become contaminated by mercury would appear at this time to be relatively minor. In addition, there would be no change in the channel alignment or flow pattern of Tomasini Creek that would increase its influence on the Giacomini Ranch. Currently, Tomasini Creek only tops its levees and floods into the East Pasture during large flood events such as the late 2005 30-year flood event, although the creek is known to have at least one connection with the East Pasture via a culvert that allows high tide waters to flood into the shallowly flooded area that attracts moderate numbers of waterfowl and shorebirds during the winter. The potential risk for contaminant influx into the Project Area could increase over the long-term because of increased tidal inundation within the Project Area due to sea level rise, which appears to be increasing at a much higher rate than originally predicted based on recently published studies (Overpeck et al. 2006).

Watershed: From a watershed perspective, Alternative A would have negligible to perhaps minor beneficial effects on sediment nutrient and contaminant concentrations. Over the short term, disturbance of sediments from construction activities may increase the influx of sediment-associated nutrients and contaminants to downstream waters, but as discussed earlier, removal of the levees would encourage Lagunitas Creek to overflow onto its historic East Pasture floodplains during flood events and thereby decrease the amount of nutrients, contaminants, and other pollutants that are carried downstream into the southern portion of Tomales Bay for eventual deposition into subtidal and intertidal sediments. (This subject is discussed in more detail under Water Resources.) While the magnitude of the effect of the proposed project on sediment resources in downstream portions of the watershed is hard to predict, it would be expected to remain within the relatively broad range of natural variability observed in these systems.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The impacts of Alternative A on soil resources in the Project Area and watershed would generally range from negligible adverse to moderate beneficial (Table 36). While changes in the Project Area would not be dramatic over the short-term, over the long-term, moderate reductions in nutrient concentrations within sediment of the Giacomini Ranch would be expected to be generated by the elimination of cattle and conversion to open space and potential changes in nutrient processing capabilities with breaching of levees and better drainage of soils. Hydrologic reconnection of the Giacomini Ranch to Lagunitas Creek would increase the potential for influxes of nutrient-laden waters from fluvial and tidal sources, including Lagunitas Creek. Sediment contaminant concentrations, which appear to be very low currently (Parsons and Allen 2004a), might increase negligibly from breaching of the East Pasture levees. Levee breaching and hydrologic reconnection would increase both fluvial/creek and tidal influences and thereby potentially increase exposure to contaminants such as mercury that occur in the outer portion of Tomales Bay currently and that are known to actively move within watersheds through sediment resuspension and redistribution. However, the potential risk of mercury contamination appears relatively negligible at this time based on recent sampling that showed that most of the mercury was concentrated in the outer Bay, with levels dropping off sharply towards the southern end of Tomales Bay. From a watershed perspective, this alternative would have negligible to perhaps minor beneficial effects on the quality of subtidal and intertidal sediments in Tomales Bay through a potential decrease in loading of nutrients, contaminants, and other pollutants from Lagunitas Creek due to increased connectivity of the creek with its historic floodplain on the Giacomini Ranch.

Alternative B

Analysis: Alternative B would have very similar effects to Alternative A in terms of effect on soil resource conditions in the Project Area and the watershed (Table 36). The primary differences between Alternative B and A relate to the fact that, in Alternative B, the East Pasture levees would be removed completely, and the West Pasture levees would be breached in several locations. In the East Pasture, the shift to full levee removal is expected to have relatively negligible effects on the amount and rate of reduction in soil nutrients or the potential for exposure to contaminants such as mercury. Levee breaching of the West Pasture might increase the amount and rate of nutrient reductions in soils or increase the potential for exposure to contaminants such as mercury, but the degree of change would be relatively minor, because this pasture is less intensively managed and grazed. In terms of contaminants, the West Pasture, which appeared to be relatively uncontaminated based on contaminant screening (Parsons and Allen 2004a), is already exposed to potential contaminants from sources in the bay through muted tidal flushing on Fish Hatchery Creek, which runs parallel to and is influenced to some degree by Lagunitas Creek. However, breaching of the levee along Lagunitas Creek would increase potential exposure to Bay, or creek, sources of contaminants, although the risk that sediments within the West Pasture would become contaminated by mercury would appear at this time to be relatively minor.

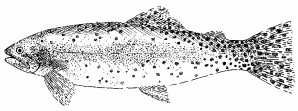
Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Alternative B would have very similar effects to Alternative A in terms of effect on soil resources in the Project Area and the watershed (Table 36). The impacts of Alternative B would range from adverse negligible to beneficial moderate. The primary difference between Alternative B and Alternative A is that the East Pasture levee is removed completely and that the West Pasture is now included in the proposed project, with limited breaching of the levee. These changes would not be expected to have more than



negligible effects on the overall amount and rates of soil nutrient reductions and the potential for exposure to contaminants such as mercury.

Alternative C

Analysis: Alternative C would have very similar effects to Alternative B in terms of effect on soil resources in the Project Area and watershed, except for effects related to restoration of Olema Marsh and Tomasini Creek (Table 36). Under Alternative C, the East and West Pastures would be restored, along with Olema Marsh. Restoration would involve complete removal of levees in the East and West Pastures along Lagunitas Creek and excavation of even more new tidal channels. Tomasini Creek would be realigned into one of its historic alignments midway through the East Pasture. In Olema Marsh, an adaptive restoration approach would be undertaken, with initial excavation of a shallow berm and the Bear Valley Creek channel to improve hydraulic connectivity and drainage of currently impounded waters. Poor drainage has converted Olema Marsh into an extensive vegetated and open water pond with no stream gradient, and there is some evidence that water levels are continuing to increase over time (KHE 2006a). In future years, should these initial actions not appear to lead to the desired degree of restoration, the Park Service, CSLC, and Audubon Canyon Ranch (ACR) would consider replacement of the culverts at Levee Road or Bear Valley Road or both culverts.

Because excavation and/or culvert replacement would be expected to substantially improve hydraulic connectivity of Olema Marsh and Lagunitas Creek and increase drainage of ponded waters, water surface elevations within Olema Marsh would drop substantially, exposing the thick layer of peat or organic rich-soils to air. Aeration of the underlying peat materials would cause rapid decomposition or breakdown of organic materials. The expected range of water surface level change would range from as much as 4 feet with removal of the berm and shallow excavation of the channel up to 6 feet with replacement of the Levee Road culvert (KHE 2006b). The effect of these improvements in hydrologic connectivity would be eased by phasing the adaptive restoration components over time.

Nutrients: Oxidation of impounded soils, particularly peat soils or soils that were historically exposed to tidal influence, can dramatically affect nutrient conditions within soils. Rapid decomposition of peat and organic-rich mineral soils can generate a pulse in mineralization or production of inorganic nutrients, with pH often driving which nutrient forms are the most prevalent (DeLaune and Smith 1985; Anisfeld and Benoit 1997; Portnoy 1999; Sommer and Horwitz 2001; Parsons and Martini-Lamb 2003). Oxidation often results in a lowering in soil pH because of the production of humic acids and other types of acids, and these acids can shift the nutrient pathway away from nitrification or the production of nitrates from ammonium. In addition, introduction of saltwater can decrease binding of ammonium already present in soils through the higher ionic strength of saltwater relative to minerals or organic matter (Portnoy 1999). Nutrients produced through breakdown of organic matter or such as ammonium and phosphate can either remain in drained soils, or they can be flushed into overlying waters when soils are flooded again (Delaune and Smith 1985, Portnoy 1999). Often, these pulses are relatively short-lived, lasting a matter of weeks (Anisfeld and Benoit 1997, Parsons and Martini-Lamb 2003). Nutrient efflux into overlying waters may also be spatially variable, with areas exposed to tidal influence having higher rates of efflux because of cation exchange. The implications of the nutrient efflux for water quality are discussed in greater detail under Water Resources.

The pH in systems that are drained is often depressed further in saline or tidally influenced soils (pH ~ 3-4 with pH 7 considered normal) than in freshwater wetland ones (pH ~5.0), because oxidation of pyrite and other iron-sulfur compounds in tidally influenced soils leads to extensive production of additional acidic compounds (e.g., sulfuric acid and ferrous iron; Delaune and Smith 1985). The persistence of acidic conditions within soils depends to a large degree on the influx rate of waters high in carbonates such as seawater, groundwater, or streams, with acids typically quickly buffered in wetlands with some consistent source of water. The peat underlying Olema Marsh is expected to be relatively fresh or low salinity in nature, at least within surface layers, because tidal influences have been largely precluded or at least limited since construction of Levee Road in the late 1800s. However, estuarine-derived muds and peat probably underlie the peat at some unknown depth. Therefore, pHs generated by breakdown of organic matter would be expected to be closer to 5 than 3-4, and permanent Bear Valley Creek inflow, combined with persistent subsurface groundwater inflow from the Inverness Ridge, would be expected to buffer acids within a short time of being produced, although there could be some spatial variability within the marsh where lower pHs persist.

The reintroduction of tidal influence into Olema Marsh after many decades of absence may have other effects on the chemistry of its soils. An influx of sulfates, which are naturally high in ocean waters, would occur during daily tidal flows, and these sulfates would typically be reduced in the low or no oxygen environment of wetland soils to its reduced form, sulfides. Abundant sulfides in the root zone can be toxic to plants. In many marshes, this toxicity is avoided through binding of sulfides with iron, which neutralizes its effect on plants. Tidally influenced marshes with low iron content and/or stagnant water conditions are likely to have higher sulfide concentrations within soils. Sustained high sulfide concentrations were observed in diked marshes that had been historically waterlogged with freshwater from improper drainage when seawater was reintroduced, because of the low levels of iron (Portnoy 1999). Some studies in San Francisco Bay have shown lower iron concentrations in brackish/freshwater marshes than salt marshes (Goman 2005). A sediment screening study conducted in the Project Area revealed very high concentrations of iron in all sediment samples high despite that some of the areas had been diked for decades and isolated from tidal influence. Iron is naturally high in the Tomales Bay and other San Francisco Bay watershed and is detected regularly in creek and groundwater (NMWD, unpub. data). The permanent Bear Valley Creek flow, as well as subsurface groundwater inflow from the Inverness Ridge, would be again to be expected to buffer Olema Marsh against negative of seawater reintroduction by maintaining iron concentrations in the peat, which is known to strongly bind iron (Syrovetnik and Neretnieks 2002).

Over time, subsidence would be expected to reach some kind of equilibrium with water surface levels, but while subsidence can occur relatively rapidly, the long-term effects of drainage on sediment nutrient pools and fluxes can persist for some time, with effects noted in some marshes even 10 years after marshes had been drained (Portnoy 1999). For the purposes of this evaluation, analysis of short-term effects takes into account the longer time horizons needed for resources that are typically relatively stable over time to reach post-restoration equilibrium conditions and assumed to be at least 10-15 years. During this intermediate period, a tremendous shift would be expected, at least in surficial soils, from organic nutrient forms (peat) to inorganic forms such as ammonium and phosphate, with a possible efflux of nutrients out of the soils (Portnoy 1999).

For this reason, short-term effects of this alternative in Olema Marsh nutrient pools would be characterized as minor to moderate and probably, although not necessarily, adverse. From an overall project perspective, both Giacomini Ranch and Olema Marsh would be expected to experience at least negligible to minor reductions in nutrients over the short-term, with effects becoming more pronounced (moderate) for the Giacomini Ranch over the long-term. For Olema Marsh, on the other hand, the degree of change would be expected to decrease appreciably in the long-term as the marsh came into equilibrium with changed water surface level conditions. While reductions in nutrient concentrations in Giacomini Ranch soils can easily be interpreted as beneficial, in Olema Marsh, the changes in soil nutrients over the long-term are harder to characterize. However, impoundment of waters could be interpreted as having created artificially high nutrient pools in the form of inorganic nutrients (peat and organic matter), with restoration beneficial in reestablishing more natural and balanced soil nutrient concentration and processing conditions characteristic of conditions prior to diking in the late 1800s.

Contaminants: These same biogeochemical processes have implications for contaminants, as well as nutrients. Under oxidized conditions, many marsh soils will release sediment-bound contaminants into overlying waters. Oxidation in and of itself does not necessarily lead to release of metals, but oxidation combined with a sharp decrease in pH as is often observed in saline soils can encourage a “pulse” of formerly sediment-complexed metals into the water column. Studies have documented releases of a variety of metals, including silver, aluminum, cadmium, chromium, copper, iron, manganese, nickel, lead, selenium, and zinc (DeLaune and Smith 1985; Soukup and Portnoy 1986; Gambrell et al. 1991; Anisfeld and Benoit 1997). Release of contaminants such as metals appears to be higher from saline or saltwater wetland soils than freshwater wetland ones, probably because of the lower pHs often present in oxidized tidally influenced soils (pH ~3-4) than in freshwater wetland ones (~5.1; Delaune and Smith 1985). Soils high in humic acids or organic carbon also tend to bind metals (Syrovetnik and Neretnieks 2002), as well as organic contaminants such as DDT and other pesticides, as well as chlorinated benzenes.

As noted earlier, the peat underlying Olema Marsh is expected to be relatively fresh or low salinity in nature, at least within surface layers, with historic estuarine-derived muds and peat some distance below the surface due to extensive build-up of the peat during the last 100 years. The potential for a pulse in metal or organic contaminants into overlying waters following draining and oxidation of Olema Marsh soils would appear relatively minor given the relatively low probability of any historic or current exposures to organic contaminants or metals, even metals such as nickel, chromium, and valanium that are naturally high in the ultramafic or serpentine soils found in the Franciscan Formation, which is prevalent in the San Francisco Bay

region, including eastern Tomales Bay (Hornberger et al. 1999) The sediment screening survey conducted in the Project Area in 2003 did show ubiquitously high levels of nickel and chromium in the Project Area, except in Fish Hatchery Creek (Parsons and Allen 2004a). The upper portions of Fish Hatchery Creek, as well as Bear Valley Creek, drain completely off the Inverness Ridge, which is dominated by granitic rock such as quartz-diorite and granodiorite that probably contains low levels of metals relative to the Franciscan Formation (G. Kamman, KHE, *pers. comm*.).

Within the Giacomini Ranch, the potential for exposure to contaminants would increase, because Tomasini Creek would be rerouted to connect with one of its historic alignments and move through the East Pasture. During high flow events that result in scour of the channel bed upstream of the Project Area, sediment-bound contaminants that may have originated from the now-closed West Marin Landfill could be remobilized and eventually deposited within the new channel or floodplain of Tomasini Creek. Because of the increase in exposure to contaminants – or conditions that could release contaminants such as those potentially occurring in Olema Marsh – effects of Alternative C on sediment contaminant conditions within the Project Area were characterized as adverse – minor. The potential risk for contaminant influx into the Project Area could increase over the long-term because of increased tidal inundation within the Project Area due to sea level rise, which appears to be increasing at a much higher rate than originally predicted based on recently published studies (Overpeck et al. 2006).

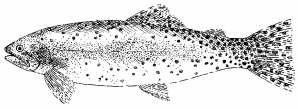
Watershed: From a watershed perspective, Alternative C would be expected to have negligible to minor beneficial effects on sediment nutrient and contaminant concentrations. Over the short term, disturbance of sediments from construction activities may increase the influx of sediment-associated nutrients and contaminants to downstream waters, but removal of the levees would encourage Lagunitas Creek to overflow onto its historic floodplains during flood events and thereby decrease the amount of nutrients, contaminants, and other pollutants that are carried downstream into the southern portion of Tomales Bay for eventual deposition into subtidal and intertidal sediments. (This subject is discussed in more detail under Water Resources.) The magnitude of this effect is expected to be slightly greater than under Alternative A, because of the inclusion of the West Pasture and the removal of levees on Tomasini Creek, which would act to direct more of the nutrient and contaminant load carried by high flows in this subwatershed into the Project Area rather than out into the bay.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: As discussed under the No Action Alternative, there is at least one project that could potentially cause cumulative impacts with the proposed project under Alternative C-- the proposed Bear Valley Creek Watershed and Fishery Enhancement Project. Changes in erosion or sedimentation patterns resulting from this project could have cumulative effects on nutrients in sediments, because nutrients and contaminants are often bound to sediment. Depending upon the duration of the transitional phase for Olema Marsh, the Bear Valley Creek project could cause influxes of nutrients to increase temporarily, which could end up having a temporary moderate adverse cumulative impact with the proposed project if decomposition of organic matter was still generating higher than normal levels of nutrients. This impact would be expected to dissipate with time as both the upper and lower systems come into equilibrium with changed conditions, reducing cumulative effects over the long-term to very negligible or even beneficial in nature. Contaminants are less of a concern in this watershed. Overall, then, cumulative impacts on sediment nutrients and contaminants in Olema Marsh would be considered to be adverse and negligible over the long-term, with adverse moderate effects possible over the short-term due to elevated nutrient levels. The potential for this project to affect sediment nutrient and contaminants in the Giacomini Ranch is considered extremely negligible.

Other than the Bear Valley Creek project, there are no currently proposed or reasonably foreseeable projects that would have the potential to cause cumulative impacts in the Giacomini Ranch should Alternative C be implemented. The RWQCB instituted a clean-up of the Gambonini mine that dramatically reduced the potential for additional mercury to enter Tomales Bay, but it did not address mercury that had already entered the Bay and that is being stored and redistributed in estuarine sediments. The RWQCB had also been attempting to force the owners of the West Marin Landfill in the Tomasini Creek watershed to perform some remedial clean-up that would decrease documented problems with leaching of landfill materials into the creek,



but a Marin County judge dismissed the case (D. Elias, RWQCB, *pers. comm.*). Enforcement action is reportedly being pursued by another agency.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Alternative C would have very similar effects to Alternative B in terms of effect on soil resources in the Project Area and watershed, with the intensity of impacts ranging from minor adverse to beneficial moderate (Table 36). The largest differences between Alternative C and Alternative B come from the inclusion of Olema Marsh and the rerouting of Tomasini Creek into one of its historic alignments in the East Pasture. Under this alternative, hydrologic connectivity and drainage of excessively impounded waters would be improved by excavation of berms and channel flow paths and potentially replacement of culverts at Levee Road and Bear Valley Road. These restoration actions would potentially decrease water surface levels from 4 to 6 feet over time through a phased approach to adaptive restoration. Decreases in water surface levels would expose flooded peat soils to air and cause rapid compaction through accelerated rates of organic matter decomposition that would have appreciable effects on soil nutrient pools. These changes would be expected to have minor short-term adverse impacts on soil nutrient conditions, but long-term effects would be considered beneficial as nutrient levels and rates of nutrient processing began to approach conditions more characteristic of natural undiked marshes.

In addition to its effect on nutrients, oxidation of waterlogged peat and saline soils can be accompanied by decreases in pH that often result in releases of sediment-bound contaminants to overlying waters. This effect is less pronounced in freshwater wetlands (Delaune and Smith 1985), and this, combined with the naturally low levels of contaminants expected from anthropogenic sources in this subwatershed, would suggest that the risk of contaminant release from oxidation of peat soils in Olema Marsh would be negligible. A higher potential for exposure to contaminants would probably come from rerouting of Tomasini Creek into one of its historic alignments through the East Pasture, thereby increase exposure of creek channels and adjacent floodplains to potential contaminant sources in Tomasini Creek that may have originated from the now-closed West Marin Landfill.

Alternative D

Analysis: Alternative D would have the same effects on soil resources in the Project Area and watershed as Alternative C (Table 36). Under Alternative D, Tomasini Creek would be rerouted completely into one of its historic alignments, but this difference is not expected to change its potential effects on soil nutrient and contaminant levels in the Project Area or watershed.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts for Alternative D would be the same as Alternative C.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Alternative D would have the same effects on soil resources in the Project Area and watershed as Alternative C. Under Alternative D, Tomasini Creek would be rerouted completely into one of its historic alignments, but this difference is not expected to change its potential effects on soil nutrient and contaminant levels in the Project Area or watershed.

Air Resources – Air Quality

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

The Seashore and north district of the GGNRA are classified as a Class I area under the Clean Air Act (42 USC 7401 et seq.). The Act requires land managers of Class I areas to protect air quality and related values, including visibility, plants, animals, soils, water quality, cultural and historic structures, and visitor health from the effects of air pollution.

The Clean Air Act (CAA) charges the Environmental Protection Agency (EPA) with identifying national ambient air quality standards to protect public health and welfare. A more detailed description of laws, regulations, and policies governing air quality can be found in Chapter 3 under Air Resources. Under the Clean Air Act, standards have been set for seven pollutants: ozone (O3), carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), particulate matter less than 10 microns (PM10), very fine particulate matter less than 2.5 microns in diameter (PM2.5), and lead (Pb). A description of these pollutants and standards can be found in Chapter 3 under Air Resources and in Tables 5-6. The federal government has ceded responsibility and authority to establish more stringent air quality standards and regulations to states, which are required to develop state implementation plans (SIP) to achieve and maintain federal air quality standards. The California Air Resources Board (CARB) has set stricter ambient air quality standards than national standards (Table 5 in Chapter 3 under Air Resources). Under the 1988 California Clean Air Act, air basins were designated as attainment, non-attainment, or unclassified for the state standards. The Bay Area Air Basin is classified as a California non-attainment area for ozone and particulate matter (Table 5 in Chapter 3 under Air Resources). The Bay Area Air Quality Management District (BAAQMD) is the air quality management district for the Project Area and has primary responsibility for control of air pollution. The air pollutants of greatest concern in the SFBAAB are O3, CO, and PM10.

Significance criteria developed by the state and county under CEQA focus on the potential for the proposed project to conflict with or obstruction of implementation of Bay Area Air Quality Plan; violate air quality standards; contribute substantially to existing or projected air quality violation for the Basin; contribute cumulatively to a net increase of any pollutant that the Bay Area Air Quality Basin is not in attainment with; expose sensitive receptors to substantial pollutant concentrations such as fumes or dust; or create objectionable odors.

General Assumptions and Methodologies

- Potential impacts to air quality from the proposed project would result primarily from construction equipment operated during the construction period and any potential increase in vehicular trips associated with visitors and residents either coming to view the restored Project Area or using public access facilities.
- BAAQMD has established thresholds of significance under CEQA for construction and project operations-related impacts. These thresholds are used as a basis for establishing impact thresholds for impact indicators related to construction and short-term/long-term project-related on air quality.

Described below are methodologies for impact indicators related to air quality resources, including specific assumptions or details on methodologies.

Air Quality-Construction-Related Impacts. The BAAQMD has established thresholds of significance under CEQA for construction impacts. According to BAAQMD, fine particulate matter (PM10) is the pollutant of greatest concern with respect to construction activities (BAAQMD 1999). BAAQMD has identified a set of feasible control measures for minimizing production of PM10 through construction activities, including Basic Measures for all construction sites and Enhanced Measures for larger construction sites (> 4 acres; BAAQMD 1999). If all of the control measures are implemented as appropriate for the size of the construction site, then BAAQMD has deemed that emissions from construction activities would be considered less than significant under CEQA. Should no control measures be implemented, potential emissions of PM10 and other air pollutants emitted in the exhaust of construction equipment would need to be either estimated using area or gallon-based factors developed by BAAQMD (Table 7; BAAQMD 1999) or quantified based on the type and horsepower of equipment, number of days of operation or truck trips, number of control measures to be implemented, and average trip length, etc. Demolition of buildings also generates PM10 emissions, which

BAAQMD notes can be estimated using the following emission factor: 0.00042 lbs PM10 per cubic feet of building volume (South Coast Air Quality Management District 1993) in BAAQMD 1999).

Park Service NEPA regulations require that impacts be analyzed using a broad range of intensities. For the proposed project, a broad range of impact thresholds were developed that incorporates both the potential for avoiding significant impacts through implementation of the appropriate control measures, as well as the potential for estimating air quality impacts through use of cubic yard-based estimation factors developed by BAAQMD (1999; Table 37). Because separate impact thresholds are not provided for construction, thresholds of significance established by BAAQMD for project operations (see Project Operations – Carbon Monoxide and Total Emissions, Table 40 below) were divided by 3 to develop the broader range of impact thresholds used in this document to evaluate the intensity of impact from construction on air quality resources. As impact thresholds between the different pollutants were not necessarily strongly correlated, impacts are presented when necessary as the range of impact intensity estimated for individual pollutants, as well as the median – or midpoint value – intensity.

TABLE 37. AIR QUALITY – ALL POLLUTANTS RELATED TO CONSTRUCTION EMISSIONS

Source: BAAQMD, Park Service Management Policies, Marin CWP Nature: Beneficial, Adverse Context: Local Community, Regional (Marin Coast, Bay Area Air Basin) Duration: Construction	
No Impact	There would be no potential for impact to air quality associated with implementation of the proposed project.
Negligible	There would be potential for impact, because implementation would involve use of construction equipment and vehicles used to transport personnel to and from the Project Area, however, impacts would be barely detectable, because: 1) all the appropriate control measures recommended by BAAQMD would be implemented; *OR* 2) estimated emissions from construction equipment would NOT exceed the following thresholds based on pounds per day: 1) PM10 (<27); 2) CO (<183); 3) ROG[1] (<27), 4) NOX (<27), and 5) SOX (<27).
Minor	There would be potential for measurable impact, because implementation would involve use of construction equipment and vehicles used to transport personnel to and from the Project Area, however, impacts would be relatively small, with estimated emissions from construction equipment falling in the following ranges based on pounds per day generated: 1) PM10 (27-53); 2) CO (183-367); 3) ROG (27-53), 4) NOX (27-53), and 5) SOX (27-53).
Moderate	There would be potential for impact, because implementation would involve use of construction equipment and vehicles used to transport personnel to and from the Project Area, and impacts would be appreciable, with estimated emissions from construction equipment falling in the following ranges based on pounds per day generated: 1) PM10 (54-80); 2) CO (368-550); 3) ROG (54-80), 4) NOX (54-80), and 5) SOX (54-80).
Major or Substantial	There would be potential for impact, because implementation would involve use of construction equipment and vehicles used to transport personnel to and from the Project Area, and impacts would be substantial or major, with estimated emissions from construction equipment exceeding the following thresholds based on pounds per day generated: 1) PM10 (>80); 2) CO (>550); 3) ROG (>80), 4) NOX (>80), and 5) SOX (>80).

Air Quality – Project-Related Impacts. The BAAQMD has also established thresholds of significance under CEQA for impacts related to project operation. The Thresholds of Significance established by BAAQMD assume that, for most of the proposed projects, motor vehicles traveling to and from the projects represent the primary source of air pollutant emissions associated with project operation (BAAQMD 1999). Project-related Thresholds of Significance have been developed for the following pollutants or combination of pollutants:

- Local Carbon Monoxide,
- Total Emissions (includes ROG, NOX, and PM10),
- Odors,
- Toxic Air Contaminants,
- Accidental Releases/Acutely Hazardous Air Emissions, and
- Cumulative Impacts.

[1] ROG=Reactive Organic Gas

These BAAQMD thresholds and the specific methodologies and assumptions developed for the proposed project are discussed in more detail below.

- ***The proposed project would not have any potential for Toxic Air Contaminants or Accidental Releases/Acutely Hazardous Air Emissions, so these criteria are not discussed further***.

Localized Carbon Monoxide Concentrations (BAAQMD 1999): Localized carbon monoxide concentrations should be estimated for projects in which: 1) vehicle emissions of CO would exceed 550 lb./day, 2) project traffic would impact intersections or roadway links operating at Level of Service (LOS) D, E or F **or** would cause LOS to decline to D, E or F, or 3) project traffic would increase traffic volumes on nearby roadways by 10 percent or more unless the increase in vehicle traffic volume is less than 100 vehicles per hour. A project contributing to CO concentrations exceeding the State Ambient Air Quality Standard of 9 parts per million (ppm) averaged over 8 hours and 20 ppm for 1 hour would be considered to have substantial and therefore significant impact under CEQA.

Because potential air quality impacts posed by the proposed project would largely be related to increased visitation of the restored wetland and enhanced public access opportunities, traffic volumes were used as the criterion for impact thresholds, with the BAAQMD threshold divided by 3 to establish a broader range of impact thresholds for analyzing the intensity of the impact as required by Park Service NEPA regulations (Table 39). Estimated vehicle trips was generated by projecting future maximum or peak visitation to the Project Area based on the types of public access and public access structures, facilities, and uses and/or attractions under the various alternatives relative to existing visitation rates to other major visitation areas within the park. Maximum or peak visitation was divided by 1.3 to reflect the assumption that approximately 70 percent of all visitors to the Project Area would be driving alone. A more complete description of these methodologies can be found in Chapter 3 under Visitor and Resident Experience. Maximum peak visitation assumed that all maximum numbers might potentially occur on the same day to ensure that a conservative estimate of impact is generated, but it is highly unlikely that maximum peak visitation for all facilities would occur simultaneously.

TABLE 38. AIR QUALITY – CARBON MONOXIDE – PROJECT-RELATED

Source: BAAQMD, Park Service Management Policies, Marin CWP Nature: Beneficial, Adverse Context: Local Community, Regional (Marin Coast, Bay Area Air Basin) Duration: Long-Term	
No Impact	There would be no potential for impact to air quality from carbon monoxide associated with implementation of the proposed project.
Negligible	The proposed project would have negligible or barely measurable impact on air quality associated with carbon monoxide, because traffic volume on nearby roadways would NOT increase by more than 3 percent, and/or the increase would be less than 33 vehicles per hour.
Minor	The proposed project would have a small or slightly measurable impact on air quality associated with carbon monoxide, because the increase in traffic volume on nearby roadways would be greater than 3 percent, but less than 6 percent, and/or the increase would be between 33-66 vehicles per hour.
Moderate	The proposed project would have a moderate or measurable impact on air quality associated with carbon monoxide, because the increase in traffic volume on nearby roadways would be greater than 6 percent, but less than 9 percent, and/or the increase would be between 66-99 vehicles per hour.
Major or Substantial	The proposed project would have major or substantial impacts on air quality associated with carbon monoxide, because traffic volume on nearby roadways would increase by 10 percent or more, and the increase would be ≥ 100 vehicles per hour.

Total Emissions (BAAQMD 1999): Totals emissions from project operations need to be compared to the BAAQMD thresholds provided in Table 40, unless it meets some of the screening criteria identified below.

TABLE 39. BAAQMD CEQA THRESHOLDS OF SIGNIFICANCE FOR TOTAL EMISSIONS RESULTING FROM PROJECT OPERATIONS

Pollutant	ton/year	lb/day	kgm/day
ROG	15	80	36
NOX	15	80	36
PM10	15	80	36

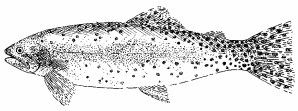
To enable project proponents to determine whether a project may exceed the threshold of significance under CEQA for total emissions from project operations, BAAQMD has developed project screening criteria that are based on the threshold of significance for NOX (80 lbs/day). The criteria list screening thresholds for trip generation rate or size of project for various housing, retail, office, and other commercial and residential development projects. ***Generally, BAAQMD "does not recommend a detailed air quality analysis for projects generating less than 2,000 vehicle trips per day, unless warranted by the specific nature of the project or project setting***" (BAAQMD 1999). However, BAAQMD stresses that the screening criteria ***only address one threshold of significance and does not include other air quality issues such as carbon monoxide, odors, toxics, and cumulative impacts*** (BAAQMD 1999). Impact thresholds for this impact indicator are based on both the potential for the proposed project to generate less than 2,000 vehicle trips per day or on the project generating less than "substantial" or major amounts of ROG, NOX, and PM10 in pounds per day.

To establish a broad range of impact thresholds for evaluating the intensity of the impact as required Park Service NEPA regulations, projects with less than 2,000 vehicle trips per day were characterized as having negligible or minor impacts (Table 40). For moderate and major/substantial impacts, only BAAQMD total emissions criteria was used. As with other BAAQMD criteria, emissions thresholds for ROG, NOX, and PM10 were divided by 3 to develop a broader range of impact thresholds. Estimated vehicle trips was generated by projecting future maximum or peak visitation to the Project Area based on the types of public access and public access structures, facilities, and uses and/or attractions under the various alternatives relative to existing visitation rates to other major visitation areas within the park. Maximum or peak visitation was divided by 1.3 to reflect the assumption that approximately 70 percent of all visitors to the Project Area would be driving alone. A more complete description of this methodology can be found in Chapter 3 under Visitor and Resident Experience. Maximum peak visitation assumed that all maximum numbers might potentially occur on the same day to ensure that a conservative estimate of impact is generated, but it is highly unlikely that maximum peak visitation for all facilities would occur simultaneously.

TABLE 40. AIR QUALITY – TOTAL EMISSIONS EFFECTS – PROJECT-RELATED

Source: BAAQMD, Park Service Management Policies, Marin CWP Nature: Beneficial, Adverse Context: Local Community, Regional (Marin Coast, Bay Area Air Basin) Duration: Long-Term	
No Impact	There would be no potential for impact to air quality from total emissions associated with implementation of the proposed project.
Negligible	The proposed project would have a negligible or barely measurable effect on air quality associated with total emissions, because the number of trips generated would not exceed 1,000 vehicle trips per day; *OR* estimated vehicle-generated emissions would NOT exceed the following thresholds based on pounds per day generated: 1) PM10 (<27); 2) ROG (<27), and 3) NOX (<27).
Minor	The proposed project would have a minor or small impact on air quality associated with total emissions, because the number of trips generated would not exceed 2,000 vehicle trips per day; *OR* estimated vehicle-generated emissions would fall in the following ranges based on pounds per day generated: 1) PM10 (27-53); 2) ROG (27-53), and 3) NOX (27-53).
Moderate	The proposed project would have moderate impacts on air quality associated with total emissions, with estimated vehicle-generated emissions falling in the following ranges based on pounds per day generated: 1) PM10 (54-80); 2) ROG (54-80), and 3) NOX (54-80).
Major or Substantial	The proposed project would have substantial to major impacts on air quality associated total emissions, with estimated vehicle-generated emissions exceeding the following thresholds based on pounds per day generated: 1) PM10 (>80); 2) ROG (>80), and 3) NOX (>80).

Odors (BAAQMD 1999): Under CEQA, any project with the potential to frequently expose members of the public to objectionable odors would be deemed to have a significant impact. According to BAAQMD, odor impacts on residential areas and other sensitive receptors warrant the closest scrutiny, but consideration should also be given to other land uses where people may congregate, such as recreational facilities,



worksites and commercial areas. BAAQMD requires that potential odor impacts should be evaluated for both of the following situations: 1) sources of odorous emissions being located near existing receptors, and 2) receptors such as housing developments being located near existing odor sources. The proposed project would have the potential to create or increase a source of odors, primarily odors associated with wetlands.

BAAQMD recommends that certain types of operations constructed within a set distance from sensitive receptors using establishing screening level distance criteria be subject to a more detailed analysis, including contacting BAAQMD regarding potential odor complaints (BAAQMD 1999). Most of these facilities for which screening level distances have been established are operations such as wastewater treatment plants, sanitary landfills, and petroleum refineries. There are no established screening level distances for wetlands, restoration projects, or agricultural activities in the BAAQMD guidelines (BAAQMD 1999). As of 2002, there was only one large stationary source of odors in West Marin for which complaints had been received, which appeared to be associated with the now closed West Marin landfill (Illingworth & Rodkin and Nichols Berman 2002). Members of the local community have voiced objections during the scoping period and afterwards to the smell of manure emanating from the Giacomini Ranch dairy facility: any formal complaints regarding this may have been lodged with County of Marin rather than BAAQMD. BAAQMD provides no quantitative or qualitative thresholds of significance under CEQA for odors. Because odors are difficult to quantify, impact thresholds attempt to qualitatively estimate the potential impact of the proposed project on nearby sensitive receptors (Table 41).

TABLE 41. AIR QUALITY – ODORS

Source: BAAQMD, Marin CWP Nature: Beneficial, Adverse Context: Local Community Duration: Construction, Short-Term, Long-Term	
No Impact	There would be no potential for impact to air quality from odors associated with the proposed project.
Negligible	The proposed project would generate odors that would be barely detectable by sensitive receptors (e.g., adjacent residential and commercial development and park visitors).
Minor	The proposed project would generate odors that would be noticeable by sensitive receptors (e.g., adjacent residential and commercial development and park visitors), but not objectionable.
Moderate	The proposed project would generate odors that would be noticeable by sensitive receptors (e.g., adjacent residential and commercial development and park visitors) and slightly objectionable.
Major or Substantial	The proposed project would generate odors that would be major and strikingly apparent by sensitive receptors (e.g., adjacent residential and commercial development and park visitors) and moderately to highly objectionable such that a complaint is lodged with BAAQMD or the County of Marin.

Cumulative Air Quality Impacts (BAAQMD 1999): BAAQMD provides some additional guidance on evaluating cumulative air quality impacts under CEQA. Any proposed project that individually has a significant air quality impact on the Bay Area Air Basin would also be considered by BAAQMD to have a cumulatively significant air quality impact under CEQA. Those projects that do not individually have significant impacts would be considered to not cumulatively have significant impacts if the proposed project is consistent with the local general plan **and** the general plan of the regional air quality plan, in this case, the Clean Air Plan (BAAQMD 1999). The local general plan for the appropriate city or county must be consistent with the Clean Air Plan for this guideline to apply (BAAQMD 1999). The Marin CWP is consistent with the Clean Air Plan (Illingworth & Rodkin and Nichols Berman 2002).

Impact Analysis

TABLE 42. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR AIR QUALITY RESOURCES

All impacts would be considered Adverse (unless otherwise noted) and Regional and are separately analyzed for Construction and Short-Term/Long-Term, with the exception of Odors, which would be considered a Local Community impact and is analyzed for Short-Term and Long-Term. Entries with a slash refer to the range of impact intensities estimated for individual pollutants, with the median intensity boldfaced.

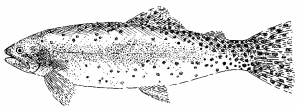
	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Air Pollutants – Construction Emissions	Negligible	Negligible/ Moderate	Negligible/ Major or Substantial*	Negligible/ Major or Substantial*	Negligible/ Major or Substantial*
NEPA: Intensity Following Mitigation			Moderate	Moderate	Moderate
CEQA: Significance Following Mitigation			Less than Significant	Less than Significant	Less than Significant
Air Pollutants – Project-Generated Carbon Monoxide Emissions	Negligible	Minor	Minor	Negligible	Negligible
Air Pollutants – Project-Generated Total Emissions	Negligible	Negligible	Negligible	Negligible	Negligible
Odors Construction/Short-Term	Beneficial - Minor	Adverse - Negligible	Adverse - Negligible	Adverse- Moderate	Adverse- Moderate
Long-Term	Beneficial - Minor	Beneficial - Minor	Beneficial - Minor	Beneficial - Minor	Beneficial - Minor

* NOX production only

No Action Alternative

Analysis: The No Action Alternative would generally have negligible effects on air quality both during construction and after the proposed project was implemented (Table 42). Under the No Action Alternative, levees, tidegates, and culverts in the Giacomini Ranch are not breached or removed, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. (The Park Service is required under its existing agreement with CalTrans to restore wetlands as mitigation for impacts caused by CalTrans to aquatic habitat from a road repair on State Route 1 in Marin County in exchange for the Park Service receiving monies to purchase and restore the Giacomini Ranch.) The remainder of the levee would not be deconstructed, although there would be no levee maintenance. Olema Marsh is also not restored, and there would be no construction of new public access facilities. With closure of the dairy in 2007 as specified in the Park Service's purchase agreement with the Giacomini family, agricultural management would largely be discontinued, although there would be a possibility for leased grazing through a separate environmental review process.

Emissions-Construction: The minor amount of grading that would be conducted as part of the 11-acre wetland restoration component would result in only negligible amounts of particulate matter (PM10), carbon monoxide (CO), sulfur dioxide (SOX), reactive organic gasses (ROG), and nitrogen dioxide (NOX) being generated from emissions of earthmoving equipment, with all pollutants considerably below threshold levels. Recent monitoring by the Park Service found no exceedances for ozone at the Seashore under either the California or federal standard (Sullivan et al. 2001). In fact, visibility at the Seashore improved during the period of 1996 to 1999 primarily due to a decrease in nitrate particulates, a major component of visibility blocking material in coastal California. Particulate nitrate is formed from nitrogen oxide and hydrocarbon gases emitted into the atmosphere from fires, diesel engines, and other sources (Malm 2000).



Emissions-Project Implementation: After construction is completed, pollutant production would be limited to emissions associated with personal vehicles used by visitors and residents to access existing public access facilities; earthmoving equipment used to dredge some of the Inverness Ridge drainages to maintain hydraulic capacity for flood control purposes; and, should leased grazing be approved in the future, trucks used to haul cattle to and from the Giacomini Ranch. The post-project implementation actions would be expected to have negligible effects on carbon monoxide (CO) and other emission pollutants, with estimated hourly maximum or peak traffic volume estimated at less than the 33 vehicles-per-hour and 1,000 vehicles—per-day thresholds established for negligible. These maximum or peak volume traffic estimates represent conservative or cautious estimates that err on the side of overestimating impacts such that the maximum or peak for each of the public access facilities is assumed to occur simultaneously, which is unlikely.

Odors: In terms of odor, this alternative would have a minor beneficial effect on odors, because land use would switch from an intensively managed dairy to open space and/or leased grazing, which would be expected to have less odors in both the short- and long-term. As noted earlier, members of the local community have voiced objections during the scoping period and afterwards to the smell of manure emanating from the Giacomini Ranch dairy facility.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: There are no currently proposed or reasonably foreseeable projects that would have the potential to cause cumulative impacts should the No Action alternative be implemented. Most of the other medium- to large projects that might be constructed during the same timeframe are distant enough that there would be no cumulative air quality impacts, except for the Bear Valley Creek Watershed and Fishery Enhancement Project. However, there is no definitive timeframe for construction of this project.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The No Action alternative would result generally in negligible air quality impacts from construction and project implementation and would represent a minor beneficial effect on odors in the local community with conversion from the dairy to either open space and/or leased grazing uses. The only construction would be a small restoration component that is required under the Park Service's existing mitigation agreement with CalTrans, and project-related effects would be limited to vehicles and trucks associated with visitors and residents using existing public access facilities, flood control-related maintenance, and livestock transport.

Alternative A

Analysis: The effects of Alternative A on air quality would generally range from negligible to moderate during construction and negligible to minor effects after implementation (Table 42). Under Alternative A, restoration occurs in the East Pasture of the Giacomini Ranch, with construction of new public access facilities limited to the eastern and southern perimeters of the East Pasture. There are no restoration or public access components in the West Pasture or Olema Marsh, except for the potential future extension of the southern perimeter trail to Inverness Park.

Emissions-Construction: Construction activities for both restoration and public access in the East Pasture would be estimated to involve approximately 100,750 cubic yards of earthmoving. Construction of the restoration component is estimated to take approximately five (5) months or one (1) construction season. The public access component would be constructed after restoration is completed and is estimated to take two (2) construction seasons. Excavation, fill, and grading actions would result in only negligible amounts of particulate matter (PM10), reactive organic gasses (ROG), and sulfur dioxide (SOX); minor amounts of carbon monoxide (CO), and moderate amounts of nitrogen dioxide (NOX) being generated from emissions of earthmoving equipment.

Emissions-Project Implementation: After construction is completed, pollutants would be produced primarily from emissions associated with personal vehicles used by visitors and residents to access existing public access facilities and, to a much lesser extent, earthmoving equipment used to dredge some of the Inverness Ridge drainages to maintain hydraulic capacity for flood control purposes. These actions may have minor effects on carbon monoxide (CO), with estimated hourly maximum or peak traffic volumes associated less than 66 vehicles per hour. These maximum or peak volume traffic estimates represent conservative or cautious estimates that err on the side of overestimating impacts such that the maximum or peak for each of the public access facilities is assumed to occur simultaneously, which is unlikely. This alternative may have a negligible effect on Total Emissions, with maximum or peak daily vehicular traffic below 1,000 vehicles per day.

Odors: In terms of odor, this alternative would have a minor beneficial effect on odors, because land use would switch from an intensively managed dairy to open space, which would be expected to have fewer odors over the long-term. As noted earlier, members of the local community have voiced objections during and after the scoping period to the smell of manure emanating from the Giacomini Ranch Dairy facility. During construction and over the short-term, there may be a negligible adverse impact associated with disturbance of wetland and agricultural soils. At least one of the odors associated with wetlands is a "rotten egg" smell produced by hydrogen sulfides, but this is typically a localized smell that occurs when sediments are disturbed by people walking or digging in the mud. However, it is possible that, during the construction period, when wet soils are excavated, these types of odors might be magnified at least temporarily. In addition, excavation and grading related to removal of agricultural wastes such as manure may also temporarily increase agricultural odors in the Project Area vicinity.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The effects of Alternative A on air quality during construction and after implementation would generally range from negligible to moderate. Under this alternative, the East Pasture of the Giacomini Ranch would be restored, with construction of new public access facilities limited to the eastern and southern perimeter of the East Pasture. Project-related effects would involve primarily emissions from vehicles and trucks associated with visitors and residents using existing public access facilities, as well as, to a lesser degree, flood control-related maintenance. Based on the number of maximum or peak vehicles projected on an hourly or daily basis, these effects would be negligible (total emissions) to minor (carbon monoxide). This alternative would have a long-term minor beneficial effect on odors in the local community with conversion from the dairy to either open space or grazed lands, although there may be some negligible adverse effects during construction and over the short-term associated with disturbance of wetland soils and soils with high concentrations of manure.

Alternative B

Analysis: The effects of Alternative B on air quality during construction and after implementation would generally range from negligible to major or substantial (Table 42). Under Alternative B, restoration occurs in both the East and West Pastures of the Giacomini Ranch, with most of the construction of new public access facilities limited to the eastern and southern perimeters of the East Pasture.

Emissions-Construction: Construction activities for both restoration and public access would be estimated to involve approximately 140,500 cubic yards of earthmoving. Under Alternative B, construction of the restoration component is estimated to take approximately five (5) to seven (7) months during two (2) construction seasons. The public access component would be constructed after restoration is completed and is estimated to take two (2) construction seasons. Earthmoving associated with public access would be

reduced under Alternative B relative to Alternative A, because the eastern perimeter trail would involve construction of a boardwalk rather than importation of fill for a culverted dirt trail. Excavation, fill, and grading actions for the West Pasture and public access components would result in only negligible amounts of emissions being generated by earthmoving equipment. However, there is still potential for the future trail extension to Inverness Park under this alternative, which could be constructed by either widening the Sir Francis Drake Boulevard road berm or by placing a boardwalk in the West Pasture. The former would require some earthmoving.

In the East Pasture, where construction is more intensive, earthmoving would potentially produce major or substantial amounts of nitrogen dioxide (NOX) and minor amounts of carbon monoxide (CO), in addition to negligible amounts of particulate matter (PM10), reactive organic gasses (ROG), and sulfur dioxide (SOX). The "substantial" amount of NOX potentially emitted, which was estimated from the amount of cubic yards of earth moved during the East Pasture restoration, would represent a significant impact under CEQA according to BAAQMD CEQA guidelines (1999). The Park Service and CSLC propose to mitigate this impact to a less-than-significant level under CEQA and moderate under NEPA through instituting Best Management Practices identified below.

Emissions-Project Implementation: Alternative B would have very similar effects to Alternative A on air quality after project implementation. The minimal amount of public access-related vehicle trips and maintenance-related use of earthmoving equipment would have only negligible effects on carbon monoxide (CO) and Total Emissions of other pollutants.

Odors: In terms of odor, this alternative would have a minor beneficial effect on odors similar to Alternative A, because land use would switch from an intensively managed dairy to open space, which would be expected to have fewer odors over the long-term.

Proposed Mitigation Measures: Construction activities during restoration of the East Pasture would potentially generate major or substantial amounts of nitrogen dioxide (NOX) from emissions of earthmoving equipment. This would be considered a significant impact under CEQA based on BAAQMD CEQA guidelines (1999). The Park Service and CSLC propose to mitigate this impact to a less-than-significant level under CEQA and moderate under NEPA through instituting the following Best Management Practices advocated by BAAQMD. Specifically, contractors would be required to: 1) minimize idling time to 5 minutes; 2) maintain properly tuned equipment; and 3) limit the hours of operation of heavy duty equipment or the number of pieces of equipment operating simultaneously.

Effectiveness of Proposed Mitigation Measures: Mitigation measures proposed by the Park Service and CSLC are ones recommended specifically by BAAQMD for mitigating impacts of pollutant emission from earthmoving equipment during construction and would, therefore, be considered to proven, effective mitigation measures. Implementation of these measures would be expected to reduce impacts to less-than-significant levels, although they would not eliminate impacts entirely.

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The effects of Alternative B on air quality during construction and after implementation would range generally from negligible to major or substantial, with substantial impacts restricted to generation of nitrogen dioxide (NOX) during restoration of the East Pasture. Under this alternative, both the East and West Pastures of the Giacomini Ranch would be restored, with most of the construction of new public access facilities limited to the eastern and southern perimeter of the East Pasture. Construction of the West Pasture and public access components would generate negligible emissions, but the more intensive restoration proposed for the East Pasture may produce minor amounts of carbon monoxide (CO), but major or substantial amounts of NOX. The "substantial" emissions of NOX are a result of the large volume (in Cubic Yards) of earthmoving proposed in the East Pasture would be considered a significant impact under CEQA. The Park Service and CSLC propose to mitigate this impact to a less-than-significant level under CEQA and a moderate impact under NEPA through construction-related Best Management Practices (see above) recommended by BAAQMD (1999).

Project-related effects would involve primarily emissions from vehicles and trucks associated with visitors and residents using existing public access facilities, as well as, to a much lesser degree, flood control-related maintenance. Based on the number of maximum or peak vehicles projected on an hourly or daily basis, effects would be negligible for both carbon monoxide and total emissions. This alternative would have a long-term minor beneficial effect on odors in the local community with conversion from the dairy to either open space or grazing land, although there may be some negligible adverse effects during construction and over the short-term after implementation associated with disturbance of wetland and heavily manured soils.

Alternative C

Analysis: Alternative C would have very similar effects as Alternative B on air quality during construction and after implementation, with the intensity of effects ranging generally from negligible to major (Table 42). Under Alternative C, restoration occurs in the East and West Pastures of the Giacomini Ranch and Olema Marsh. As with the other alternatives, most of the construction of new public access facilities is limited to the eastern and southern perimeters of the East Pasture, although the amount of public access on the eastern perimeter is scaled back.

Emissions-Construction: Construction activities for both restoration and public access would be estimated to involve approximately 195,725 cubic yards of earthmoving. Construction of the Giacomini Ranch restoration component would be estimated to occur over a period of five (5) to seven (7) months during approximately two (2) construction seasons. The Olema Marsh restoration component is designed as an adaptive restoration approach and so would, therefore, be phased into three (3) individual components, each conducted in a separate construction season. The public access component would be constructed after the Giacomini Ranch restoration is completed and is estimated to take two (2) additional construction seasons.

Excavation, fill, and grading actions for the West Pasture, Olema Marsh, and public access components would result in only negligible amounts of emissions being generated by earthmoving equipment. However, as in Alternative B, earthmoving in the East Pasture, where construction is more intensive, would potentially produce major or substantial amounts of nitrogen dioxide (NOX) and minor amounts of carbon monoxide (CO), in addition to negligible amounts of particulate matter (PM10), reactive organic gasses (ROG), and sulfur dioxide (SOX). The “substantial” amount of NOX potentially emitted, which was estimated from the amount of cubic yards of earth moved during the East Pasture restoration, would represent a significant impact under CEQA according to BAAQMD CEQA guidelines (1999). The Park Service and CSLC propose to mitigate this impact to a less-than-significant level under CEQA and a moderate impact under NEPA through instituting Best Management Practices identified below.

Emissions-Project Implementation: Alternative C would have very similar effects to Alternative B on air quality after project implementation. After construction is completed, pollutants would be produced primarily from emissions associated with personal vehicles used by visitors and residents to access existing public access facilities and, to a much lesser extent, earthmoving equipment used to dredge some of the Inverness Ridge drainages to maintain hydraulic capacity for flood control purposes. These actions may have negligible effects on both carbon monoxide (CO) and emissions of other pollutants. Hourly maximum or peak volume traffic is estimated at approximately 23 vehicles per hour or approximately 230 vehicles per day, below the 33 vehicle-per-hour and 1,000 vehicle-per-day thresholds for negligible under carbon monoxide and other emissions impact indicators, respectively. These maximum or peak volume traffic estimates represent conservative or cautious estimates that err on the side of overestimating impacts such that the maximum or peak for each of the public access facilities is assumed to occur simultaneously, which is unlikely.

Odors: In terms of odor, this alternative would have a minor beneficial effect on odors over the long-term, because land use would switch from an intensively managed dairy to open space, which would be expected to have fewer odors over the long-term. Members of the local community have voiced objections during and after the scoping period to the smell of manure emanating from the Giacomini Ranch dairy facility. During construction and over the short-term, there may be a moderate adverse impact associated with disturbance of wetland and agricultural soils in Giacomini Ranch and Olema Marsh. In addition to the potential odors generated by excavation of wetland and heavily manured soils in the Giacomini Ranch discussed under Alternative A, the Olema Marsh restoration component also has the potential to generate adverse odors during construction and over the short-term after implementation, because lowering of water surface levels within the impounded marsh would cause oxidation of peat soils and breakdown of organic matter. The decaying

organic matter, combined with odors generated by chemical reactions within the soil such as hydrogen sulfides, may cause noticeable and slightly objectionable odors in the vicinity of the marsh until the marsh comes into equilibrium with new water surface level conditions. Phasing of the project through adaptive restoration would help to ameliorate the severity of odor problems by staggering periods of major drainage and organic matter decomposition.

Proposed Mitigation Measures: Construction activities during restoration of the East Pasture would potentially generate major or substantial amounts of nitrogen dioxide (NOX) from emissions of earthmoving equipment. This would be considered a significant impact under CEQA based on BAAQMD CEQA guidelines (1999). The Park Service and CSLC propose to mitigate this impact to a less-than-significant level under CEQA and a moderate impact under NEPA through instituting the following Best Management Practices advocated by BAAQMD. Specifically, contractors would be required to: 1) minimize idling time to 5 minutes; 2) maintain properly tuned equipment; and 3) limit the hours of operation of heavy duty equipment or the number of pieces of equipment operating simultaneously.

Effectiveness of Proposed Mitigation Measures: Mitigation measures proposed by the Park Service and CSLC are ones recommended specifically by BAAQMD for mitigating impacts of pollutant emission from earthmoving equipment during construction and would, therefore, be considered to proven, effective mitigation measures. Implementation of these measures would be expected to reduce impacts to less-than-significant levels, although they would not eliminate impacts entirely.

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The effects of Alternative C on air quality during construction and after implementation would be very similar to Alternative B, with the intensity of effects ranging from negligible to major or substantial. Under this alternative, both the Giacomini Ranch and Olema Marsh would be restored, with most of the construction of new public access facilities limited to the eastern and southern perimeter of the East Pasture. Construction of the West Pasture, Olema Marsh, and public access components would generate negligible emissions, the more intensive restoration proposed for the East Pasture may produce minor amounts of carbon monoxide (CO), but major or substantial amounts of NOX. The “substantial” emissions of NOX are a result of the large volume (in Cubic Yards) of earthmoving proposed in the East Pasture would be considered a significant impact under CEQA. The Park Service and CSLC propose to mitigate this impact to a less-than-significant level under CEQA and a moderate impact under NEPA through construction-related Best Management Practices (see above) recommended by BAAQMD (1999).

Project-related effects would involve primarily emissions from vehicles and trucks associated with visitors and residents using existing public access facilities, as well as, to a much lesser degree, flood control-related maintenance. Based on the number of maximum or peak vehicles projected on an hourly or daily basis, effects would be negligible for both carbon monoxide and Total Emissions. This alternative would have a long-term minor beneficial effect on odors in the local community with conversion from the dairy to either open space or grazing land. However, there may be some moderate adverse effects during construction and over the short-term after implementation associated with excavation-related disturbance of wetland and heavily manured soils in the Giacomini Ranch and drainage-related decomposition of organic matter and related chemical changes of Olema Marsh soils.

Alternative D

Analysis: Alternative D would have identical effects on air quality during construction and after implementation as Alternative C, even through it would involve considerably more earth-moving than Alternative C (Table 42).

Emissions-Construction: Under Alternative D, the degree of restoration is expanded in the East Pasture to include excavation of a topographically elevated area to intertidal elevations, as well as additional tidal channels, complete realignment of Tomasini Creek, and replacement of the culvert on Tomasini Creek at Mesa

Road. Under this alternative, public access is scaled back further on the eastern and southern perimeters of the East Pasture. Construction activities for both restoration and public access would be estimated to involve approximately 242,725 cubic yards of earthmoving. Construction scheduling would be identical to Alternative C, with the exception that the Mesa Road culvert would be replaced at some point after restoration is completed. The "substantial" amount of NOX potentially emitted, which was estimated from the amount of cubic yards of earth moved during the East Pasture restoration, would represent a significant impact under CEQA according to BAAQMD CEQA guidelines (1999).

Emissions-Project Implementation: Alternative D would have very similar effects to Alternative C on air quality after project implementation. The minimal amount of public access-related vehicle trips and maintenance-related use of earthmoving equipment would have only negligible effects on carbon monoxide (CO) and Total Emissions of other pollutants.

Odors: In terms of odor, this alternative would have identical effects to Alternative C, with a minor beneficial effect over the long-term and a moderate adverse effect potentially during construction and over the short-term due to excavation and drainage-related disturbances to wetland and heavily manured soils in the Giacomini Ranch and organic matter decomposition and related chemical changes in Olema Marsh.

Proposed Mitigation Measures: Construction activities during restoration of the East Pasture would potentially generate major or substantial amounts of nitrogen dioxide (NOX) from emissions of earthmoving equipment. This would be considered a significant impact under CEQA based on BAAQMD CEQA guidelines (1999). The Park Service and CSLC propose to mitigate this impact to a less-than-significant level under CEQA and a moderate impact under NEPA through instituting the following Best Management Practices advocated by BAAQMD. Specifically, contractors would be required to: 1) minimize idling time to 5 minutes; 2) maintain properly tuned equipment; and 3) limit the hours of operation of heavy duty equipment or the number of pieces of equipment operating simultaneously.

Effectiveness of Proposed Mitigation Measures: Mitigation measures proposed by the Park Service and CSLC are ones recommended specifically by BAAQMD for mitigating impacts of pollutant emission from earthmoving equipment during construction and would, therefore, be considered to proven, effective mitigation measures.

Cumulative Impacts: Cumulative impacts would be the same as described for the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Despite increases in excavation in the East Pasture and addition of other restoration components, Alternative D would have very similar effects as Alternative C on air quality during construction and after implementation. Construction in the East Pasture would produce minor amounts of carbon monoxide (CO), but major or substantial amounts of NOX. The "substantial" emissions of NOX are a result of the large volume (in Cubic Yards) of earthmoving proposed in the East Pasture would be considered a significant impact under CEQA. The Park Service and CSLC propose to mitigate this impact to a less-than-significant level through construction-related Best Management Practices (see above) recommended by BAAQMD (1999).

In terms of project implementation, the minimal amount of public access-related vehicle trips and maintenance-related use of earthmoving equipment would have only negligible effects on carbon monoxide (CO) and Total Emissions of other pollutants. This alternative would have a long-term minor beneficial effect on odors in the local community with conversion from the dairy to either open space, although there may be some moderate adverse effects during construction and the short-term associated with excavation- and drainage-related disturbance of wetland and heavily manured soils in the Giacomini Ranch and Olema Marsh.

Air Resources - Noise and Soundscapes

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

The Park Service is directed to preserve, to the greatest extent possible, the natural soundscapes of parks and to protect natural soundscapes from degradation due to noise, defined as "undesirable human-caused sound" (NPS 2006, Section 4.9). The Park Service policy is considered a more stringent standard than set by the federal Noise Control Act of 1972, which was established to promote an environment free of the noise that can jeopardize public health or welfare. A number of federal, state, and local agencies have established policies regarding the maximum amplitude or peak pressure of the sound wave, which are measured in decibels. The U.S. Department of Housing and Urban Development (HUD) established 24-hour period thresholds for noise impacts on residential projects, with 65 decibels over 24-hour period (dB-Ldn) or less considered acceptable, 66-75 dB-Ldn normally unacceptable, and 75 db-Ldn or greater as unacceptable. Ldn refers to noise averaged over a 24-hour period or the Day-Night Equivalent Sound Level. The California Department of Health Services (DHS) has published guidelines for use in developing in local general plans, which range from less than 65 dB-Ldn for low-density residential uses and conditionally acceptable levels as less than or equal to 70 dB-Ldn.

In 1994, the Marin County Noise Element mandated that residences, public spaces, and institutions not be subjected to noise levels above an average of 60 decibels (dB) over a 24-hour period or 60 dB-Ldn. Many planning agencies use a 24-hour average of noise intensity, with a 10 dB "penalty" added for nighttime noise (10:00 p.m. to 7:00 a.m.) to account for the greater intrusiveness of loud noises during this time of the day (California Code of Regulations 1988).

The County has also developed noise criteria under its CEQA guidelines (Marin County Community Development Agency 1994). These criteria generally characterize noise impacts as significant if the project would generate noise that 1) conflicts with countywide or state noise standards; 2) substantially increases noise levels in areas of sensitive receptors; or 3) is not compatible with baseline or ambient noise levels. Sensitive noise receptors include schools, residences, child care centers, health facilities, and convalescent centers. Unlike some counties such as Napa, the County of Marin has not established separate noise criteria for construction: The County of Napa has established 75 dBA[2] as the maximum allowable sound levels during construction. However, in 2005, the County did recently expand the loud and unnecessary noise ordinance to include guidelines on acceptable hours of operation for "loud noise-generating construction-related equipment (e.g., backhoes, generators, jackhammers)" as Monday through Friday, 8 a.m. to 5 p.m., with some exceptions, including construction projects of City, County, State, other public agency, or other public utility (Marin County Board of Supervisors, Ordinance No. 3431).

General Assumptions and Methodologies

- The proposed project has the potential to impact soundscapes and noise through operation of construction equipment and haul trips to local quarries to dispose of excess excavated sediment, as well as vehicles used to transport construction personnel to and from the Project Area. Following completion of construction, noise would be generated primarily through an increase in vehicles of visitors who might come to view the restored wetland or use the public access facilities.
- Noise levels have been studied in a few areas in the vicinity of the Project Area by the County of Marin (State Route 1) and by proponents of other projects (selected areas in Point Reyes Station). Most of these areas are outside the Seashore and the north district of the GGNRA. No ambient noise levels are available for the Seashore.
- To estimate ambient noise conditions for several roads in and near the Project Area that have not been surveyed, an approach from HUD's noise assessment guidelines in its *Noise Guidebook* (HUD 2004) was used that estimates average ambient noise levels based on vehicular traffic counts.
    - Noise levels were estimated using average daily traffic data collected in traffic surveys conducted by BRW and Lee Engineering in 1998. These roads included Bear Valley Road, Sir Francis Drake Boulevard, Pierce Point Road, and State Route 1 north of Point Reyes Station.
    - While the BRW and Lee Engineering (1998) study projected that park visitation and vehicle trips would climb 1 percent annually through 2010, park visitation has dropped overall since 1998 and, in 2005,

[2] dBA=decibels adjusted or decibels as measured on a frequency range similar to the human ear (1 kHz to 4 kHz).

was 27 percent lower than BRW and Lee Engineering projections. Therefore, these numbers could slightly overestimate ambient noise conditions on roads, although they do not take into account ancillary sources (e.g., construction at adjacent houses, etc.) that contribute to ambient noise levels along road corridors.

- For this analysis, the maximum threshold for ambient noise conditions is established as 60 dB–Ldn or 60 dBA over a 24-hour period, which is mandated by county ordinance. There may be noises during the daytime that exceed 60 dBA, which reflects the fact that the Project Area is bordered by several heavily traveled roads, including Sir Francis Drake Boulevard, Levee Road, Bear Valley Road, and State Route 1. However, noise levels are averaged over a 24-hour period, with nighttime noise conditions projected to average 45 dBA, so there can be temporary periods in which noises reach as high as 75 dBA without violating county ordinance.
- Sensitive receptors in the Project Area are represented almost exclusively by residences (Figure 40). The closest residences to the Project Area are three homes along Sir Francis Drake Boulevard in Inverness Park, which are contiguous with and at roughly the same elevation as the West Pasture of the Giacomini Ranch. There are approximately 12 parcels on Levee Road, which are across Lagunitas Creek from the southern portion of the East Pasture of the Giacomini Ranch, are also at roughly the same elevation as the pastures. The nearest non-residence sensitive receptors are a childcare center operated at the Dance Palace and a senior housing project near Mesa Road in Point Reyes Station, which are approximately 800 to 400 feet, respectively, away from the Project Area.

Described below are methodologies for impact thresholds related to soundscape and noise resources, including specific assumptions or details on methodologies.

Noise and Soundscapes – Construction-Related: The impact thresholds for construction-related noise are based on thresholds established by the county and CEQA guidelines, which discourages exposure to noise levels that would exceed county ordinances and other federal and state laws and policies, as well as noise that would result in a substantial increase in temporary and periodic noise exceeding ambient noise levels (Table 43). The County of Marin has established 24-hour noise thresholds of 60 dB-Ldn associated with operation of a completed project, but it has not established specific thresholds for construction. It should be noted that the 24-hour noise threshold for agricultural and industrial areas is 70dB-Ldn. The threshold established by Marin CWP of 60dB-Ldn pertains to a 24-hour average noise level, including the assignment of a 10dB penalty for noise occurring at night between 10 p.m. and 7 a.m. The noise associated with construction is different from operational noises, because it is louder, but usually short-term or more intermittent and does not occur in the evening or nighttime hours. While the Counties of Napa and Solano have established thresholds of 75 dBA on construction activities at 50 feet, Marin County does not have a construction noise ordinance.

The existing use of the Project Area is an agricultural operation. Proposed actions will return the area to a more natural condition, but for the purpose of this analysis, the construction activities will be considered consistent with the agricultural 24-hour threshold of 70 dB-Ldn. Noise surveys have shown that maximum levels for temporary and periodic noise often exceed 75 dBA in towns such as Point Reyes Station, reaching as high as 87 dBA (EDAW Inc. 2001). The hours of construction for the proposed project within sensitive receptor zones would be 7am to 6pm during weekdays. Any work exceeding these hours or occurring on the weekends within sensitive receptor zones would be short-term and would require approval by the Park Service, CSLC, and possibly the county. The absence of project-related construction noise during the evening and night hours means that noise during night hours would not exceed low-level ambient or background conditions for town and rural areas (~45 dBA). Therefore, construction-related noise that does not exceed 75 dBA during the hours of 7:00 a.m. to 6:00 p.m., Monday through Friday, would meet the 24-hour noise thresholds of 60 dB-Ldn established by the County of Marin.

Impact thresholds for the construction period, then, incorporate a range of potential construction-related changes to ambient noise conditions, with levels exceeding 75dBA considered major under NEPA and substantial and significant under CEQA. CalTrans and the Federal Highway Administration have published criteria relating to the intensity of impacts from changes in ambient noise levels. According to these guidances, increases in ambient noise conditions of 5 dBA is considered “possibly significant,” and increases of 6 – 10 dBA in urban areas and ≥ 10 dBA in rural areas -- or exceedances of local noise ordinances -- are considered generally significant under CEQA. Changes in ambient noise of less than 3 dBA are assumed to be negligible due to the fact that human ear can barely detect changes of this magnitude.

Noise produced by construction equipment depends upon a number of variables. These variables include: 1) the type of equipment (e.g., excavator, jackhammer, bulldozer, sheet pile driver, dump truck, etc.), 2) period

Figure 40. Sensitive Noise Receptors and Construction Zones

of operation of equipment, 3) number of pieces of equipment operated simultaneously, 4) distance from the receiver to construction equipment, and 5) effects of topography and other factors (e.g., sound walls, wind direction, thick, dense vegetation) on noise propagation or attenuation. The number of pieces of construction equipment operating simultaneously can vary considerably during the construction period, but it can be assumed that several pieces of equipment might be operating simultaneously. Based on the conceptual design approach, it is anticipated that anywhere from one to four pieces of construction equipment would be operating on specific construction tasks during each construction year or years (2007 or 2007 and 2008) depending on the particular alternative. Construction noise can also include multiple haul trips made by dump trucks or trucks used to either bring construction materials to the Project Area or to transport materials such as excavated sediment to disposal locations, which can increase noise along roadway corridors.

For the purposes of this analysis, the maximum number of potential pieces of construction equipment, including 3 dump trucks, will be assumed to be operating simultaneously to provide a conservative or cautious estimate of impact, although it is unlikely that all equipment would be operating simultaneously. The number of necessary construction personnel will also be estimated, with a person-to-vehicle ratio of 1.3 assumed. Changes in noise levels generated by dump trucks and construction personnel vehicles along roadway corridors were estimated using HUD noise assessment guidelines (HUD 2004) that estimate average 24-hour noise conditions from average daily traffic volume. Under most alternatives, construction activities would be concentrated to some degree in focal areas (Figure 40). Noise generated by maximum number of simultaneously operating construction equipment in these construction focus areas will be evaluated relative to the distance to the nearest sensitive receptors, which are almost exclusively private residences. Scaling factors used to adjust noise emissions from equipment will be attenuation of noise with distance, with noise produced by construction equipment expected to decrease about 6 dB for every doubling of distance. In addition, noise barriers, which can include embankments, walls, and thick, dense vegetation at least 100 feet in width (Federal Highway Administration 2001) also attenuate sound.

TABLE 43. NOISE AND SOUNDSCAPES – CONSTRUCTION-RELATED EFFECTS

Source: Park Service Management Policies, HUD, Marin CWP Nature: Beneficial, Adverse Context: Local Community Duration: Construction	
No Impact	There would be no potential for impact to noise and soundscape resources associated with construction of the proposed project.
Negligible	The proposed project would generate construction-related noise that would be barely detectable (change of ≤ 3 dBA) by sensitive receptors from existing conditions (adjacent residences) and within the range of ambient or background noise conditions.
Minor	The proposed project would generate construction-related noise that would have a minor effect on ambient noise levels (change of ≤ 5 dBA) and would be detectable by sensitive receptors beyond existing conditions (adjacent residences). Maximum noise levels during construction would not exceed 75 dBA as perceived by the nearest sensitive receptor.
Moderate	The proposed project would generate construction-related noise that would have a moderate effect on ambient noise levels (change of ≤ 10 dBA) and be apparent and appreciable to sensitive receptors beyond existing conditions (adjacent residences). Maximum noise levels during construction may exceed 75 dBA as perceived by the nearest sensitive receptor for short periods of time, without construction noise mitigation measures.
Major or Substantial	The proposed project would generate construction-related noise that would have a substantial effect on ambient noise levels (change of > 9 dBA) and highly apparent to sensitive receptors beyond existing conditions (adjacent residences). Maximum noise generated during construction would potentially exceed 75 dBA as perceived by the nearest sensitive receptor.

Noise and Soundscapes – Project-Related: Impacts to noise and soundscapes from implementation or operation of the proposed project would result primarily from the potential increase in the number of visitors, residents, and vehicles coming to view the restored wetland or use the public access facilities. Estimates of the change in visitors and vehicles within the Project Area are based on projected increases in overall park visitation in the future, as well as on evaluation of the number of public access-related structures, facilities, and attractions/uses provided by each of the various alternatives. These semi-quantitative ranking systems are discussed in greater detail under Chapter 3.

To qualitatively or semi-quantitatively estimate noise generated by visitors, residents, and vehicles, the estimated maximum number/range of visitors and residents and associated vehicles that would visit or use each of the facilities in the Project Area was used as the basis for analysis. It would be expected that the highest visitation would occur on weekends, when visitation to the local community and parks are naturally highest. The evaluation also assumed that peak visitation would occur simultaneously on weekends for all of the public access facilities proposed under the various alternatives. Approximately 70 percent of the visitors were assumed to be driving alone, while the other 30 percent were assumed to be paired in vehicles. In addition to vehicle noise, visitors would generate additional noise through conversation: people talking normally generate noise levels in the range of approximately 50 to 70 dB, with normal conversation in the range of 60 – 65 dB. However, for the purposes of this analysis, the relative contribution of conversation to changes in ambient noise levels was considered negligible. This approach was considered to provide a conservative or cautious estimate of impacts such that it would err on the side of over-estimating the total number of people and vehicles that might be present at any one time.

The impact thresholds for project-related noise were based on thresholds established by the county and CEQA guidelines, which discourage exposure to noise levels that would exceed county ordinances and other federal and state laws and policies, as well as noise that would ***substantially*** and permanently increase ambient noise levels above existing levels (Table 44). CalTrans and the Federal Highway Administration have published criteria relating to the intensity of impacts from changes in ambient noise levels. According to these guidances, increases in ambient noise conditions of 5 dBA is considered "possibly significant," and increases of 6 – 10 dBA in urban areas and ≥ 10 dBA in rural areas -- or exceedances of local noise ordinances -- are considered generally significant under CEQA. In addition, changes in ambient noise conditions that would increase noise levels above 60 dB-Ldn, the threshold established by the County, would be considered major under NEPA and substantial and significant under CEQA. Based on a night-time average ambient noise condition of 45 dBA, which is reasonable for a rural area, daytime averages would need to exceed 75 dBA to exceed the 60 dB-Ldn thresholds established by the county noise ordinance. Because the proposed project will both potentially increase and decrease the number of noise sources (e.g., agricultural operations), impact thresholds incorporate the potential for both increases and decreases in ambient noise conditions (assumed to be 60 dB-Ldn) for areas adjacent to the Project Area), with changes in ambient noise of < 3 dBA assumed to be negligible due to the fact that human ear can barely detect changes of this magnitude.

TABLE 44. NOISE AND SOUNDSCAPES – PROJECT-RELATED EFFECTS

Source: Park Service Management Policies, HUD, Marin CWP Nature: Beneficial, Adverse Context: Local Community Duration: Long-Term	
No Impact	There would be no potential for impact to noise and soundscape resources associated with implementation of the proposed project.
Negligible	The proposed project would generate an undetectable or barely detectable change (generally ≤ 3 dBA) in ambient noise conditions in the local community. Changes in ambient noise conditions would not exceed the 60 dB-Ldn 24-hour average noise level threshold established by county ordinance.
Minor	The proposed project would generate a small, but detectable change (generally ≤ 5 dBA) in ambient noise conditions in the local community. Changes in ambient noise conditions would not exceed the 60 dB-Ldn 24-hour average noise level threshold established by county ordinance.
Moderate	The proposed project would generate an apparent or appreciable change (≤ 10 dBA) in ambient noise conditions in the local community. However, changes in ambient noise conditions would not exceed the 60 dB-Ldn 24-hour average noise level threshold established by county ordinance.
Major or Substantial	The proposed project would generate a major or substantial change (> 10 dBA) in ambient noise conditions in the local community; OR Would exceed County of Marin noise ordinance of 60 dB-Ldn or 60 dBA over a 24-hour period.

Impact Analysis

TABLE 45. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR AIR RESOURCES – SOUNDSCAPES

All impacts would be considered Adverse (unless otherwise noted) and Local Community and are separately analyzed for Construction and Short-Term/Long-Term. ***Slashed entries refer to the range in intensity of impacts for specific components under impact indicators: bold-faced entries refer to the average impact intensity.***

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Noise and Soundscapes – Construction-Related Effects	Negligible/ Minor	Negligible/ Major or Substantial*	Negligible/ Major or Substantial*	Negligible/ Major or Substantial*	Negligible/ Major or Substantial*
NEPA: Intensity Following Mitigation		Moderate	Moderate	Moderate	Moderate
CEQA: Significance Following Mitigation		Less than Significant	Less than Significant	Less than Significant	Less than Significant
Noise and Soundscapes – Project-Related Effects	Beneficial - Minor	Adverse-Minor	Adverse-Minor	Adverse-Negligible	Beneficial-Negligible

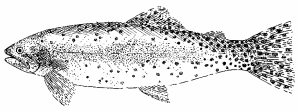
* Conclusion limited to Specific Sensitive Receptor Areas near Levee Road, C Street, and/or Sir Francis Drake Boulevard in Inverness Park.

No Action Alternative

Analysis: The effects of the No Action Alternative on ambient noise in the local community during construction and after implementation would generally range from negligible to minor (Table 45). Under the No Action Alternative, levees, tidegates, and culverts in the Giacomini Ranch are not breached or removed, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. (The Park Service is required under its existing agreement with CalTrans to restore wetlands as mitigation for impacts caused by CalTrans to aquatic habitat from a road repair on State Route 1 in Marin County in exchange for the Park Service receiving monies to purchase and restore the Giacomini Ranch.) The remainder of the levee would not be deconstructed, although there would be no levee maintenance. Olema Marsh and the West Pasture are not restored, and there would be no construction of new public access facilities.

Construction: The wetland restoration/mitigation component would be located more than 2,000 feet from any sensitive noise receptors. The largest source of noise associated with construction would come from an increase in truck traffic along primary roadway corridors associated with hauling of excavated sediments to local quarries. Approximately 200 truck trips would be required to dispose of approximately 3,800 cubic yards of sediment. For this analysis, three trucks were assumed to be running simultaneously for a short, concentrated period of time. This analysis also took into account vehicular traffic associated with commuting of construction personnel to the Project Area.

Because the wetland restoration is located in the northwestern corner of the East Pasture, trucks hauling sediment would be traveling through Point Reyes Station and then would likely use Sir Francis Drake Boulevard to the primary quarry disposal locations in the Seashore located near Pierce Point Road (Figure 10). In rural areas, ambient noise levels typically range from 40 to 50 dBA. In urban areas or in rural areas adjacent to roads and highways such as Point Reyes Station, noise levels typically range from 60 to 70 dBA. Ambient noise levels on State Route 1 south of Point Reyes Station averaged 65 decibels in 2001 (County of Marin 2004). In the town of Point Reyes Station, average ambient noise levels were slightly higher (69 dB), with maximum and minimum levels of 87 and 43 dB, respectively (EDAW Inc. 2001). Traffic on local roads and State Route 1 constitutes the dominant noise source (EDAW Inc. 2001). Based on an approach that estimates average ambient noise levels from traffic survey data, noise levels for non-surveyed roads could average 70.8 dBA for State Route 1 north of Point Reyes Station; 69.5 dBA for Bear Valley Road and Sir Francis Drake Boulevard; and 66.5 dBA for Pierce Point Road.



As these numbers would suggest, most of the local and regional roadways such as Sir Francis Drake Boulevard are already somewhat noisy because of the relatively high volume of car and truck traffic associated with residents, park visitors and staff, and dairy and ranching-associated businesses. Agricultural operations in the Olema Valley and Point Reyes Peninsula generate a considerable number of truck trips within the local community, including twice daily runs of milk trucks and periodic runs of hay trucks and other suppliers. Increased truck traffic along these already busy local and regional roadways would cause only a negligible increase (≤ 3 dBA) in noise levels in Point Reyes Station and along Sir Francis Drake Boulevard. However, the lower volume of traffic on Pierce Point Road, combined with its steeper gradient, may increase the relative effect of these truck trips on noise conditions, causing a minor change in ambient noise levels in this area with the increase estimated at approximately 4 dBA.

Project Implementation: After construction is completed, noise levels would not be expected to increase relative to baseline conditions, because there would be no new public access structures or facilities. This alternative would potentially have a beneficial minor effect on soundscapes in that it would generate a small, but detectable decrease in noise associated with intensive agricultural operations such as dairies. Dairies often produce loud or sharp temporary noises from operation of milk trucks, backhoes, All-Terrain Vehicles (ATV), and other mechanized farm equipment that have peak noise levels ranging from 100 to 122 dBA at 0-5 feet (Depczynski et al. 2002). While the dairy will close in spring 2007 due to the expiration of the existing Reservation of Use Agreement with the Giacomini Trust, there is a potential for leased grazing of dairy heifers or beef cattle under the No Action Alternative through separate environmental review process. Even if leased grazing is approved, noise intensity would still be expected to be lower than those of the dairy operations and would be limited largely to the periodic or infrequent use of livestock trucks to trailor animals on and off the Giacomini Ranch. In addition, there may be occasional noise generated by earthmoving equipment performing maintenance on the property. Overall, the No Action Alternative would be expected to result in a minor beneficial effect in noise conditions for the local community after implementation, particularly for residents along 3rd and C Streets and possibly for downtown Point Reyes Station.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: There is only one currently proposed or somewhat reasonably foreseeable project that would have the potential to cause cumulative impacts to soundscapes and ambient noise in the local community should the No Action alternative be implemented. Once the Giacomini Dairy closes, lands along C Street would be available for other uses. These parcels are primarily zoned Commercial Residential (CRAB-2) and could potentially at some point be developed into as many as 8-10 homes. For the local community as a whole, residential development would constitute a negligible to minor adverse impact, although the impacts to nearby residents could possibly be constructed as appreciable or moderate. As with the proposed project, the analysis of impacts from this potential project would need to take into account existing or baseline ambient noise generated along C Street by operation of the dairy, including twice-daily milk truck runs, hay trucks, and use of earthmoving equipment for maintenance and ATVs. Because the No Action would be expected to have minor beneficial, effects on ambient noise following implementation, cumulative impacts would be considered adverse negligible at most. Most of the other medium- to large projects that might be constructed during the same timeframe are distant enough that there would be no cumulative effects on ambient noise, except for the Bear Valley Creek Watershed and Fishery Enhancement Project. However, there is no definitive timeframe for construction of this project.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The effects of the No Action Alternative on ambient noise in the local community would generally range from adverse negligible/minor to beneficial minor. The only construction would be a small restoration component that is required under the Park Service's existing mitigation agreement with CalTrans, which would have negligible effects on sensitive receptors except for along Pierce Point Road. Hauling of excavated sediments to quarries in the Pierce Point Road vicinity would generate a minor increase in ambient noise levels during construction. This alternative would actually have a minor beneficial effect on ambient noise conditions after implementation, because loud and sharp noises associated with intensive agriculture

such as dairying would be discontinued when the dairy closes in spring 2007 in accordance with the expiration of the Park Service's existing Reservation of Use Agreement with the Giacomini Trust. Potential future maintenance and agricultural uses such as leased grazing would be expected to produce only very infrequent or periodic loud noises from use of earthmoving equipment and trucks to trailor animals on and off the Giacomini Ranch.

Alternative A

Analysis: The effects of Alternative A on ambient noise in the local community during construction and after implementation would range from negligible to major (Table 45). Under this alternative, the East Pasture of the Giacomini Ranch would be restored, with new public access structures and facilities largely located on the eastern and southern perimeters of the East Pasture. The West Pasture and Olema Marsh would not be restored, although there is a potential for a future extension of the southern perimeter trail to Inverness Park either through widening of the Sir Francis Drake Boulevard berm or a boardwalk that would run through the West Pasture.

Construction: Most of the effects of construction on sensitive noise receptors or residences in the vicinity of the East Pasture would be attenuated either through distance or natural barriers such as road embankments, elevation differences, or thick, dense vegetation. There are at least two areas identified as a sensitive construction zones (southeastern portion of East Pasture and Sir Francis Drake Boulevard corridor) where sounds would not naturally be attenuated to the degree needed to keep noise levels below 75 dBA during daytime hours (Figure 40). Under this alternative, most of the construction in the southern portion of the East Pasture occurs in the western quadrant near White House Pool: creek banks would be regraded to a more stabile profile, and a prefabricated bridge would be installed. These areas appear distant enough from residences that noise levels would not increase substantially.

However, grading and finishing of the southern perimeter trail across from the homes on Levee Road and homes on 3rd and C Streets would potentially elevate noise to 84 to 86 dBA for very short periods of time. Homes on Levee Road are approximately 130 to 150 feet from the East Pasture levee, and those at the corner of 3rd and C Street are approximately 80 feet away. The latter would be more affected by trail construction activities. Grading would be required to construct the trail, but this activity would occur only for a very short period, and other trail-related construction activities (e.g., fence installation, installation of trail tread) in this zone would otherwise appear to generate minimal noise. The other sensitive construction zone would occur along the Sir Francis Drake Boulevard corridor and would be associated with the potential future extension of the southern perimeter trail to Inverness Park. While this trail would be designed and constructed through a separate environmental review process jointly conducted with the county, it would possibly involve either widening of the Sir Francis Drake Boulevard road berm through placement of fill or construction of a boardwalk in the West Pasture. Both of these approaches would possibly generate construction-related noise that would exceed 75 dBA.

Because earthmoving and other construction activities would generate noise at levels that may exceed 75 dBA for nearby sensitive receptors, impacts under this alternative would be characterized as be major under NEPA and substantial and significant under CEQA. These impacts would be localized and very short term and would be mitigated to less than significant under CEQA and moderate under NEPA using Best Management Practices identified below.

Other than earthmoving, the largest source of noise associated with construction would come from an increase in noise along local and regional roadway corridors associated with hauling of excavated sediments to local quarries. Under this alternative, approximately 39,250 cubic yards of excess sediment excavated would be hauled to quarries within the Seashore for disposal, which would result in an increase in the number of potential truck trips from approximately 200 under the No Action Alternative to 2,000 under Alternative A. This analysis assumed that use of 20 cubic-yard trucks and that three trucks would be running simultaneously for a longer period of time relative to the No Action Alternative, (E. Polson, Polson Civil Engineering, *pers. comm*.). As with the No Action Alternative, it also took into account vehicle-related noise associated with commuting of construction personnel to the Project Area.

Because this alternative focuses on the East Pasture, trucks hauling sediment would be traveling through Point Reyes Station from either the Mesa Road or C Street access points and then would likely use Sir Francis Drake Boulevard to reach the primary disposal locations in the Seashore located near Pierce Point Road (Figure 10).

Most of the local and regional roadways such as Sir Francis Drake Boulevard are already somewhat noisy because of the relatively high volume of car and truck traffic associated with residents, park visitors and staff, and dairy and ranching-associated businesses. Agricultural operations in the Olema Valley and Point Reyes Peninsula generate a considerable number of truck trips within the local community, including twice daily runs of milk trucks and periodic runs of hay trucks and other suppliers.

Increased truck traffic would cause only a negligible increase (≤ 3 dBA) in noise levels in Point Reyes Station and along Sir Francis Drake Boulevard. The intensity of impact would be minimized to some degree by the extended timeframe over which construction would occur: restoration would occur over one construction season, with construction of public access expected to occur over two construction seasons following implementation of restoration. However, the lower volume of traffic on Pierce Point Road, combined with its steeper gradient, may increase the effect of hauling relative to Sir Francis Drake Boulevard. In this area, truck trips would cause a minor short-term, localized change in ambient noise levels estimated at approximately 4 dBA. Taking into account the length of travel on each of the roads, truck hauling during construction would be expected to result in no more than an overall adverse negligible effect on ambient noise conditions along local and regional roadways.

Project Implementation: After implementation, effects on soundscape resources or ambient noise conditions would result primarily from changes in visitation and the number of vehicles traveling to and from the Project Area, because of the expansion in public access-related structures, facilities, and attractions/uses. In addition, there may be occasional noise generated by earthmoving equipment performing maintenance on the property. As discussed under the No Action Alternative, this alternative would potentially have a beneficial effect on soundscapes in that it would generate a small, but detectable decrease in noise associated with intensive agricultural operations such as dairies. Dairies often produce loud or sharp temporary noises from operation of milk trucks, backhoes, All-Terrain Vehicles (ATV), and other mechanized farm equipment that have peak noise levels ranging from 100 to 122 dBA at 0-5 feet (Depczynski et al. 2002).

In general, the potential increase in noise associated with visitation and use of public access facilities in the Project Area would not be expected to result in more than a negligible to minor adverse effect on ambient noise conditions. The largest potential for a change in ambient noise conditions would occur for sensitive receptors on Levee Road, near 3rd and C Street, and directly north of the worker housing along Tomasini Creek on the west side of Mesa Road in Point Reyes Station. The southern perimeter trail that would be constructed in the vicinity of these sensitive receptors would be used by a higher number of visitors than the informal path that currently exists, thereby increasing the number of vehicles relative to baseline conditions. The higher number of visitors relative to baseline conditions would increase noise levels both from vehicles and from people conversing with each other. In addition to noise from traveling vehicles, residences near 3rd and C Streets in Point Reyes Station would be affected by sounds associated with engine starting and acceleration and deceleration of vehicles traveling to and from new or expanded public access structures and facilities, because they would be located in the vicinity of designated trailheads. Noise from engine starting and vehicle acceleration and deceleration are louder than those generated by a traveling vehicle.

Other sensitive receptors that could possibly be affected by construction or enhancement of public access facilities are residences on the Point Reyes Mesa above the eastern perimeter trail and homes along Sir Francis Drake Boulevard adjacent to the possible future extension of the southern perimeter trail to Inverness Park. Currently, there is no public access along the eastern perimeter of the East Pasture except at the terminus of the Tomales Bay Trail. Therefore, construction of the eastern perimeter trail, which would connect to the Tomales Bay Trail, would introduce a new source of noise for residences along the Point Reyes Mesa, however, visitation-related increases in ambient noise levels would be expected to represent no more than a minor adverse impact in this area. Noise generated near homes along Sir Francis Drake Boulevard by the possible future extension of the southern perimeter trail to Inverness Park would be largely masked by the roadway noise and would have no more than a negligible adverse effect on ambient noise relative to baseline conditions.

The intensity of these impacts must be balanced with the fact that these areas are currently subject to higher ambient levels of noise due to operation of the dairy, worker housing, and the existing informal path on the East Pasture levee. Noise associated with the dairy facility on C Street includes twice daily milk truck stops; hay truck and other truck deliveries; operation of backhoes, dump trucks, and other construction equipment; and vehicle and conversation noise of ranch workers. In addition, a certain amount of noise is already generated in this area by people using the informal path that currently exists on the levee, who usually park near 3rd and C Streets. On Mesa Road, noise is generated by ranch workers living in housing on the north side

of Tomasini Creek, as well as by earthmoving equipment used by the Giacominis for ranch maintenance activities in the East Pasture.

Under Alternative A, noises associated with dairy operations would be eliminated, while noise associated with visitation and use of public access facilities would either be considered an increase relative to public access-related noise generated under baseline conditions (southern perimeter trail) or a new source of noise (eastern perimeter trail). Because public access-related noise would increase relative to baseline conditions and would be more constant than the agricultural-related noise eliminated by close of the dairy, this alternative may have an overall minor adverse effect on ambient noise conditions that would not violate the county noise ordinance of 60 dB-Ldn.

Proposed Mitigation Measures: To reduce noise levels to the maximum extent practicable in sensitive construction zones, the construction contractor shall employ the following noise-reducing Best Management Practices (BMP). Construction would be limited to the hours of 7 a.m. and 6 p.m. Monday through Friday. All equipment would have sound control devices that are no less effective than those provided by the original equipment and would have muffled exhaust. In addition, contractor would be required Maintain properly tuned equipment and limit idling time to 5 minutes, limit the number of concurrently operating pieces of construction equipment within the Sensitive Noise Receptor Area, notify adjacent residences in advance of construction, and potentially reschedule construction activities.

Effectiveness of Proposed Mitigation Measures: Implementation of the proposed mitigation measures would reduce the intensity of impacts in sensitive construction zones to less-than-significant levels under CEQA.

Cumulative Impacts: There is only one currently proposed or somewhat reasonably foreseeable project that would have the potential to cause cumulative impacts to soundscapes and ambient noise in the local community should the No Action alternative be implemented. Once the Giacomini Dairy closes, lands along C Street would be available for other uses. These parcels are primarily zoned Commercial Residential (CRAB-2) and could potentially at some point be developed into as many as 8- 10 homes. For the local community as a whole, residential development would probably constitute a negligible to minor adverse impact, although the impacts to nearby residents could be considered moderate. As with the proposed project, the analysis of impacts from this potential project would need to take into account existing or baseline ambient noise generated along C Street by operation of the dairy, including twice-daily milk truck runs, hay trucks, and use of earthmoving equipment for maintenance and ATVS. Because Alternative A would be expected to have minor adverse effects on ambient noise after implementation, project-related cumulative impacts would be considered adverse minor to moderate at most. There would be no cumulative impacts expected for construction

As discussed under the No Action Alternative, most of the other medium- to large projects that might be constructed during the same timeframe are distant enough that there would be no cumulative effects on ambient noise, except for the Bear Valley Creek Watershed and Fishery Enhancement Project. However, there is no definitive timeframe for construction of this project.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The effects of Alternative A on ambient noise in the local community during construction and after implementation would generally range from negligible adverse to major or substantial adverse, with substantial adverse effects mitigated to less-than-significant levels under CEQA. Under Alternative A, restoration and construction of new public access structures and facilities would occur primarily in the East Pasture, although there is a potential to extend the southern perimeter trail to Inverness Park. In general, construction would have only negligible to minor effects on noise along local and regional roadways associated with hauling of excavated sediments and negligible effects on most of the sensitive receptors or residences near the Project Area because of attenuation of noise with distance and natural sound barriers. However, the close proximity of homes on Levee Road, 3rd and C Streets in Point Reyes Station, and Sir Francis Drake Boulevard to two major construction areas would potentially result in temporary, short-term noise levels exceeding 75 dBA. This would be considered a substantial and significant impact under CEQA. While these

impacts cannot be eliminated, they have been reduced to a less-than-significant level under CEQA through adoption of noise-reducing construction management practices.

The primary effects of this alternative on ambient noise conditions following project implementation may be associated largely with increases in visitation and traffic due to construction or expansion of public access structures, facilities, and attractions/uses. Projected increases in vehicle volume associated with higher numbers of visitors would have a barely detectable or very negligible impact on state, regional, and local roadways. However, impacts may be higher in certain areas such as 3rd and C Streets and directly north of the worker housing near Mesa Road in Point Reyes Station, where trailheads would be located due to noise from engine starting and vehicle acceleration and deceleration. Construction of the eastern perimeter trail would also introduce a new source of noise for residents on the Point Reyes Mesa. Ultimately, the increase in public access-related noise associated with expansion or construction of public access facilities would be offset to some degree by the elimination of noises associated with operation of the dairy, although visitation and use of public access facilities would be expected to generate a more constant level of noise than the intermittent or periodic loud and sharp noises produced by milk trucks, hay trucks, and earthmoving equipment used for maintenance. Therefore, overall, project implementation would be expected to potentially have a minor adverse effect on ambient noise conditions for at least certain areas within the local community, although ambient noise conditions would not exceed the county noise ordinance of 60 dB-Ldn.

Alternative B

Analysis: The effects of Alternative B on ambient noise in the local community would be very similar to Alternative A, generally ranging from negligible adverse to major or substantial (Table 45). Under this alternative, the East and West Pastures of the Giacomini Ranch would be restored, with most of the new public access structures and facilities still largely located on the eastern and southern perimeters of the East Pasture as they would be in Alternative A. The amount of construction in the sensitive construction zones in the southeastern portion of the East Pasture would be increased, and two other zones would be added in the West Pasture, where levees would be breached or berms or levees would potentially be constructed. Construction in these areas would have the potential to generate noise localized, short-term noise levels exceeding 75 dBA, which would constitute a major impact under NEPA and a substantial and significant impact under CEQA. These effects would be mitigated to a less-than-significant level under CEQA and to a moderate level under NEPA using the mitigation measure BMPs described under Alternative A.

Construction: Under this alternative, approximately 71,050 cubic yards of excess sediment excavated would be hauled to quarries within the Seashore for disposal (Figure 10). There are at least two areas identified as sensitive construction zones (southeastern portion of East Pasture; Sir Francis Drake Boulevard corridor; southern portion of West Pasture) where construction sounds would not naturally be attenuated to the degree needed to keep noise levels below 75 dBA (Figure 40). Because of this, the number of potential truck trips would climb from approximately 200 under the No Action Alternative and 2,000 under Alternative A to 3,600 under Alternative B. Despite this, impacts to noise levels along local and regional roadways would still be estimated to be negligible, because of the moderate to high existing ambient noise conditions along these busy road corridors and the extended timeframe over which hauling would occur. This alternative would be constructed over three to four construction seasons, with the public access component anticipated to take two years for construction after restoration is completed. The only noticeable increase in estimated noise from hauling occurred along Pierce Point Road, where the lower overall traffic volume on this road, combined with the steeper road gradient, would cause a minor short-term, localized change in ambient noise levels estimated at approximately 4 dBA. Taking into account the length of travel on each of the roads, truck hauling during construction would be expected to result in no more than an overall adverse negligible effect on ambient noise conditions along local and regional roadways.

Project Implementation: After implementation, effects on soundscape resources or ambient noise conditions would result largely from changes in visitation and the number of vehicles traveling to and from the Project Area, because of the expansion in public access structures, facilities, and attractions/uses. In general, the effects of Alternative B on ambient noise after implementation would be almost identical to those of Alternative A, because the public access components are very similar with a few exceptions. The magnitude of a potential increase in visitation and visitor-related traffic would be expected to result in no more than a negligible to minor adverse effect on ambient noise conditions.

The intensity of these impacts must be balanced with the fact that these areas are currently subject to higher ambient levels of noise due to operation of the dairy, worker housing, and the existing informal path on the East Pasture levee. Under both Alternatives A and B, noises associated with dairy operations would be eliminated, while noise associated with visitation and use of public access facilities would either be considered an increase relative to public access-related noise generated under baseline conditions (southern perimeter trail) or a new source of noise (eastern perimeter trail). Because public access-related noise would increase relative to baseline conditions and would be more constant than the agricultural-related noise eliminated by close of the dairy, this alternative would have an overall minor adverse effect on ambient noise conditions that would not violate the county noise ordinance of 60 dB-Ldn.

Proposed Mitigation Measures: Proposed measures to reduce noise levels to the maximum extent practicable in sensitive construction zones would be the same as under Alternative A.

Effectiveness of Proposed Mitigation Measures: Implementation of the proposed mitigation measures would reduce the intensity of impacts in sensitive construction zones to less-than-significant levels under CEQA.

Cumulative Impacts: Cumulative impacts would be the same as described under Alternative A.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Despite increases in the extent and degree of restoration, Alternative B would have very similar project-related and cumulative effects as Alternative A on ambient noise in the local community that would range from negligible adverse to major or substantial, with substantial construction-related effect on sensitive receptors reduced to less-than-significant levels under CEQA and to a moderate level under NEPA through incorporation of noise-reducing construction management practices. Following implementation, this alternative would have an almost identical minor adverse effect to Alternative A on ambient noise conditions in the local community that would not violate the county noise ordinance of 60 dB-Ldn. While noise associated with the dairy would be eliminated with its closure, noise associated with increased visitation to new or expanded public access facilities would increase slightly relative to baseline conditions and would be more constant than noise generated by milk trucks, hay trucks, earthmoving equipment used for dairy maintenance, and other agricultural activities.

Alternative C

Analysis: Alternative C would have very similar effects on ambient noise in the local community during construction and after implementation as Alternative B, with the intensity of effects ranging from negligible adverse to major or substantial adverse (Table 45). Under this alternative, the scope of restoration is expanded to include Olema Marsh and the adjacent Olema Creek watershed, as well as the East and West Pastures of the Giacomini Ranch. The degree of active restoration within the East Pasture and West Pasture is increased, as well. The extent of public access along the eastern perimeter of the East Pasture would be scaled back to include two spur trails or spur trail extensions, with the Mesa Road spur trail becoming an ADA-compliant trail.

<u>*Construction*</u>: As with the other alternatives, most of the effects of construction on sensitive noise receptors or residences in the vicinity of the East and West Pastures would be attenuated either through distance or natural barriers such as road embankments, elevation differences, or thick, dense vegetation. Similar to Alternative B, there are at least three areas identified as sensitive construction zones (southeastern portion of East Pasture; Sir Francis Drake Boulevard corridor; southern portion of West Pasture) where construction sounds would not naturally be attenuated to the degree needed to keep noise levels below 75 dBA (Figure 40). However, under this alternative, the intensity of restoration in at least two of these sensitive construction areas would increase with the addition of shallow grading or scraping of a 30-acre pasture to eliminate weeds in addition to levee removal, creek bank regrading, and trail construction in the East Pasture and complete removal of the levee in the West Pasture (Figure 40). Also, there would still be the potential for future expansion of the southern perimeter trail to Inverness Park and construction of levees around lower-elevation private properties on the east side of Sir Francis Drake Boulevard (Sir Francis Drake Boulevard

corridor; Figure 40). Because earthmoving and other construction activities may generate noise at levels that would potentially exceed 75 dBA for nearby sensitive receptors in these areas, impacts under this alternative would be characterized as be major under NEPA and substantial and significant under CEQA. These impacts would still be localized and very short term, although the duration of impacts would be slightly longer than under Alternative B. These effects would be mitigated to a less-than-significant level under CEQA and to a moderate level under NEPA using the mitigation measure BMPs described under Alternative A.

Other than earthmoving, the largest source of noise associated with construction would come from an increase in noise along local and regional roadway corridors associated with hauling of excavated sediments to local quarries. Under this alternative, approximately 112,500 cubic yards of excess sediment excavated would be hauled to quarries within the Seashore for disposal, which would result in an increase in the number of potential truck trips from approximately 200 under the No Action Alternative and 3,600 under Alternative B to 5,600 under Alternative C. This analysis assumed that use of 20 cubic-yard trucks and that three trucks would be running simultaneously for a longer period of time relative to Alternative B (E. Polson, Polson Civil Engineering, *pers. comm*.). As with the other alternatives, it also took into account vehicle-related noise associated with commuting of construction personnel to the Project Area. Under this alternative, trucks hauling sediment from the East Pasture would be traveling through Point Reyes Station from either the Mesa Road or C Street access points and then would likely use Sir Francis Drake Boulevard to reach the primary disposal locations in the Seashore located near Pierce Point Road (Figure 10). Trucks hauling sediment from Olema Marsh and the West Pasture would primarily be using Sir Francis Drake Boulevard and, for Olema Marsh, either Bear Valley or Levee Roads.

Most of the local and regional roadways such as Sir Francis Drake Boulevard are already somewhat noisy because of the relatively high volume of car and truck traffic associated with residents, park visitors and staff, and dairy and ranching-associated businesses. Agricultural operations in the Olema Valley and Point Reyes Peninsula generate a considerable number of truck trips within the local community, including twice daily runs of milk trucks and periodic runs of hay trucks and other suppliers. Despite the increase in trips relative to Alternative B, truck traffic would still be expected to cause only a negligible increase (≤ 3 dBA) in noise levels in Point Reyes Station and along Sir Francis Drake Boulevard. The intensity of impact would be minimized to some degree by the high levels of ambient noise that currently exist along these busy road corridors and the extended timeframe over which construction would occur. Construction would occur over an estimated five to seven construction seasons, because it includes construction of public access facilities and restoration of Olema Marsh, which would be restored under an adaptive approach that would use phase restoration over time.

Impacts would be slightly higher on Pierce Point Road, because the lower volume of traffic, combined with its steeper gradient, would magnify the effects of hauling on noise conditions relative to Sir Francis Drake Boulevard. In this area, truck trips would cause a minor short-term, localized change in ambient noise levels estimated at approximately 4 dBA. Taking into account the length of travel on each of the roads, truck hauling during construction would be expected to result in no more than an overall adverse negligible effect on ambient noise conditions along local and regional roadways.

Project Implementation: After implementation, effects on ambient noise would result primarily from changes in visitation and the number of vehicles traveling to and from the Project Area, because of the expansion in public access-related structures, facilities, and attractions/uses. In addition, there may be occasional noise generated by earthmoving equipment performing maintenance on the property. Relative to Alternative B, the potential increase in noise associated with visitation and use of public access facilities in the Project Area would be lower, because of changes to or scaling back of the southern and eastern perimeter trails. Therefore, this alternative would still be expected to have barely detectable or very negligible impacts on ambient noise conditions along local and regional road corridors.

The largest potential for a change in ambient noise conditions would occur for sensitive receptors on Levee Road and near 3rd and C Street and in the Point Reyes Mesa area in Point Reyes Station. Under Alternative C, Mesa Road becomes an ADA-compliant spur trail that leads to a viewing near the Giacomini Hunt Lodge on the edge of Tomasini Creek. Access from Point Reyes Station to the southern perimeter trail changes to the Green Bridge, with access point at the corner of 3rd and C Street eliminated. This change in trailhead location decreases potential effects to sensitive receptors near 3rd and C Streets from noise associated with engine starting and vehicle acceleration and deceleration, although noise from users of the adjacent trail system might still be detectable relative to existing conditions. (Noise from engine starting and vehicle acceleration and deceleration are louder than those generated by a traveling vehicle.)

Residences in the Point Reyes Mesa area – particularly those directly north of Tomasini Creek near Mesa Road – would potentially become more affected by sounds associated with engine starting and acceleration and deceleration of vehicles traveling to and from new or expanded public access structures and facilities, because the Mesa Road spur trail would be converted to an ADA-compliant facility. However, any increase in visitation relative to Alternative B due to restructuring of these facilities would be expected to be negligible. Other sensitive receptors that could possibly be affected by construction or enhancement of public access facilities are residences along Sir Francis Drake Boulevard adjacent to the possible future extension of the southern perimeter trail to Inverness Park. However, noise generated near homes along Sir Francis Drake Boulevard by the possible future extension of the southern perimeter trail to Inverness Park would be largely masked by the roadway noise and would have no more than a negligible adverse effect on ambient noise relative to baseline conditions.

The intensity of public access-related impacts to ambient noise must be balanced with the fact that these areas are currently subject to higher ambient levels of noise due to operation of the dairy, worker housing, and the existing informal path on the East Pasture levee. As discussed under the No Action Alternative and Alternative A, this alternative would potentially have a beneficial effect on soundscapes in that it would generate a small, but detectable decrease in noise associated with intensive agricultural operations such as dairies. Noise associated with the dairy facility on C Street includes twice daily milk truck stops; hay truck and other truck deliveries; operation of backhoes, dump trucks, and other construction equipment; and vehicle and conversation noise of ranch workers. In addition, a certain amount of noise is already generated in this area by people using the informal path that currently exists on the levee, who usually park near 3rd and C Streets. On Mesa Road, noise is generated by ranch workers living in housing on the north side of Tomasini Creek, as well as by earthmoving equipment used by the Giacominis for ranch maintenance activities in the East Pasture.

Under Alternative C, noises associated with dairy operations would be eliminated, while noise associated with visitation and use of public access facilities would either be considered an increase relative to public access-related noise generated under baseline conditions (southern perimeter trail) or a new source of noise (two spur trails on eastern perimeter). Because public access-related noise would increase relative to baseline conditions and would be more constant than the agricultural-related noise eliminated by close of the dairy, this alternative would still have an overall adverse effect on ambient noise, although impacts would be reduced relative to Alternative B to negligible rather than minor. As with other alternatives, changes in noise levels would not violate the county noise ordinance of 60 dB-Ldn.

Proposed Mitigation Measures: Proposed measures to reduce noise levels to the maximum extent practicable in sensitive construction zones would be the same as described under Alternative A.

Effectiveness of Proposed Mitigation Measures: Implementation of the proposed mitigation measures would reduce the intensity of impacts in sensitive construction zones to less-than-significant levels under CEQA.

Cumulative Impacts: Cumulative impacts would be the same as described under Alternative A.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The effects of Alternative C on ambient noise in the local community during construction and after implementation would generally range from negligible adverse to major or substantial adverse, with substantial adverse effects mitigated to less-than-significant levels under CEQA and moderate under NEPA. Under Alternative C, the extent and degree of restoration would be expanded to include Olema Marsh and more active restoration actions in the Giacomini Ranch. Construction or expansion of public facilities would be scaled back relative to Alternatives A and B, although there is still a potential to extend the southern perimeter trail to Inverness Park and construct a small levee around lower-elevation private properties on the east side of Sir Francis Drake Boulevard. In general, construction would have only negligible to minor effects on noise along local and regional roadways associated with hauling of excavated sediments and negligible effects on most of the sensitive receptors or residences near the Project Area because of attenuation of noise with distance and natural sound barriers. However, the close proximity of homes on Levee Road, 3rd and C Streets in Point Reyes Station, and Sir Francis Drake Boulevard to three major construction areas would

potentially result in temporary, short-term noise levels exceeding 75 dBA. This would be considered a major impact under NEPA and a substantial and significant impact under CEQA. While these impacts cannot be eliminated, they have been reduced to a less-than-significant level under CEQA and a moderate level under NEPA through adoption of noise-reducing construction management practices.

The primary effects of this alternative on ambient noise conditions after implementation would be associated largely with increases in visitation and traffic due to construction or expansion of public access structures, facilities, and attractions/uses. Projected increases in visitation and related increases in vehicle traffic would be lower than those under Alternatives A and B and would, therefore, still have barely detectable or very negligible impacts on ambient noise conditions along local and regional road corridors. However, impacts may be higher in areas located next to trailheads due to noise from engine starting and vehicle acceleration and deceleration. Under this alternative, the Point Reyes Station trailhead for the southern perimeter trail is moved from 3rd and C Streets to the Green Bridge, and the ADA-compliant component on this trail is eliminated and switched to the Mesa Road spur trail. This change should decrease impacts to sensitive receptors near 3rd and C Streets, although it may increase impacts slightly to those near the Mesa Road spur trail relative to Alternative B. Ultimately, the increase in public access-related noise associated with expansion or construction of public access facilities would be offset to some degree by the elimination of noises associated with operation of the dairy, although visitation and use of public access facilities would be expected to generate a more constant level of noise than the intermittent or periodic loud and sharp noises produced by milk trucks, hay trucks, and earthmoving equipment used for maintenance. Therefore, overall, project implementation would still be expected to potentially have a negligible adverse effect on ambient noise conditions for at least certain areas within the local community, although noise levels would not exceed the county noise ordinance of 60 dB-Ldn.

Alternative D

Analysis: The effects of Alternative D on ambient noise in the local community would be similar to Alternative C with some exceptions, generally ranging from negligible beneficial to major or substantial adverse (Table 45). Under this alternative, restoration actions would be expanded in the East Pasture to include replacement of the Tomasini Creek culvert at Mesa Road. The public access component would be scaled back considerably, with elimination of the bridge on the southern perimeter trail, the Mesa Road spur trail, and the possible future extension of the southern perimeter trail to Inverness Park. While distance and barriers would attenuate most of the construction noise to minimal levels, the amount of construction in the three sensitive construction zones would remain similar to that under Alternative C. Therefore, construction in these areas would have the potential to generate noise localized, short-term noise levels exceeding 75 dBA, which would constitute a major impact under NEPA and a substantial and significant impact under CEQA. These effects would be mitigated to a less-than-significant level under CEQA and to a moderate level under NEPA using the mitigation measure BMPs described under Alternative A.

Construction: Under this alternative, approximately 147,250 cubic yards of excess sediment excavated would be hauled to quarries within the Seashore for disposal (Figure 10). Because of this, the number of potential truck trips would climb from approximately 200 under the No Action Alternative and 5,600 under Alternative C to 7,400 under Alternative D. Despite this, impacts to noise levels along local and regional roadways would still be estimated to be negligible, because of the moderate to high existing ambient noise conditions along these busy road corridors and the extended timeframe over which hauling would occur. This alternative would be constructed over six to seven construction seasons, because it includes the Tomasini Creek culvert, public access, and Olema Marsh, which would be restored under a phased adaptive approach. As with the other alternatives, the only noticeable increase in estimated noise from hauling occurred along Pierce Point Road, where the lower overall traffic volume on this road, combined with the steeper road gradient, would cause a minor short-term, localized change in ambient noise levels estimated at approximately 4 dBA. Taking into account the length of travel on each of the roads, truck hauling during construction would still be expected to result in no more than an overall adverse negligible effect on ambient noise conditions along local and regional roadways.

Project Implementation: After implementation, effects on soundscape resources or ambient noise conditions would result largely from changes in visitation and the number of vehicles traveling to and from the Project Area, because of the expansion in public access structures, facilities, and attractions/uses. In general, the effects of Alternative D on ambient noise after implementation would be much lower than the other alternatives, because of the considerable scaling back of the public access component. The magnitude of a

potential increase in visitation and visitor-related traffic would be expected to result in no more than a very negligible effects on ambient noise along local and regional road corridors and negligible adverse effects on ambient noise conditions for sensitive receptors near trails or trailheads. As with Alternative C, the Point Reyes Station trailhead for the southern perimeter spur trail would originate at the Green Bridge rather than at 3rd and C Streets, thereby decreasing impacts to these residences. The elimination of the bridge also decreases the number of potential trail users, reducing the potential impact for noise impacts to residents on Levee Road. Elimination of the Mesa Road spur trail would decrease the potential for impacts to residences on the Point Reyes Mesa.

The intensity of these impacts is reduced even further by the fact that these areas are currently subject to higher ambient levels of noise due to operation of the dairy, worker housing, and the existing informal path on the East Pasture levee. As with the other alternatives, noises associated with dairy operations such as milk trucks, hay trucks, earthmoving equipment used for dairy maintenance and ATVs would be eliminated. Ultimately, this alternative would have an overall negligible beneficial effect on ambient noise conditions, because noises associated with dairy would be eliminated, and public access-related noise would be expected to be much lower than under the other alternatives and only slightly higher than under baseline conditions.

Proposed Mitigation Measures: Proposed measures to reduce noise levels to the maximum extent practicable in sensitive construction zones would be the same as described under Alternative A.

Effectiveness of Proposed Mitigation Measures: Implementation of the proposed mitigation measures would reduce the intensity of impacts in sensitive construction zones to less-than-significant levels under CEQA.

Cumulative Impacts: Cumulative impacts would be the same as described under Alternative A.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Despite increases in the extent and degree of restoration, Alternative D would have very similar project-related and cumulative effects on ambient noise in the local community during construction and after implementation as Alternative C, with effects ranging from negligible beneficial to major or substantial adverse. Substantial impacts of construction-related effect on sensitive receptors would be reduced to less-than-significant levels under CEQA and moderate levels under NEPA through incorporation of noise-reducing construction management practices. Other construction-related noise impacts would generally range from negligible to minor. Following implementation, this alternative would be expected to have a negligible beneficial effect on ambient noise. Noise associated with the dairy such as milk trucks, hay trucks, earthmoving equipment used for dairy maintenance, ATVs, and other agricultural operations would be eliminated with its closure, while noise associated with visitation to new or expanded public access facilities would be much lower than under other alternatives and only slightly higher than under baseline conditions.

Water Resources – Hydraulics and Hydrologic Processes

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

In recent decades, more local, state, and federal agencies have adopted policies regarding hydrologic processes, specifically the need to minimize hydrologic alterations and maintain natural hydrologic processes for improved water quality, viable fish and wildlife populations, and ecologically healthy fish and wildlife habitats. In its 2006 Management Policies, the Park Service urges parks to re-establish natural functions and processes altered by changes to hydrologic patterns and sediment transport, acceleration of erosion and sedimentation, floodplains, and disruption of natural processes to conditions characteristic of the surrounding environment (NPS 2006, Sections 4.1.5 and 4.6.4). Local agencies and plans also promote preservation and restoration of natural hydrologic processes and functions and have established policies restricting impoundments, diversions, channelization, and removal of riparian habitat or buffer. These policies and plans are discussed in more detail under Water Resources in Chapter 3.

Significance criteria developed by the county and CEQA for water resources pertaining to hydraulics and hydrologic processes include 1) substantial changes in absorption rates, drainage patterns (including alteration of the course of a stream or river), or the rate and amount of surface runoff; 2) substantial changes in drainage patterns that would result in substantial erosion and siltation on- or off-site; and 3) substantial changes in the flow of surface water or ground waters, including currents, rate of flow, and the course or direction of water movement. The DOI has mandated that federal agencies in DOI must address actions that would have adverse or beneficial impacts to floodplains.

General Assumptions and Methodologies

- The purpose of the proposed project is to restore natural hydrologic processes and functions, with the degree of restoration varying among proposed alternatives.
- The extent to which processes and functions can be restored within the Project Area and immediate vicinity is constrained to some degree by the need to maintain existing public services and safety (e.g., county roads, not increase potential for flooding of homes and roads, minimize saltwater intrusion into local municipal groundwater supplies), as well as provide opportunities for public access and enjoyment of the restored wetland.
- Some aspects relating to sediment transport processes are evaluated in other sections of this chapter, specifically potential changes to water quality relating to transport of suspended sediment (Water Resources – Water Quality) and potential changes in aggradation or erosion of Lagunitas Creek channel bed (Public Health and Safety – Flooding).

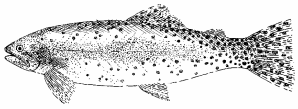
Listed below are methodologies for impact thresholds related to hydrologic processes, including specific assumptions or details on methodologies.

Changes in Surface Tidal Processes: Impact thresholds focus on changes in the area subject to surface tidal processes relative to baseline conditions, in which surface tidal processes have either been eliminated or reduced as a result of levee and road construction and installation of tidegates and culverts (Table 46). Changes in surface tidal processes represent estimates of the area subject to daily tidal action during Mean High Water (MHW) tide events under the various alternatives (KHE 2006a). Daily tidal action to MHW is used to represent tidal prism, where mean high water is 4.64 feet MLLW. No construction or short-term impacts to surface tidal hydrologic processes would be anticipated.

TABLE 46. SURFACE TIDAL HYDROLOGIC PROCESSES

Source: Park Service Management Policies, Marin CWP Nature: Beneficial, Adverse Context: Project Area, Watershed Duration: Long-Term	
No Impact	There would be no potential for impact to surface tidal processes associated with the proposed project.
Negligible	There would be a negligible change (≤ 10 percent) in the extent of area subject to surface tidal hydrologic processes during daily tides.
Minor	There would be a minor change (≤ 25 percent) in the extent of area subject to surface tidal hydrologic processes during daily tides.
Moderate	There would be a moderate change (≤ 50 percent) in the extent of area subject to surface tidal hydrologic processes during daily tides.
Major or Substantial	There would be a substantial or major change (> 50 percent) in the extent of area subject to surface tidal hydrologic processes during daily tides.

Changes in Surface Freshwater Hydrologic Processes: Impact thresholds for surface freshwater hydrologic processes focus on changes in the number of infrastructure facilities (e.g., tidegates, culverts, dams, roads, levees, wells or pumps) or management practices (e.g., creek dredging, creek straightening or realignment) that affect fluvial processes and related properties, such as sediment transport, frequency and pattern of flood flows, channel movement or migration, water residence time, etc. (Table 47). Because changes in surface area affected by increases or decreases in infrastructure or creek management practices occur relatively infrequently when flood flows are able to overtop creek bank or levees, surface area was not considered the best overall indicator of potential change in freshwater processes, although changes in floodplain capacity is evaluated later in this section.



To evaluate how the proposed project would affect freshwater hydrologic processes, the number of existing structures, facilities, or management practices for each freshwater system or subwatershed in the Project Area was compared between baseline or existing conditions (See Table 7 in Chapter 3) and the various alternatives. For each alternative, the number of structures or facilities removed, maintained, or installed – some alternatives include installation of a bridge or public access infrastructure -- was evaluated along with the number of management practices that would be discontinued, maintained, or initiated. A partially weighted scoring system that takes into account the relative degree of change (e.g., breached versus completely removed) and the number of hydrologic or geomorphic processes or conditions that might be affected by each type of structure, facility, or management practice was used in analysis. To represent what effect the proposed project might have on watershed function, this analysis also evaluates the effect of the proposed project relative to constraints on freshwater hydrologic processes within each of the respective subwatersheds. (Only the mainstems of Lagunitas Creek and Bear Valley Creek are incorporated.) In addition, temporary effects on freshwater hydrologic processes associated with construction are also evaluated. These could include coffer dams used to dewater aquatic areas to allow for improved construction access.

TABLE 47. SURFACE FRESHWATER HYDROLOGIC PROCESSES

Source: Park Service Management Policies, CCC/LCP Zone II, Marin CWP, Community Plan Nature: Beneficial, Adverse Context: Project Area, Watershed Duration: Long-Term	
No Impact	There would be no potential for impact to fluvial or surface freshwater hydrologic processes associated with the proposed project.
Negligible	There would be a negligible change (≤ 10 percent) in the number of infrastructure, facilities, and management practices affecting fluvial or surface freshwater hydrologic processes. Changes would have a barely detectable effect on the overall number of infrastructure, facilities, and management practices (≤ 5 percent) affecting freshwater hydrologic processes within the overall subwatersheds.
Minor	There would be a minor change (±11 - 25 percent) in the number of infrastructure, facilities, and management practices affecting fluvial or surface freshwater hydrologic processes. Changes would have a measurable effect on the overall number of infrastructure, facilities, and management practices (≤ 10 percent) affecting freshwater hydrologic processes within the overall subwatersheds.
Moderate	There would be a moderate change (± 26 - 50 percent) in the number of infrastructure facilities and management practices affecting surface freshwater hydrologic processes. Changes would have an appreciable effect on the overall number of infrastructure, facilities, and management practices (≤ 25 percent) affecting freshwater hydrologic processes within the overall subwatersheds.
Major or Substantial	There would be a major or substantial change (> 50 percent) in the number of infrastructure facilities and management practices affecting surface freshwater hydrologic processes. Changes would have a striking effect on the overall number of infrastructure, facilities, and management practices (> 25 percent) affecting freshwater hydrologic processes within the overall subwatersheds.

Changes in Hydrologic Functions - Floodplains: Impact thresholds focus on changes in floodplain storage or cumulative volume of inundated waters in cubic feet that are stored or move through Lagunitas, Fish Hatchery Creek, and Tomasini Creek floodplains during the 2- and 100-year flood events relative to existing or baseline conditions (Table 48). These particular flood events were chosen for analysis, because levees have reduced the frequency of and area available for storage during flooding or periods when creek waters overtop banks and spill onto adjacent floodplains and marshplains, particularly for floods with recurrence intervals ≤ 3.5 years. Cumulative floodwater storage volume was estimated using computerized hydraulic models developed for the various alternatives and simulating floods of all the flood recurrence intervals, including the 2- and 100-year flood events (KHE 2006a). Cumulative volume takes into consideration not only peak total storage capacity, but the total volume of water that moves through off-channel storage areas during an entire storm event, which may include several peaks in flood flow depending on the intensity and pattern of rainfall. Hydraulic models include extreme storm tide conditions as freshwater flooding and extreme tides often coincide, thereby increasing the volume of floodwaters (KHE 2006a). No construction or short-term impacts to surface tidal hydrologic processes would be anticipated.

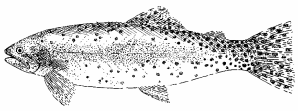


TABLE 48. HYDROLOGIC FUNCTIONS - FLOODPLAINS AND FLOODWATER RETENTION

Source: Park Service Management Policies, CCC/LCP Zone II, Marin CWP Nature: Beneficial, Adverse Context: Project Area, Watershed Duration: Long-Term	
No Impact	There would be no potential for impact to floodplains or floodplain storage associated with the proposed project.
Negligible	There would be a negligible change (±10 percent) in floodplain storage or cumulative volume of floodwaters on floodplains during the 2- and 100-year flood events associated with the proposed project.
Minor	There would be a minor change (±11 - 25 percent) in floodplain storage or cumulative volume of floodwaters on floodplains during the 2- and 100-year flood events associated with the proposed project.
Moderate	There would be a moderate change (± 26 - 50 percent) in floodplain storage or cumulative volume of floodwaters on floodplains during the 2- and 100-year flood events associated with the proposed project.
Major or Substantial	There would be a major or substantial change (> 50 percent) in floodplain storage or cumulative volume of floodwaters on floodplains during the 2- and 100-year flood events associated with the proposed project.

Changes in Hydrologic Processes – Sediment Transport Dynamics: Impact thresholds focus on changes in deposition of suspended sediment onto floodplains or marshplains during the 2-year flood event (Table 49). Sediment transport rates for different stream discharge or flow rates were derived from sediment yield rating curves for suspended sediment at the Lagunitas Creek near Point Reyes Station gauge (USGS Station 11460600) developed by H. Esmaili & Associates (1980) for Marin Municipal Water District. The mainstem of Lagunitas Creek at the Point Reyes gauge demonstrated the highest rates (if not total loads) of sediment transport at lower flows (streamflows < 1,000 cfs), thereby making the 2-year flood event the most appropriate modeled flow for analysis.

The potential movement of sediment onto floodplains in the Project Area is restricted by poor connectivity between creeks and floodplains during smaller and more frequent flood events (< 10-year flood events). Smaller flow events such as these often constitute the "dominant discharge" streamflows at which most of the sediment transport within many systems occurs, at least on average. During the 1979-1980 study, the rate of sediment transport in the lower portions of Lagunitas Creek just upstream of the Project Area showed signs of declining at the 1-year flood event, although the total load continued to increase with streamflow at a slower rate, with some of the most extensive sedimentation in recent decades observed after the 100-year flood event in 1982 (H. Esmaili and Associates 1980; Anima et al. 1988). Based on the sediment rating curve developed by H. Esmaili & Associates (1980), approximately 50,000 tons per day of suspended sediment would potentially move through the Project Area during a 2-year flood event.

This analysis assumes that the bedload being transported in Lagunitas Creek largely remains within the creek channel and that most of the sediment that would be deposited on floodplains and marshplains would be suspended sediment such as fines (silts, clays) and medium-grained sands (Dunne and Leopold 1978). Only a portion of floodwaters carrying sediment during flood events end up on the floodplains or marshplains, with some being deposited in lower elevation off-channel features such as oxbows and secondary channels or within the active channel itself (Heimann 2001). Sediment yield for the stream discharge associated with the 2-year flood event (3,531cfs; KHE 2006a) at the Point Reyes Station gauge on Lagunitas Creek was then factored by the percentage of cumulative flood volume of waters moving through the East and West Pasture floodplains under the various alternatives to estimate the proportion of sediment in tons per day likely to be deposited on floodplains during overbank flooding. As with bedload sediment transport, suspended sediment loads are likely to be variable both vertically and horizontally within floodwater flows, however, for the purposes of this analysis, suspended sediment was assumed to be relatively uniformly distributed throughout the water column. In some systems, sediment deposition on floodplains has shown a strong linear relationship with both cumulative suspended sediment load and cumulative streamflow, with these variables explaining up to 82 percent of the variability in floodplain sediment deposition (Heimann and Roell 2000). No construction or short-term impacts to surface tidal hydrologic processes would be anticipated.

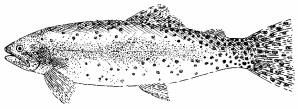


TABLE 49. HYDROLOGIC PROCESSES – SEDIMENT TRANSPORT

Source: Park Service Management Policies, Marin CWP Nature: Beneficial, Adverse Context: Project Area/Watershed Duration: Long-Term	
No Impact	There would be no potential for impact to sediment deposition rates in the Project Area or sedimentation within the southern portion of the Tomales Bay watershed.
Negligible	There would be a negligible change (±10 percent) in sediment deposition rates in the Project Area and delivery of sediment by Lagunitas Creek to the southern portion of the Tomales Bay watershed.
Minor	There would be a minor change (±11 - 25 percent) in sediment deposition rates in the Project Area and delivery of sediment by Lagunitas Creek to the southern portion of the Tomales Bay watershed.
Moderate	There would be a moderate change (± 26 - 50 percent) in sediment deposition rates in the Project Area and delivery of sediment by Lagunitas Creek to the southern portion of the Tomales Bay watershed.
Major or Substantial	There would be a major or substantial change (> 50 percent) in sediment deposition rates in the Project Area and delivery of sediment by Lagunitas Creek to the southern portion of the Tomales Bay watershed.

Impact Analysis

TABLE 50. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR WATER RESOURCES –HYDRAULICS AND HYDROLOGIC PROCESSES

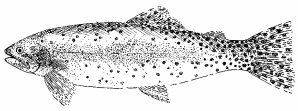
All impacts would be considered Project Area and are separately analyzed for Construction and Short-Term/Long-Term.

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Surface Tidal Hydrologic Processes	Beneficial-Negligible	Beneficial-Moderate	Beneficial-Moderate	Beneficial-Moderate	Beneficial-Moderate
Surface Freshwater Hydrologic Processes (Project Area/ Watershed)	Beneficial-Minor/ Negligible	Beneficial-Minor/ Minor	Beneficial-Moderate/ Minor	Beneficial-Moderate/ Moderate	Beneficial-Moderate/ Moderate
Hydrologic Functions – Floodplains and Floodwater Retention	Beneficial –- Negligible	Beneficial - Moderate	Beneficial - Major	Beneficial - Major	Beneficial - Major
Hydrologic Processes – Sediment Transport (Project Area/ Watershed)	Beneficial-Negligible/ Negligible	Beneficial-Major/ Minor	Beneficial-Major/ Minor	Beneficial-Major/ Minor	Beneficial-Major/ Minor

No Action Alternative

Analysis: The No Action Alternative would generally have negligible to minor beneficial effects on water resources and hydrologic processes and functions (Table 50).

Under the No Action Alternative, levees in the Giacomini Ranch are not breached or removed, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. The Park Service is required under its existing agreement with CalTrans to restore wetlands as mitigation for impacts caused by CalTrans to aquatic habitat from a road repair on State Route 1 in Marin County in exchange for the Park Service receiving monies to purchase and restore the Giacomini Ranch. The remainder of the levee would remain, although there would be no levee maintenance. Olema Marsh is also not restored, and there would be no new public access facilities. There would be only a negligible change in surface tidal hydrologic processes or areas exposed to daily tidal action, floodplain area and the volume of water moving through floodplains, and sediment deposition on floodplains relative to baseline or existing conditions, at least in the immediate long-term future.



Under the No Action Alternative, there is a potential for leased grazing of dairy heifers or beef cattle on the Giacomini Ranch lands in the future, which would be in accordance with the parks' GMP. Leasing would undergo a separate environmental review process, but it is likely that, if lease or leases were approved, that the Seashore would institute restrictions on resource setbacks or setbacks from creeks and certain wetland areas, as well as the intensity, duration, and timing of grazing. In addition, certain creeks in the West Pasture would continue to be dredged to eliminate flood risks to adjacent private residences.

Levees would continue to act as constraints on floodplains and floodwater retention, although these constraints are limited to smaller flood events such as the 2- to 10-year floods.
Without maintenance, levees would be expected to degrade over time, thereby increasing the potential for greater change in these processes and functions, however, the rate of degradation is difficult to predict and location of breaching and flooding would be clustered around large scale storm events. During this same time frame, long-term trends in sea level rise could also cause an increase in the potential extent of area inundated by tides, especially on upstream reaches of Tomasini Creek and Olema Marsh. Levees and tidegates would generally restrict the potential for surface tidal inundation in the East and West Pastures, however, recently published studies suggest that sea level rise rates may be much greater than predicted, with water levels rising as much as 3 feet by 2100 (Overpeck et al. 2006).. This sea level rise, when combined with levee degradation, could lead to intrusion of tidal influence into large portions of the Giacomini Ranch pastures, particularly areas below 4 ft NAVD88.

Under the existing purchase agreement with the Giacomini Trust, the Giacomini Ranch dairy had a 7-year Reservation of Use agreement that allowed the Giacomini family to continue dairying until the agreement expires in spring 2007. At that time, the dairy will close, and agricultural management practices associated with dairying will cease. These management practices include crossing of Lagunitas Creek by Giacomini Ranch dairy cows; infrequent discharge of waters in East Pasture ditch system to Lagunitas Creek; periodic maintenance of levees and creek crossings; dredging of creeks for improved pasture drainage; disposal of sediments; and diversion of waters from Lagunitas Creek and Fish Hatchery Creek for pasture irrigation and livestock watering purposes. The Park Service will also dedicate appropriative irrigation water right to beneficial instream uses.

Tidal Prism: Through the limited wetland mitigation component, the extent of area inundated by daily tidal action and available floodplain within the East Pasture would be increased by 10 acres. The tidegate/flashboard dam structure on Tomasini Creek would not be removed, but would be left in place to maintain subtidal conditions during low tides for the federally endangered fish species, tidewater goby (*Eucyclogobius newberryi*). The tidegate/flashboard dam structure currently does not function properly, allowing the full extent of high tides into the diked portion of Tomasini Creek. The structure prevents complete outflow during low tides, controlling a residual base water level at least 1- to 2 feet above the deepest part of the channel (KHE 2006a). Peak high tides within the diked portion of Tomasini Creek reach 7 feet NAVD88 and are not attenuated significantly as distance from the tidegate increases (KHE 2006a). Estuarine circulation patterns and salinities would continue to be dampened by the appreciable amount of groundwater inflow that comes from the Point Reyes Mesa, maintaining brackish water salinities for most of the summer and fall despite the strength of tidal influence. During high tides, there would still continue to be some muted tidal action in the shallowly flooded sparsely vegetated flats in eastern portion of the East Pasture from Tomasini Creek waters flowing through a culvert in the Tomasini Creek berm.

Tidegates which facilitate the existing muted tidal regime in the northern portion of the West Pasture would also remain on Fish Hatchery Creek. The existing condition has been documented to cause seasonal spikes in salinity in the large freshwater marsh adjacent to Sir Francis Drake Boulevard. The West Pasture tidegate mutes the tidal regime to fluctuate between 3.4 and 5.25 ft NAVD88. Circulation patterns and salinities in the West Pasture would continue to be strongly influenced by perennial freshwater flow from Fish Hatchery Creek, as well as several other small drainages. In Olema Marsh, the box culvert at Levee Road would continue to act as a grade control structure that limits tidal exchange into a very limited portion of the marsh to tides exceeding 4.5 ft NAVD88 (KHE 2006a).

Floodplain/Floodwater Retention: Under this alternative, levees would continue to act as constraints on floodplains and floodwater retention, although these constraints are limited to smaller flood events such as the 2- to 10-year floods. Under these smaller flow events, floodplains for Lagunitas and Tomasini Creeks within the Project Area are limited to the channel and narrow fringes of marshplain on the outboard of the levees. At its upstream end, the East Pasture would flood during 3.5-year flood events or during storms that occur, on average, every 3.5 years, which is reflected in the relatively low cumulative volume of floodwaters that move

through the East Pasture and Tomasini Creek under a 2-year event (~97 acre-feet; KHE 2006a). Almost all of that water comes from Tomasini Creek, which is hydrologically disconnected from the adjacent East Pasture by a levee. Overtopping of the creek bank in the East Pasture downstream of White House Pool would occur less frequently (7-year flood event). On larger floods, the entire pasture would be inundated, with cumulative floodwater volume during a 100-year event climbing to approximately 19,000 acre-feet (KHE 2006a). Tomasini Creek would only reach levels sufficient to overbank flood onto floodplains during some of the larger flood events (KHE 2006a). Under this alternative, inundated area in the East Pasture would range from 1.8 acres under the 2-year flood event, with the entire 350-acre East Pasture flooded during a 50-year event (KHE 2006a). Once flooded, floodwaters in the East Pasture would be expected to become impounded – the bathtub effect -- for days or even weeks in the lower elevation northern portions of the East Pasture just as they do now, because drainage outflow is restricted by the levees, concrete spillway, and undersized or poorly functioning tidegates.

Flooding of the West Pasture by Lagunitas Creek would not occur generally until stream discharge reached levels comparable to a 12-year flood event, although the numerous Inverness Ridge drainages that flow into the West Pasture would continue to cause flooding problems for residents adjacent to Sir Francis Drake Boulevard (KHE 2006a). An analysis of the effect of the proposed project on flooding issues related to public health and safety are discussed later in this Chapter. The inundation area in the West Pasture would be larger (76 acres) than the East Pasture under the 2-year event because of flooding from Fish Hatchery Creek and the other Inverness Ridge drainages, with the entire 200 acres completely flooded by the 500-year event (KHE 2006a). However, the cumulative volume of floodwaters in the West Pasture would be much lower, ranging from approximately 4 to 610 acre-feet (KHE 2006a). As with the East Pasture, the West Pasture also tends to impound waters in its northern portions because of levees, concrete spillway, and limited drainage outflow through the tidegate, although the degree of impoundment is considerably reduced. For Olema Marsh, the problem would continue to be levees and culverts holding water in, not keeping waters out. Under a 2-year flood event, the lack of hydraulic connectivity and inadequate drainage caused by the Levee Road culvert would maintain inundated area at 49 acres, with the extent of the 500-year flood event climbing only slightly to 67 acres (KHE 2006a). The only change in floodplains and floodwater storage would come from restoration of the 11-acre wetland, and this would be expected to have an extremely negligible effect on flooding patterns.

Stream Power and Sediment Transport Patterns: The potential movement of sediment onto floodplains in the Project Area would continue to be restricted by poor connectivity between creeks and floodplains during smaller and more frequent flood events (< 10-year flood events). Smaller flow events such as these often constitute the "dominant discharge" streamflows at which most of the sediment transport within many systems occurs, at least on average. During the 1979-1980 study, the rate of sediment transport in the lower portions of Lagunitas Creek just upstream of the Project Area already showed signs of declining at the 1-year flood event, although the total load continued to increase with streamflow at a slower rate, with some of the most extensive sedimentation in recent decades observed after the 100-year flood event in 1982 (H. Esmaili and Associates 1980; Anima et al. 1988). Based on the sediment rating curve developed by H. Esmaili & Associates (1980), approximately 50,000 tons per day of suspended sediment would potentially move through the Project Area during a 2-year flood event, with only negligible amounts potentially being deposited on Project Area floodplains. The only potential change in sediment deposition patterns on the Giacomini Ranch floodplains relative to baseline conditions would be negligible and would come from the 11-acre restored wetland in the northeastern portion of the East Pasture, which is unlikely to receive much in the way of sediment.

The potential movement of sediment onto floodplains would occur under higher flood flow events, although, at the higher flow velocities, a higher percentage of sediment may be transported through rather than deposited onto floodplains. During higher flood flows (~3.5- to 7-year flood events), floodwaters within Lagunitas Creek would crest the levee and flow into the East Pasture. Based on hydraulic modeling, stream power would drop sharply once floodwaters crest the levee, causing most, if not all, of the sediment to deposit in the southern portion of the pasture (KHE 2006a). This is the same sediment deposition pattern that exists now, although the Giacominis have preferentially directed flood flows to the southwestern corner of the East Pasture by removing or lowering levees in this area (KHE 2006a). Stream power would decrease appreciably under all flooding conditions in the northern portion of the East Pasture due to impoundment of floodwaters by the levee, concrete spillway, and tidegates/culverts (G. Kamman, KHE, *pers. comm*.). Similar to baseline conditions, stream power would remain extremely low throughout Olema Marsh, although transport capacity increases considerably near the Levee Road culvert outlet (KHE 2006a). In Lagunitas Creek, stream power during a 2-year flood event would be similar to baseline conditions and remain sufficient to maintain transport

capacity of fine sediments, coarse sands, and fine gravels throughout the Project Area (KHE 2006a). Stream power would be even lower in the West Pasture than the East Pasture, with hydraulic modeling suggesting that there would be little to no sediment deposition under even higher flood flows (KHE 2006a).

The potential movement of sediment onto floodplains would occur under higher flood flow events, although, at the higher flow velocities, a greater percentage of sediment may be transported through rather than deposited onto floodplains. During higher flood flows (~3.5- to 7-year flood events), floodwaters within Lagunitas Creek would crest the levee and flow into the East Pasture. Based on hydraulic modeling, stream power would drop sharply once floodwaters crest the levee, causing most, if not all, of the sediment to deposit in the southern portion of the pasture (KHE 2006a). This is the same sediment deposition pattern that exists now, although the Giacominis have preferentially directed flood flows to the southwestern corner of the East Pasture by removing or lowering levees in this area (KHE 2006a). Stream power would decrease appreciably under all flooding conditions in the northern portion of the East Pasture due to impoundment of floodwaters by the levee, concrete spillway, and tidegates/culverts (G. Kamman, KHE, *pers. comm*.). Similar to baseline conditions, stream power would remain extremely low throughout Olema Marsh, although transport capacity increases considerably near the Levee Road culvert outlet (KHE 2006a). In Lagunitas Creek, stream power during a 2-year flood event would be similar to baseline conditions and remain sufficient to maintain transport capacity of fine sediments, coarse sands, and fine gravels throughout the Project Area (KHE 2006a). Stream power would be even lower in the West Pasture than the East Pasture, with hydraulic modeling suggesting that there would be little to no sediment deposition under even higher flood flows (KHE 2006a).

Tidal Power and Sediment Transport Patterns: Sediment can also be moved through estuarine sediment transport processes. Hydraulic modeling of tidal velocities during an average tidal month suggests that tidal velocities do not exceed 1.3 ft/s except in between White House Pool and the cattle crossing location (KHE 2006a). These velocities are typically insufficient to move loose sandy clay, much less the denser alluvial sands and gravels that primarily comprise the Lagunitas Creek streambed in the Project Area (KHE 2006a). The tidegate/culvert on Fish Hatchery Creek also appears to have reduced tidal velocities in the West Pasture, with velocities rarely exceeding 0.3 ft/s. In Olema Marsh, tidal velocities may exceed 2.6 ft/s, but tidal influence only extends into Bear Valley Creek and the marsh outlet for a very short distance (~60 feet; KHE 2006a). There is no tidal influence currently in the East Pasture, and the wetland mitigation/restoration would be expected to have only a very negligible effect, if any, on tidal velocities.

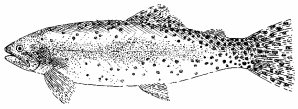
Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: There are at least two currently proposed projects that would have the potential to cause cumulative impacts should the No Action alternative be implemented, the Bear Valley Creek Watershed Enhancement Project and replacement of the Rift Zone Trail culvert. The Rift Zone Trail culvert would be replaced in the summer of 2006 with a bridge. The Bear Valley Creek Project proposes to replace failing or underperforming hydrologic infrastructure at a number of locations on Bear Valley Creek within the Seashore boundaries. There is no definitive timeframe for construction of this project, but preliminary design for this project would be expected to have a cumulatively beneficial effect through improvement of hydrologic and ecological processes and functions in the upper portions of the Bear Valley Creek subwatershed, upstream of Olema Marsh. This effect would be appear to be negligible to minor for the proposed project as a whole, but it would be a major or substantial beneficial effect on the Bear Valley Creek subwatershed.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The No Action alternative would generally result in generally negligible to minor beneficial effects on hydrologic processes. The restoration would add approximately 10 acres intertidal habitat and would have only negligible effects on floodplains and floodwater storage and sediment transport processes. The No Action Alternative would have minor beneficial effects on fluvial or surface freshwater hydrologic processes in the Project Area, largely because of the elimination of intensive agricultural management practices. Should leasing grazing be approved after the Reservation of Use agreement expires in 2007, there would continue to be cattle grazing, but the Seashore would institute restrictions that would establish resource



setbacks, grazing intensity, duration, and timing. These and the other changes would have minor beneficial effects on hydrologic processes in the Project Area, but only negligible beneficial effects on watershed function.

Alternative A

Analysis: Alternative A would have minor to major beneficial effects on water resources and hydrologic processes and functions (Table 50). Under Alternative A, only the East Pasture would be restored, with new public access facilities limited to the eastern and southern perimeters of the East Pasture. Restoration would involve breaching of levees in the East Pasture along Lagunitas Creek, and excavation of new tidal channels. Streambank armoring in the southwestern corner of the East Pasture creek bank would be removed and the banks regraded to a more stabile profile. Most of the actions under this alternative focus on removal agricultural infrastructure such as filling of ditches, ripping of compacted roads, fence removal, and removal of pumps, pipelines, and concrete spillways. The West Pasture and Olema Marsh would not be restored, and there would be no levee maintenance in the West Pasture.

As with the No Action Alternative, the tidegate/flashboard dam structure on Tomasini Creek would not be removed, but would be left in place to maintain subtidal conditions during low tides for the federally endangered fish species, tidewater goby (*Eucyclogobius newberryi)*. Tidegates would also remain on Fish Hatchery Creek, preserving the muted tidal regime that currently exists in the northern portion of the West Pasture and causing seasonal spikes in salinity in the large freshwater marsh adjacent to Sir Francis Drake Boulevard. The West Pasture tidegate attenuates both the upper and lower portions of the tidal range, maintaining water levels between 3.4 and 5.25 ft NAVD88. Salinities in the West Pasture would continue to be strongly influenced by perennial freshwater flow from Fish Hatchery Creek and groundwater inflow from Inverness Ridge, as well as several other small drainages. In Olema Marsh, the box culvert at Levee Road would continue to act as a grade control structure that limits tidal exchange into a very limited portion of the marsh to tides exceeding 4.5 ft NAVD88 (KHE 2006a).

Under the existing purchase agreement with the Giacomini Trust, the Giacomini Ranch dairy has a 7-year Reservation of Use agreement that allows the Giacomini family to continue dairying until the agreement expires in spring 2007. At that time, the dairy will close, and agricultural management practices associated with dairying will cease. These management practices include crossing of Lagunitas Creek by Giacomini Ranch dairy cows; infrequent discharge of waters in East Pasture ditch system to Lagunitas Creek; periodic maintenance of levees and creek crossings; dredging of creeks for improved pasture drainage; disposal of sediments; and diversion of waters from Lagunitas Creek and Fish Hatchery Creek for pasture irrigation and livestock watering purposes. In addition, the infrastructure described above would be removed. The Park Service would also be redesignating the appropriative water right purchased with the Giacomini Ranch that has been used for irrigation for beneficial instream uses. However, certain creeks in the West Pasture would need to continue to be dredged to eliminate flood risks to adjacent private residences.

As part of the public access, the southern perimeter trail would include a prefabricated bridge across Lagunitas Creek, near the old summer dam location across from White House Pool County Park, The bridge would be designed to have no footings in the active channel or floodplain, thereby reducing effects on hydrologic processes. Future extension of the southern perimeter trail, in collaboration with the County of Marin, would connect White House Pool County park with a path along Sir Francis Drake that would either run alongside Sir Francis Drake Boulevard or move off the road at the southern end of the unrestored West Pasture onto a low-elevation boardwalk that would join back with Sir Francis Drake Boulevard in Inverness Park. The other infrastructure that would be constructed under Alternative A would be a culverted berm through trail on the eastern perimeter of the East Pasture that would be expected to have minor adverse effects on conveyance of the considerable surface water run-off from the Point Reyes Mesa that flows into Tomasini Creek.

Tidal Prism: Breaching of East Pastures would result in a moderate beneficial effect on the extent of area inundated twice daily by tides. Area of intertidal habitat in the East Pasture would be increased to approximately 189 acres, thereby also dramatically increasing available floodplain. A considerable portion of the 350-acre East Pasture falls above intertidal topographic elevations and would not be subject to normal tidal flooding. These areas appear to be high either because of historic sediment deposition and/or past fill and grading events. Over the long-term, however, sea level rise could cause an increase in the potential extent of area inundated by tides, particularly in the East Pasture. Recently published studies suggest that sea level rise rates may be much greater than originally predicted, with water levels rising as much as 3 feet

by 2100 (Overpeck 2006). This rate sea level rise could lead to regular inundation of large portions of the East Pasture below 4 ft NAVD88.

Floodwater/Floodplain Retention: Under this alternative, the East Pasture would flood more frequently during smaller (1.5- to 2-year) flood events (KHE 2006a). However, Tomasini Creek flood flows would remain largely confined to the narrow channel and fringing marshplain along the East Pasture's perimeter. At its upstream end, the East Pasture would flood during 2-year events as compared to 3.5-year flood events under baseline or existing conditions (KHE 2006a). Lowering of the levee downstream of White House Pool would increase the frequency of flooding in this portion from a 7-year to a 1.5-year flood event (KHE 2006a). Cumulative floodwater volume during the 2-year flood event would increase from approximately 96 acre-feet under baseline or existing conditions to approximately 1,080 acre-feet under restored conditions (KHE 2006a). Almost all of the flood volume under baseline conditions comes from Tomasini Creek, which is hydrologically disconnected from the adjacent East Pasture by a levee.

As more water spills onto the floodplain, cumulative floodwater volume in Lagunitas Creek would drop from approximately 9,975 acre-feet to 8,970 acre-feet, a decrease of 10 percent. Cumulative floodwater volume during a 100-year event would nearly double from approximately 19,000 acre-feet to 35,000 acre-feet (KHE 2006a). Tomasini Creek would still continue to only reach levels sufficient to overbank flood onto floodplains during some of the larger flood events (KHE 2006a). Under this alternative, inundated area in the East Pasture would increase from 1.8 acres under the 2-year flood event to 298 acres, with the entire 350-acre East Pasture flooded during a 50-year event (KHE 2006a). Floodwaters would be expected to move through the East Pasture more rapidly with removal of levees, concrete spillway, and undersized or poorly functioning tidegates, which may account for the dramatic increase in cumulative floodwater volume during the 100-year event when the East Pasture would be flooded, as well, under baseline or existing conditions.

As with the No Action Alternative, flooding of the West Pasture by Lagunitas Creek would not occur generally until stream discharge reached levels comparable to a 12-year flood event, although the numerous Inverness Ridge drainages that flow into the West Pasture would continue to cause flooding problems for residents adjacent to Sir Francis Drake Boulevard (KHE 2006a). An analysis of the effect of the proposed project on flooding issues related to public health and safety are discussed later in this Chapter. The inundated area in the West Pasture would be larger (76 acres) than the East Pasture under the 2-year event because of flooding from Fish Hatchery Creek and the other Inverness Ridge drainages, with the entire 200 acres completely flooded by the 500-year event (KHE 2006a). However, the cumulative volume of floodwaters in the West Pasture would be much lower than the East Pasture, ranging from approximately 4 to 610 acre-feet during the 2- and 100-year events (KHE 2006a). The West Pasture would continue to impound waters to some degree in its northern portions because of levees, concrete spillway, and limited drainage outflow through the tidegate, although the degree of impoundment is considerably reduced. For Olema Marsh, the problem would continue to be levees and culverts holding water in, not keeping waters out. Under a 2-year flood event, the lack of hydraulic connectivity and inadequate drainage caused by the Levee Road culvert would maintain inundated area at 49 acres, with the extent of the 500-year flood event climbing only slightly to 67 acres (KHE 2006a).

Stream Power and Sediment Transport Patterns: The potential movement of sediment onto floodplains in the Project Area would increase relative to baseline conditions in the East Pasture with breaching of the Lagunitas Creek levees, particularly during smaller and more frequent flood events (< 10-year flood events). Based on the sediment rating curve developed by H. Esmaili & Associates (1980), approximately 50,000 tons per day of suspended sediment would potentially move through the Project Area during a 2-year flood event. Under Alternative A, approximately 10 percent of this or almost 4,900 tons would potentially be diverted from Lagunitas Creek and flow through the East Pasture. The percentage of material deposited on floodplains versus transported through depends on a number of factors, but trapping efficiency is often higher under smaller floods such as 5-year events than larger ones such as 25-year events, because flood flow velocities on the floodplain are lower (Heimann 2001). A study on 11 natural (versus constructed) wetlands in the United States yielded a median trapping or removal efficiency rate for Total Suspended Solids (TSS; suspended sediment and other materials) of 76 percent, with a maximum removal rate up to 95 percent (Strecker et al. 1992) *in* Kadlec and Knight 1996).

Based on hydraulic modeling, stream power during average and maximum flood conditions in the East Pasture would be considerably higher under Alternative A relative to baseline conditions, but still not high enough to increase transport capacity across the floodplain (KHE 2006a). As with No Action Alternative, stream power would drop sharply once floodwaters crest the levee, causing most of the sediment to deposit in the southern portion of the pasture (KHE 2006a). This is the same sediment deposition pattern that exists now, although

the Giacominis have preferentially directed flood flows to the southwestern corner of the East Pasture by removing or lowering levees in this area (KHE 2006a). These results would suggest that trapping efficiency, at least under the modeled flows, would be closer to the higher end of the range quoted earlier, with perhaps as much as approximately 4,700 tons/year potentially being deposited rather than transported through the East Pasture floodplain. Stream power in the West Pasture would remain similar to the No Action Alternative, because there would be no restoration activities in the West Pasture under Alternative A, with stream power similar to or slightly higher under maximum flooding to the East Pasture (KHE 2006a). Stream power in Lagunitas Creek would continue to be very similar to baseline conditions and sufficient to maintain transport capacity of fine sediments, coarse sands, and fine gravels throughout most of the Project Area, although there would be a slight decrease in stream power downstream of the cattle crossing (KHE 2006a).

Sediment deposition during floods can, over time, lead to net aggradation within floodplain areas and, ultimately, decrease trapping efficiency as vertical elevation of the floodplain rises. This trend tilts the evolutionary trajectory within wetland systems towards establishment of uplands, but within naturally dynamic systems such as estuaries, these trends are often counterbalanced by sea level rise (discussed above under Tidal Prism) and subsidence (either compaction- or fault-associated) that act to maintain or regenerate wetlands even within depostitional environments.

Tidal Power and Sediment Transport Patterns: Sediment conveyance onto floodplains would have implications for the long-term sustainability of tidal channels created in the East Pasture, with sediment deposition tending to silt in channels and decrease drainage areas that maintain channel capacity. These forces would be counteracted to some degree by the energy of tidal flows, although, over the long-term, channels would be expected to decrease in size over time relative to constructed conditions to dimensions that can be maintained by the available drainage area and tidal currents. Hydraulic modeling showed that tidal velocities (~6.6 ft/s) during an average tidal month would be sufficient in the hydrologically reconnected East Pasture Old Slough to erode or maintain created channels at least in the northern portion of the East Pasture through mobilization of sediment with bulk densities as high as compact sandy clay, including potentially sediment deposited during overbank flooding (KHE 2006a). Tidal velocities in the West Pasture would remain low (< 0.5 ft/s) due to muting of tidal inflow and below the threshold for mobilization of loose sandy clay material (KHE 2006a). In Lagunitas Creek, tidal velocities would be almost identical to those under baseline conditions and the No Action Alternative, suggesting that there would not likely be any net changes in channel conditions (KHE 2006a).

With maintenance of existing tidal velocities in Lagunitas Creek, the influence of estuarine sediment transport processes such as gravitational circulation that involves resuspension of sediment along channel bottoms through strong tidal currents would likely remain negligible in the Project Area, because tidal currents are not sufficient to move the alluvial sands and gravels that comprise most of the streambed. However, tides and currents would continue to strongly influence circulation patterns within this reach of Lagunitas Creek such as gravitational circulation or density- or salinity-based stratification of waters that could at least create, particularly in areas where bathymetry changes abruptly such as shoals, zones where suspended sediment concentrations would reach a peak or maximum and preferentially fall out of suspension in the creek channel. While this could contribute to reductions in sediment delivery to Tomales Bay, the dominance of fluvial forces in this part of the estuary would suggest that fluvial sediment transport processes governing transport and deposition within in-stream and off-stream storage areas such as floodplains would largely dictate sediment delivery rates to the Bay, at least within the Project Area. The potential for increased sediment deposition on East and West Pasture floodplains would mean that flood flows could potentially reduce delivery of sediment to the southern portion of Tomales Bay by up to 10 percent or 4,775 tons/day during 2-year events, which would suggest that this alternative might have at least a minor beneficial effect on sedimentation patterns in southern portion of the watershed.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

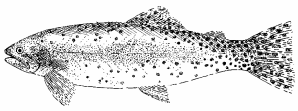
Conclusions: Alternative A would result in minor to major beneficial effects on hydrologic processes. Under Alternative A, only the East Pasture would be restored, and most of the new public access infrastructure and facilities, including a bridge, would be located along the perimeter of the East Pasture and southwestern portion of the West Pasture. Breaching of the levees would restore tidal inundation to approximately 189 acres in the East Pasture, resulting in moderate beneficial impacts. Alternative A would have minor beneficial effects on fluvial or surface freshwater hydrologic processes in the Project Area, largely because of levee breaches and elimination of agricultural infrastructure and management practices. Some of the largest benefits would come from the moderate beneficial effects on floodplains and floodwater storage and sediment transport processes. Both the cumulative amount of floodwater and the amount of suspended sediment that potentially is deposited onto the East Pasture would increase dramatically under this alternative. The potential for increased sediment deposition on East and West Pasture floodplains would mean that flood flows could potentially reduce delivery of sediment to the southern portion of Tomales Bay by up to 10 percent or 4,775 tons/day during 2-year events, which would suggest that this alternative might have at least a minor beneficial effect on sedimentation patterns in southern portion of the watershed.

Alternative B

Analysis: Alternative B would have similar impacts to Alternative A on water resources and hydrologic processes, resulting in beneficial effects that range from minor to major (Table 50). Under Alternative B, the East and West Pastures would be restored, but not Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, including construction of the pedestrian access bridge across Lagunitas Creek near the old summer dam, and a planning area for continuation of the southern perimeter trail to Inverness Park. On the West Pasture north levee, a viewing area would replace the informal existing trail. Restoration would involve complete removal of levees in the East Pasture along Lagunitas Creek and excavation of even more new tidal channels. Breaches would be created in the West Pasture levee, including removal of the north levee. The southern East Pasture creek bank would be restored through removal of rip-rap bank stabilization and regraded, where needed, to a more stabile profile. Some connection would be established between the East Pasture and Tomasini Creek through lowering of levees to allow overflow during flood events. As with Alternative A, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

Fluvial or Freshwater Processes: Alternative B would have very similar effects to Alternative A on fluvial or surface freshwater hydrologic processes in the Project Area, with impacts characterized as minor and beneficial. This alternative would expand the amount of levee breaching and removal, remove the Fish Hatchery Creek tidegate, and eliminate of agricultural infrastructure and management practices from both the East and West Pastures. As with Alternative A, the tidegate/flashboard dam structure on Tomasini Creek would remain to maintain subtidal conditions during low tides for the federally endangered fish species, tidewater goby (*Eucyclogobius newberryi*). Under this alternative, a small berm would potentially be constructed to reduce flooding of lower-elevation private properties on the east side of Sir Francis Drake Boulevard: while this would reduce fluvial influences of Lagunitas Creek on this property, it could potentially at least temporarily increase inundation or flooding of the property from surface flow and run-off from the Inverness Ridge. Approximately 5 acres of freshwater marsh would be created in the East Pasture Tomasini Triangle as alternate breeding habitat for the California red-legged frog, as removal of the Fish Hatchery Creek tidegate/culvert at the West Pasture north levee would increase tidal intrusion into the freshwater marsh that serves as its primary breeding habitat in the Giacomini Ranch currently. Creation of this marsh would constrain sheet flow of surface run-off and groundwater emerging from the base of the Point Reyes Mesa through berms constructed to prolong ponding of waters for creation of breeding California red-legged frog habitat and minimize potential tidal intrusion during extreme high or storm tides.

As with Alternative A, the southern perimeter trail would include a prefabricated bridge across Lagunitas Creek, near the old summer dam location across from White House Pool County Park, The bridge would be designed to have no footings in the active channel or floodplain, thereby reducing effects on hydrologic processes. Future extension of the southern perimeter trail, in collaboration with the County of Marin, would connect White House Pool County park with a path along Sir Francis Drake that would either run alongside Sir Francis Drake Boulevard or move off the road at the southern end of the unrestored West Pasture onto a low-



elevation boardwalk that would join back with Sir Francis Drake Boulevard in Inverness Park. In addition, under Alternative B, the east perimeter trail would be constructed as a boardwalk trail (rather than culverted berm) to allow more of the surface water run-off from the Point Reyes Mesa to flow into Tomasini Creek unimpeded.

Tidal Prism: Complete removal of the East Pasture levee would result in benefits similar to those described under Alternative A, restoring daily tidal flooding (up to MHW) to approximately 189 acres. Breaching of the West Pasture levee would have only a small effect on the extent of area inundated by daily tides, which would increase from 10.9 acres to 21.3 (KHE 2006a). Breaching of the levees would primarily influence the extent of high tides (above MHW). Under current conditions, the tide gate facility creates a muted tidal regime with tides fluctuating between 3.4 and 5.25 ft NAVD88. While only limited new areas would be inundated at MHW, areas flooded during extreme high tides in the West Pasture would increase dramatically under Alternative B from 7.1 acres to 98.9 acres (KHE 2006a). This increase in tidal influence would be expected to increase tidal flooding of the freshwater marsh adjacent to Sir Francis Drake Boulevard, which supports breeding California red-legged frog (*Rana aurora draytonii*), a federally threatened species. Generally, this would result in a reduction in area of the marsh, not complete loss of this important freshwater habitat. This issue is discussed in more detail under Wildlife Resources.

Floodplain/Floodwater Retention: Under this alternative, both the West and East Pastures would flood more frequently during smaller (1.5- to 2-year) flood events (KHE 2006a). However, Tomasini Creek flood flows would typically remain confined to the narrow channel and fringing marshplain along the East Pasture's perimeter, except when flows are high to overtop the lowered section of levee. As with Alternative A, the East Pasture would continue to flood during 1.5- to 2-year events relative to the 3.5- to 7-year flood events required under baseline conditions to overtop levees (KHE 2006a). Cumulative floodwater volume during the 2-year flood event would increase from approximately 96 acre-feet under baseline or existing conditions to approximately 1,875 acre-feet, almost double the volume under Alternative A (1,080 acre-feet; KHE 2006a). Almost all of the flood volume under baseline conditions comes from Tomasini Creek, which is hydrologically disconnected from the adjacent East Pasture by a levee. As more water spills onto the floodplain, cumulative floodwater volume in Lagunitas Creek would drop from approximately 9,975 acre-feet to 8,100 acre-feet, a decrease of 19 percent and nearly twice the reduction provided by Alternative A. Cumulative floodwater volume during a 100-year event would still double relative to baseline conditions from approximately 19,000 acre-feet to 39,200 acre-feet, but the increase between Alternatives A and B is not nearly as great (KHE 2006a). Under this alternative, inundated area in the East Pasture would remain similar to that under Alternative A (~300 acres) under the 2-year flood event, increasing from 1.8 acres under baseline conditions (KHE 2006a). During a 50-year event, the entire 350-acre East Pasture would be flooded (KHE 2006a). Floodwaters would be expected to move through the East Pasture more rapidly with removal of levees, concrete spillway, and undersized or poorly functioning tidegates, which may account for the dramatic increase in cumulative floodwater volume during the 100-year event relative to baseline or existing conditions.

Under Alternative B, flooding of the West Pasture by Lagunitas Creek would become more frequent, dropping from a 12-year recurrence interval to a 2-year recurrence interval (KHE 2006a). A certain percentage of floodwaters within the West Pasture would continue to be generated by the numerous Inverness Ridge drainages that flow into the West Pasture, which cause flooding problems for residents adjacent to Sir Francis Drake Boulevard (KHE 2006a). An analysis of the effect of the proposed project on flooding issues related to public health and safety is discussed later in this Chapter. The inundated area in the West Pasture under the 2-year event would actually decrease slightly from 76 acres to 70 acres, probably because removal of the concrete spillway, levees, and tidegate/culvert would decrease impoundment of waters. The entire 200 acres would be completely flooded by the 500-year event (KHE 2006a). The discrepancy between pastures in total inundation (50-year versus 500-year flood event) is reflected in the much lower cumulative floodwater volume in the West Pasture, which ranges from approximately 5 to 3,200 acre-feet during the 2- and 100-year events (KHE 2006a). For Olema Marsh, existing levees and culverts maintain a ponded water condition. Under a 2-year flood event, the ponded condition in the Olema Marsh would maintain inundated area at 49 acres, with the extent of the 500-year flood event climbing only slightly to 67 acres (KHE 2006a).

Stream Power and Sediment Transport Patterns: The potential movement of sediment onto floodplains in the Project Area would continue to increase under this alternative relative to baseline conditions with complete removal of the East Pasture levees and breaching of the West Pasture ones, particularly during smaller and more frequent flood events (< 10-year flood events). Under Alternative B, the percentage of suspended sediment moving through the East Pasture would increase from 10 percent or 4,900 tons/year under Alternative A to 19 percent or 8,800 tons/year under Alternative B (KHE 2006a). Conversely, the percentage

that would be diverted into the West Pasture would be much lower -- approximately 1.75 tons (KHE 2006a). The percentage of material deposited versus transported through depends on a number of factors, but often more deposition occurs under smaller floods such as 5-year events than larger ones such as 25-year events, because flood flow velocities on the floodplain are lower (Heimann 2001). A study on 11 natural (versus constructed) wetlands in the United States yielded a median trapping or removal efficiency rate for Total Suspended Solids (TSS; suspended sediment and other materials) of 76 percent, with a maximum removal rate up to 95 percent (Strecker et al. 1992 *in* Kadlec and Knight 1996)

Based on hydraulic modeling, stream power for the East Pasture would be almost identical to that under Alternative A, with trapping efficiency, at least under smaller flows, totaling approximately 8,500 tons/year. Stream power would increase considerably in the West Pasture with breaching of levees, although transport capacity would still be too low to move sediment further than the edge of the floodplain (KHE 2006a). While removal of the levees and increased off-channel storage of flood flows might be expected to decrease stream power in Lagunitas Creek channel and increase deposition or aggradation of sediment in this reach, hydraulic modeling suggests that, during 2-year flood events or typical channel-forming flows, the creek would continue to maintain transport capacity at least in the reach upstream of White House Pool (KHE 2006a). Downstream of White House Pool, stream power would drop measurably, enough to potentially decrease transport capacity of silt and fine sand, although the magnitude of these change would not be anticipated to appreciably alter channel geometry or bed-form conditions (KHE 2006a).

Tidal Power and Sediment Transport Patterns: Hydraulic modeling showed that tidal velocities (~6.6 ft/s) during an average tidal month would be sufficient in the hydrologically reconnected East Pasture Old Slough to erode or maintain created channels at least in the northern portion of the East Pasture through mobilization of sediment with bulk densities as high as compact sandy clay, including potentially sediment deposited during overbank flooding (KHE 2006a). Conversely, tidal velocities in the West Pasture may be much lower (~1.2 ft/s) than the East Pasture and below the threshold for mobilization of loose sandy clay material, although they would be higher than under baseline conditions (KHE 2006a). In Lagunitas Creek, tidal velocities would be almost identical to those under baseline conditions and Alternatives A and B, suggesting that there would not likely be any net changes in channel conditions (KHE 2006a).

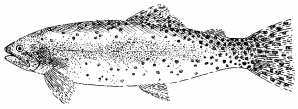
Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Alternative B would have similar minor to major beneficial effects on hydrologic processes as Alternative A. Under this alternative, both the West and East Pasture would be restored, although most of the new public access infrastructure and facilities, including a bridge, would be located along the perimeter of the East Pasture. Complete removal of the East Pasture levees and breaching of the West Pasture levees would result in moderate beneficial effect on the extent of tidal inundation. This alternative would have moderate beneficial effects on freshwater hydrologic processes in the Project Area through expanded removal and breaching of levees, removal of the Fish Hatchery Creek tidegate, and discontinuation or deconstruction of agricultural practices and infrastructure in both the West and East Pastures, although, from a watershed perspective, the beneficial effects would be relatively minor. There would be the potential for construction of small levees to protect lower-elevation properties on the east side of Sir Francis Drake Boulevard. As with Alternative A, some of the largest benefits would come from the major or substantial beneficial effects on floodplains and floodwater storage and sediment transport processes. Both the cumulative amount of floodwater and the amount of suspended sediment that moves through the Project Area floodplains would increase substantially under this alternative, potentially decreasing the amount of sediment that is delivered by Lagunitas Creek to southern Tomales Bay by up to 18 percent or 8,900 tons/day during 2-year events. Based on these results, the project would result in at least minor beneficial effect on sedimentation patterns in southern portion of Tomales Bay.



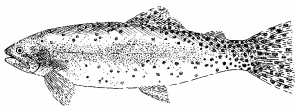
Alternative C

Analysis: Alternative C would have very similar impacts to Alternative B on water resources and hydrologic processes, with beneficial effects ranging from minor to major (Table 50). Under Alternative C, the East and West Pastures would be restored, along with Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, although access along the eastern perimeter would be scaled back through removal of the through-trail component. The southern perimeter trail would include construction of the pedestrian access bridge across Lagunitas Creek near the old summer dam, and a planning area for continuation of the southern perimeter trail to Inverness Park. Restoration would involve complete removal of levees in the East and West Pastures along Lagunitas Creek and excavation of even more new tidal channels. A small tidal channel would be initiated off Lagunitas Creek, as well as in the interior of the East Pasture. Tomasini Creek would be realigned into one of its historic alignments midway through the East Pasture. In Olema Marsh, an adaptive restoration approach would be undertaken, with initial excavation of a shallow berm and the Bear Valley Creek channel to improve hydraulic connectivity and improve drainage of currently impounded waters. As with the other alternatives, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

As with the other alternatives, the tidegate/flashboard dam structure on what would become the former Tomasini Creek would not be removed, but would be left in place to maintain subtidal conditions during low tides for the federally endangered fish species, tidewater goby (*Eucyclogobius newberryi*). During high tides, there would still continue to be some muted tidal action in the shallowly flooded sparsely vegetated flats in eastern portion of the East Pasture from Tomasini Creek waters flowing through a culvert in the Tomasini Creek berm. As discussed under Alternative B, the increase in tidal influence would be expected to increase salinities within the freshwater marsh adjacent to Sir Francis Drake Boulevard, which supports breeding California red-legged frog (*Rana aurora draytonii*). This issue is discussed in more detail under Wildlife Resources. Circulation patterns and salinities in the West Pasture would continue to be strongly influenced by perennial freshwater flow from Fish Hatchery Creek and groundwater flow from the Inverness Ridge, as well as several other small drainages. As with Alternative B, this alternative would also eliminate the borrow ditch directly north of the West Pasture levee and reconnect the tidal slough in the undiked marsh with the remnant one in the West Pasture, which persists as a shallow, frequently flooded depressional feature.

Fluvial or Freshwater Processes: Alternative C would expand upon restoration actions in Alternative B and would, therefore, appear to have moderate rather than minor beneficial effects on fluvial or surface freshwater hydrologic processes in the Project Area. Under this alternative, the West Pasture levee would be completely removed, and portions of several small channels would be realigned to more natural channel patterns or morphology from the unnaturally straight alignment created by repeated ditching efforts. The major effects that this would have on Lagunitas Creek floodplains and floodplain capacity and fluvial sediment deposition on floodplains are analyzed and discussed separately below. As with Alternative B, a small berm would potentially be constructed to reduce flooding of lower-elevation private properties on the east side of Sir Francis Drake Boulevard: while this would reduce fluvial influences of Lagunitas Creek on this property, it could potentially at least temporarily increase inundation or flooding of the property from surface flow and run-off from the Inverness Ridge.

Approximately two-thirds of the downstream portion of Tomasini Creek in the Giacomini Ranch would be removed from its leveed channel and realigned into one of its historic channel alignments, the East Pasture Old Slough. This slough would be realigned to mimic more natural tidal marsh channel patterns, as it was ditched for storage of irrigation water some time after the 1940s. This would potentially affect localized channel morphology, fluvial sediment transport and delivery, channel avulsion and meandering, and floodplains and influence hydraulic characteristics such as flow velocity and the erosive power of flood flows. The existing Tomasini Creek channel would remain as a backwater slough, with a low berm or levee placed between it and the new channel to allow some flood overflow from the new channel into the old one during flood events. Circulation patterns within would not be expected to change with disconnection of the semi-permanent freshwater flow of Tomasini Creek from its old channel, with generally well-mixed conditions continuing to exist, although salinities may increase. Groundwater inflow from the Point Reyes Mesa, however, would be expected to continue to moderate salinity concentrations of tidal waters from Tomales Bay during the summer and fall, when bay salinities increase to almost marine concentrations.



Excavation of hydrologic impediments and replacement of culverts on Levee and Bear Valley Roads in the Olema Marsh would dramatically improve hydraulic connectivity between upstream portions of Bear Valley, the marsh, and Lagunitas Creek through dramatically decreasing water levels, which appear to have been increasing generally in recent years, perhaps since the 1998 flood event. Prior to 1998, Bear Valley Creek drained from Olema Marsh through two culverts, with most of the channel flow apparently preferentially flowing to the westernmost one near White House Pool County Park (KHE 2006b). During the 1998 flood event, the main outflow for Bear Valley Creek in Olema Marsh, however, became the easternmost culvert, with huge amounts of sediment from Inverness Ridge debris flows apparently blocking the westernmost culvert. The easternmost culvert is not only smaller, but constructed at a higher elevation, which, combined with the loss of the westernmost one, has considerably reduced creek outflow from the marsh (KHE 2006b). In addition, past fill events have created a low sediment berm in the marsh near the easternmost culvert that acts almost as a funnel to creek flow, limiting the amount of water that can reach the culverts. The effect of these impediments can be seen in the fact that water levels in the marsh are consistently 4 feet above the culvert invert, and there is some evidence that water levels are continuing to rise, as only in the 1990s, one researcher described the water surface as being below the Bear Valley Road culverts, but these culverts are consistently submerged now (KHE 2006b). With a reduction in water levels in Olema Marsh, water surface levels within the Bear Valley Creek Marsh directly upstream of Bear Valley Road would be expected to decrease, as well, through improvements in hydraulic connectivity and drainage, although the degree of reduction is uncertain.

Under the adaptive restoration approach, the first step would be to remove the berm and to excavate a shallow, better defined flow path for Bear Valley in the currently vegetation-choked channel. The success of these initial restoration measures would be assessed over time, before a decision is made as to whether to proceed with replacement of one or both culverts. As discussed above, water surface levels could drop as much as 4 feet to the elevation of the culvert invert following removal of the berm and improvement in flow conditions (KHE 2006b). Replacement of the Levee Road culvert with a bridge installed at a lower elevation would potentially lower water surface levels another 1-2 feet (KHE 2006b). A decrease in water surface level would greatly improve hydraulic connectivity of the Bear Valley Creek system with Lagunitas Creek, which would have benefits for species such as salmon. The implications of this dramatic decrease in water surface levels for wildlife and other resources such as topography, soils, water quality, and vegetation are analyzed in other sections of this chapter.

As with Alternatives A and B, the only increase in infrastructure would come from installation of a prefabricated bridge near the old summer dam location across from White House Pool County Park, but the bridge would be designed to have no footings in the active channel or floodplain, thereby reducing effects on hydrologic processes. Creation of a freshwater marsh in the East Pasture Tomasini Triangle would constrain sheet flow of surface run-off and groundwater emerging from the base of the Point Reyes Mesa through berms constructed to prolong ponding of waters for creation of breeding California red-legged frog habitat and minimize potential tidal intrusion during extreme high or storm tides. In addition, there may be some minor adverse affects during construction from temporary installation of coffer dams needed to dewater construction areas such as Fish Hatchery Creek, Tomasini Creek, and areas along the East Pasture creek bank sufficiently to complete construction, but these would be largely offset by the numerous benefits this alternative would have on hydrologic processes and functions. From a watershed perspective, the expanded amount and degree of restoration under this alternative would increase its benefits to watershed function and processes relative to the other alternatives from minor to moderate.

Tidal Prism: Complete removal of East and West Pasture levees would result in a moderate beneficial effect on the extent of area inundated twice daily by tides relative to baseline conditions, but would not increase tidally inundated acreage relative to Alternative B despite continuing to increase the extent of tidal channels in the East Pasture (189.1 acres in the East Pasture and 21.3 acres in the West Pasture; KHE 2006a). These areas represent elevations that would be flooded at MHW. However, topographic surveys show additional extensive acreage would be subject to tidal inundation at tidal levels between MHW and MHHW. Over the long-term, however, sea level rise could cause an increase in the potential extent of area inundated by tides, particularly in the East Pasture. Recently published studies suggest that sea level rise rates may be much greater than originally predicted, with water levels rising as much as 3 feet by 2100. This rate sea level rise could lead to regular inundation of large portions of the East and West Pastures below 4 ft NAVD88.

In Olema Marsh, excavation of the berm and a more defined creek flow path would result in improved drainage through the marsh, and reduction of static marsh water level as described above. Dewatering and potential subsequent subsidence of peat soils would considerably expand the meager amount of existing tidal

influence into the marsh, increasing the extent of area affected by daily tidal action up to 20 acres with a tidal prism ranging from 21 to 32 acre-feet depending on the adaptive restoration components implemented (KHE 2006a).

Floodplain/Floodwater Retention: Under this alternative, both the West and East Pastures would continue to be flooded more frequently by Lagunitas Creek during smaller (1.5- to 2-year) flood events just as in Alternative B (KHE 2006a). However, under Alternative C, Tomasini Creek flood flows would now be routed through the East Pasture, as well. Under Alternative C, cumulative floodwater volume modeled for the 2-year flood event relative would climb approximately 6 percent from 1,875 acre-feet under Alternative B to 2,000 acre-feet (KHE 2006a). As water spills onto the floodplain, cumulative floodwater volume in Lagunitas Creek would drop from approximately 9,975 acre-feet to 8,000 acre-feet (KHE 2006a). This reduction would represent a decrease of 20 percent relative to baseline conditions, but only 1 percent relative to Alternative B, and may support that most of the increased cumulative floodwater volume under this alternative comes from Tomasini Creek. Cumulative floodwater volume during a 100-year event would increase only negligibly to approximately 39,200 acre-feet between Alternatives B and C, but would still represent more than 100 percent increase from baseline conditions (KHE 2006a). Under this alternative, inundated area in the East Pasture would remain roughly similar to that under Alternatives A and B (~300 acres) under the 2-year flood event, increasing from 1.8 acres under baseline conditions (KHE 2006a). During a 50-year event, the entire 350-acre East Pasture would be flooded (KHE 2006a). Floodwaters would be expected to move through the East Pasture more rapidly with removal of levees, concrete spillway, and undersized or poorly functioning tidegates, which may account for the dramatic increase in cumulative floodwater volume during the 100-year event relative to baseline or existing conditions.

Under Alternative C, complete removal of the levee would result in a minor increase in the extent of inundated area in the West Pasture under the 2-year event, with acreage increasing from 70 to 83 acres (KHE 2006a). Under Alternative C, cumulative floodwater volume under the 2-year event increases dramatically from approximately 4 acre-feet under baseline conditions and 5 acre-feet under Alternative B to 50 acre-feet under Alternative C. For the 100-year event, cumulative floodwater volume would climb from 610 acre-feet under existing conditions to approximately 5,000 acre-feet under Alternative C, a 5 percent increase over Alternative B (KHE 2006a). As discussed under Alternative B, the discrepancy between pastures in total inundation (50-year versus 500-year flood event) is reflected in the much lower cumulative floodwater volume in the West Pasture, even under fully restored conditions.

For Olema Marsh, this alternative would act to decrease floodwater retention – or at least persistent impoundment – and increase transport of floodwaters from the Bear Valley Creek system. For this reason, inundated area under the 2- to 500-year flood events would change negligibly, if at all (KHE 2006a). Inundated volume would drop from approximately 202 acre-feet under baseline conditions to 185 acre-feet under Alternative C, with the degree of reduction fairly consistent among all flood events up to the 500-year flood (KHE 2006a). This decrease in inundated volume during flood events is reflected in slightly lower maximum floodwater elevations within the marsh, which drop from approximately 11.2 to 10.7 feet NAVD88 under a 2-year event (KHE 2006a).

Stream Power and Sediment Transport Patterns: The potential movement of sediment onto floodplains in the East Pasture would increase even more under Alternative C with removal of not only the Lagunitas Creek levees, but realignment of Tomasini Creek into the East Pasture. Based on the sediment rating curve developed by H. Esmaili & Associates (1980), approximately 50,000 tons per day of suspended sediment would potentially move through the portion of Lagunitas Creek in the Project Area during a 2-year flood event. Under Alternative C, the percentage of suspended sediment potentially moving through the East and West Pastures would increase from 10 percent or approximately 4,900 tons per day under Alternative A to 20 percent or approximately 9,670 tons per day under Alternative C, with only a slight increase (< 1 percent) relative to Alternative B. Based on flood flow volume, almost 98 percent of this sediment (~ 9,500 tons/day) would move through or end up in the East Pasture rather than the West Pasture.

Based on hydraulic modeling, stream power in the East Pasture under a 2-year flood event would be almost identical to that under Alternative B, with transport capacity lost relatively quickly on the floodplains (KHE 2006a). The sudden loss in stream power would suggest that trapping efficiency, at least under smaller flows, would be approximately 8,500 tons/year potentially being deposited rather than transported through the East Pasture floodplain. The primary difference for the East Pasture would continue to be restored conditions versus baseline ones, which are affected by the presence of levees, spillways, culverts, and other infrastructure that limit outflow capacity and decrease velocities. In the West Pasture under Alternative C,

there would be a general increase in stream power, relative to both baseline conditions and Alternative B with the complete removal of the levees, tidegates, and spillway (KHE 2006a). Stream power would drop sharply once waters crest the creek bank, causing most of the fines to be deposited close to Lagunitas Creek (KHE 2006a). Stream power would remain extremely low throughout Olema Marsh during both baseline and restored conditions, although transport capacity increases considerably near the Levee Road culvert outlet (KHE 2006a). While removal of the levees and increased off-channel storage of flood flows might be expected to decrease stream power in Lagunitas Creek channel and increase deposition or aggradation of sediment in this reach, hydraulic modeling suggests that, during 2-year flood events the creek would continue to maintain transport capacity at least in the reach upstream of White House Pool (KHE 2006a). Similar to Alternative B, stream power would drop measurably downstream of White House Pool, enough to potentially decrease transport capacity of silt and fine sand, although the magnitude of these change would not be anticipated to appreciably alter channel geometry or bed-form conditions (KHE 2006a).

Sediment deposition during floods can, over time, lead to net aggradation within floodplain areas and, ultimately, decrease trapping efficiency as vertical elevation of the floodplain rises. This trend tilts the evolutionary trajectory within wetland systems towards establishment of uplands, but within naturally dynamic systems such as estuaries, these trends are often counterbalanced by sea level rise (discussed above under Tidal Prism) and subsidence (either compaction- or fault-associated) that act to maintain or regenerate wetlands even within depostitional environments.

Tidal Power and Sediment Transport Patterns: Similar to Alternative B, hydraulic modeling showed that tidal velocities (~6.6 ft/s) during an average tidal month would be sufficient in the hydrologically reconnected East Pasture Old Slough to erode or maintain created channels -- at least in the northern portion of the East Pasture -- through mobilization of sediment with bulk densities as high as compact sandy clay, including potentially sediment deposited during overbank flooding (KHE 2006a). In Olema Marsh, tidal velocities would increase considerably relative to baseline conditions, with velocities even higher than the East Pasture (~ 9 ft/s), although tidal influence would drop off sharply approximately 150 feet from Levee Road (KHE 2006a). Tidal velocities in the West Pasture would continue to be much lower (~1.2 ft/s) than the East Pasture and below the threshold for mobilization of loose sandy clay material, although they would be higher than under baseline conditions (KHE 2006a). In Lagunitas Creek, tidal velocities would be almost identical to those under baseline conditions and Alternatives A and B, suggesting that there would not likely be any net changes in channel conditions (KHE 2006a).

With maintenance of existing tidal velocities in Lagunitas Creek, the influence of estuarine sediment transport processes such as gravitational circulation that involves resuspension of sediment along channel bottoms through strong tidal currents would likely remain negligible in the Project Area, because tidal currents do not have sufficient power to move the alluvial sands and gravels that comprise most of the streambed. However, tides and currents would continue to strongly influence circulation patterns within this reach of Lagunitas Creek such as gravitational circulation or density- or salinity-based stratification of waters that could at least create, particularly in areas where bathymetry changes abruptly such as shoals, zones where suspended sediment concentrations would reach a peak or maximum and preferentially fall out of suspension in the creek channel. While this could contribute to reductions in sediment delivery to Tomales Bay, the dominance of fluvial forces in this part of the estuary would suggest that fluvial sediment transport processes governing transport and deposition within in-stream and off-stream storage areas such as floodplains would largely dictate sediment delivery rates to the Bay, at least within the Project Area. The potential for increased sediment deposition on East and West Pasture floodplains would mean that flood flows could potentially deliver up to 19 percent or 9,400 less tons/day of suspended sediment to the southern portion of Tomales Bay during 2-year events, which would suggest that this alternative might have at least a minor beneficial effect on sedimentation patterns in southern portion of the watershed.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described for the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Alternative C would have similar minor to major beneficial effects on hydrologic processes as Alternative B. Complete removal of the East and West Pasture levees and adaptive restoration of Olema Marsh would have a moderate beneficial effect on surface tidal and freshwater hydrologic processes, with effects on some processes and functions such as floodplains and floodplain capacity and fluvial sediment deposition on floodplains characterized as major beneficial effects. As with Alternative B, there would still be the potential for construction of a small levee to protect lower-elevation properties on the east side of Sir Francis Drake Boulevard.

Complete removal of East and West Pasture levees and adaptive restoration of Olema Marsh would result in a moderate beneficial effect on the extent of area inundated twice daily by tides relative to baseline conditions and an increase relative to Alternative B (KHE 2006a). These areas represent elevations that would be flooded at MHW, however, additional extensive acreage would be subject to tidal inundation at tidal levels between MHW and MHHW.

The expanded amount of restoration under this alternative increases its value to watershed restoration efforts.. As with Alternatives A and B, some of the largest benefits would come from the major or substantial beneficial effects on floodplains and floodwater storage and sediment transport processes. Alternative C would result in major beneficial impacts associated with increased floodplain function and floodwater retention. In addition, the amount of suspended sediment that moves through the Project Area floodplains would increase under this alternative, potentially decreasing the amount of sediment that is delivered by Lagunitas Creek to southern Tomales Bay by as much as 20 percent. As a result, Alternative C would have major beneficial impacts on sediment transport within the Project Area and potentially minor beneficial effects on sediment deposition within the southern end of Tomales Bay.

Alternative D

Analysis: Alternative D would have very similar impacts to Alternative C on water resources and hydrologic processes, with beneficial effects ranging from minor to major (Table 50). Under Alternative D as with Alternative C, the East and West Pastures would be completely restored, along with Olema Marsh. Almost all of the differences between Alternative D and C relate to excavation of a limited portion of the East Pasture to intertidal elevations, complete realignment of Tomasini Creek into one of its historic alignments, replacement of the Tomasini Creek Mesa Road culvert with a bridge or arch culvert, and further scaling back of new public access facilities through elimination of the bridge across Lagunitas Creek and one of the spur trails on the eastern perimeter. In addition, there would be excavation of even more new tidal channels in the East Pasture. Tomasini Creek would be realigned into one of its historic alignments just downstream of Mesa Road and would run through the constructed freshwater marsh area just north of the Giacomini Ranch dairy facility. There would be no change in restoration approach in the West Pasture from Alternative C, and the same adaptive management approach would be undertaken in Olema Marsh, with initial excavation of a shallow berm and the Bear Valley Creek channel to improve hydraulic connectivity and improve drainage of currently impounded waters. As with the other alternatives, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

Under this alternative, Tomasini Creek would be completely moved out of its leveed channel into one of its historic alignments just downstream of Mesa Road and would run through the newly created freshwater marsh in the Tomasini Triangle. Low berms would be used to ensure that the creek would not drain the marsh, which is being constructed as breeding habitat for California red-legged frog. Low berms would constrain to some degree the potential for channel avulsion or meandering, sediment deposition, and floodplain connectivity, although functionality would still be improved relative to existing leveed conditions. Replacement of the Tomasini Creek culverts at Mesa Road would increase hydraulic connectivity between upstream and downstream reaches and potentially decrease any backwater flooding effects from undersized infrastructure.

The existing Tomasini Creek channel would remain as a backwater slough, with a low berm placed between it and the new channel to allow some flood overflow from the new channel into the old one during flood events. Tidal action in the old Tomasini Creek channel would continue to be controlled by the tidegate/flashboard dam

structure, maintaining subtidal conditions in the backwater slough, until such time that the marsh and marsh channels have developed to offer alternate habitat for the tidewater goby. As under Alternative C, circulation patterns within would not be expected to change with disconnection of the semi-permanent freshwater flow of Tomasini Creek from its old channel, with generally well-mixed conditions continuing to exist, although salinities may increase. Groundwater inflow from the Point Reyes Mesa, however, would be expected to continue to moderate salinity concentrations of tidal waters from Tomales Bay during the summer and fall, when bay salinities increase to almost marine concentrations.

Under Alternative D, there would be no installation or construction of infrastructure such as bridges or culverted trails that would impede hydrologic process. Creation of a freshwater marsh in the East Pasture Tomasini Triangle would constrain sheet flow of surface run-off and groundwater emerging from the base of the Point Reyes Mesa through berms constructed to prolong ponding of waters for creation of breeding California red-legged frog habitat and minimize potential tidal intrusion during extreme high or storm tides. There may be some minor adverse effects during construction from temporary installation of coffer dams needed to dewater construction areas such as Fish Hatchery Creek, Tomasini Creek, and areas along the East Pasture creek bank sufficiently to complete construction, but these would be largely offset by the numerous benefits this alternative would have on hydrologic processes and functions. From a watershed perspective, the expanded amount and degree of restoration under this alternative would increase its benefits to watershed function and processes relative to the other alternatives from minor to moderate.

Tidal Prism: The only change in tidal hydrologic processes relative to Alternative C would come from the slightly expanded extent of area in the East Pasture inundated twice daily by tides, with acreage increasing from 189.1 acres under the other action alternatives to 195 acres under Alternative D. This increase in inundated area would come from lowering of the southwestern corner of the East Pasture to intertidal elevations. As with the other alternatives, a rise in sea level over the long-term could cause an increase in the potential extent of area inundated by tides, particularly in the East Pasture. Recently published studies suggest that sea level rise rates may be much greater than originally predicted, with water levels rising as much as 3 feet by 2100 (Overpeck et al. 2006). This rate of sea level rise could lead to regular inundation of large portions of the East and West Pastures below 4 ft NAVD88.

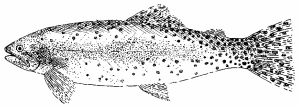
Fluvial or Freshwater Processes: As with Alternative C, Alternative D would expand upon restoration actions in Alternative B and would, therefore, also appear to have moderate rather than minor beneficial effects on fluvial or surface freshwater hydrologic processes in the Project Area. The major effects that this would have on Lagunitas Creek floodplains and floodplain capacity and fluvial sediment deposition on floodplains are analyzed and discussed separately below.

Floodplain/Floodwater Retention: Under this alternative, both the West and East Pastures would continue to be flooded more frequently by Lagunitas Creek during smaller (1.5- to 2-year) flood events just as in Alternative C (KHE 2006a). However, under Alternative D, Tomasini Creek flood flows would now be routed through a larger portion of the East Pasture. Cumulative floodwater volume in the East Pasture during the 2-year and 100-year flood events would not differ appreciably from that under Alternative C, with volume estimated at 2,030 acre-feet during the 2-year event (KHE 2006a). Cumulative floodwater volume in Lagunitas Creek during a 2-year event would also be almost identical to Alternative C, with volume estimated at 7,975 acre-feet (KHE 2006a). The reduction in cumulative floodwater volume during a 2-year event would represent roughly a 20 percent decrease relative to baseline conditions. As noted earlier, there would be no additional restoration in the West Pasture and Olema Marsh so flood frequency, cumulative floodwater volume, and inundated area would be as described under Alternative C.

Based on cumulative floodwater volume, the percentage of suspended sediment potentially moving through the East and West Pastures would account for 20 percent or approximately 9,830 tons/day, which would be double the sediment load transported under Alternative A (KHE 2006a). Almost 98 percent of this sediment (~ 9,600 tons/day) would move preferentially into the East Pasture rather than the West Pasture.

Stream Power and Sediment Transport Patterns: Stream power conditions and fluvial sediment transport patterns and processes would be similar to those described in Alternative C.

Tidal Power and Sediment Transport Patterns: Tidal power conditions and estuarine sediment transport processes and patterns would be similar to those described in Alternative C.



Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Alternative D would have similar minor to major beneficial effects on hydrologic processes as Alternative C. This alternative would expand restoration efforts by lowering more of the marshplain in the East Pasture to intertidal elevations, realigning almost the entire portion of Tomasini Creek within the Project Area into one of its historic alignments, and replacing the undersized culvert for Tomasini Creek at Mesa Road. These actions would have a moderate beneficial effect on surface tidal and freshwater hydrologic processes, with effects on some processes and functions such as floodplains and floodplain capacity and fluvial sediment deposition on floodplains characterized as major beneficial effects.

The only change in tidal hydrologic processes relative to Alternative C would come from the slightly expanded extent of area in the East Pasture inundated twice daily by tides, with acreage increasing from 189.1 acres under the other action alternatives to 195 acres under Alternative D. This increase in inundated area would come from lowering of the southwestern corner of the East Pasture to intertidal elevations. As with Alternative C, the expanded amount of restoration under this alternative, which particularly focuses on restoration of Tomasini Creek, does increase its value to watershed restoration efforts, although the beneficial effects would still be relatively minor from an overall watershed perspective. As with the other action alternatives, some of the largest benefits would come from the major or substantial beneficial effects on floodplains and floodwater storage and sediment transport processes. Both the cumulative volume of floodwater and the amount of suspended sediment that moves through the Project Area floodplains would remain similar to that of Alternative C under this alternative, potentially decreasing the amount of sediment that is delivered by Lagunitas Creek to southern Tomales Bay by as much as 20 percent.

Water Resources – Water Quality

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

The Federal Water Pollution Control Act (Clean Water Act) and subsequent amendments of 1977 (33 USC §1251 et seq)provides for the restoration and maintenance of the physical, chemical, and biological integrity of the nation's waters, primarily through three sections – Section 404, Section 401, and Section 303(d). Federal, state, and local agencies are required to comply with the Clean Water Act, and most have developed their own policies regarding activities affecting water quality. The Park Service Management Policies (2006) mandates parks to "take all necessary actions to maintain or restore the quality of surface waters and groundwaters consistent with the Clean Water Act and all other applicable federal, state, and local laws and regulations" (Section 4.6.3; NPS 2006). Additional information on other federal, state, and local policies can be found in Chapter 3 under Water Resources – Water Salinity and Water Quality.

In California, authority for Section 401 and Section 303 has been delegated to the State Water Resources Control Board (SWRCB), which also is responsible for overseeing California's water quality law, the Porter Cologne Act. The water quality control plan for the San Francisco Bay region, including the entire Marin coastline, is the Water Quality Control Plan for the San Francisco Bay Basin (RWQCB 1995a), The Basin Plan (RWQCB 1995a) designates beneficial uses of water for specific water bodies, establishes specific water quality objectives to protect those uses, and provides a program to implement the objectives. For Lagunitas Creek, beneficial uses include contact and non-contact recreation, oyster production, municipal and domestic water supply, agricultural supply, cold freshwater habitat, fish migration, preservation of rare and endangered species, recreation, fish, spawning, and wildlife habitat. Under Section 303(d) of the Clean Water Act, the state and the nine regional boards are able to declare certain water bodies as "impaired" or unable to perform designated beneficial uses by specified contaminants. Lagunitas Creek and Tomales Bay have been declared impaired under Section 303(d) for sediment, nutrients, and pathogens.

The ranges or thresholds used to characterize the quality of waters and need for cleanup measures come from the Basin Plan (RWQCB 1995a; Table 8 in Chapter 3 under Water Resources – Water Salinity and Water Quality). There are two types of objectives: narrative and numerical: Narrative objectives present general descriptions of water quality that must be attained and serve as the basis for the development of detailed numerical objectives (RWQCB 1995a). Numerical objectives typically describe pollutant concentrations, physical/chemical conditions of the water itself, and the toxicity of the water to aquatic organisms. Numerical water quality objectives in the Basin Plan build upon national water quality standards established by the U.S. Environmental Protection Agency (USEPA). Additional guidelines have been established for characterizing nutrient concentrations in natural, unpolluted waters of estuaries and freshwater streams by AWWA (1990).

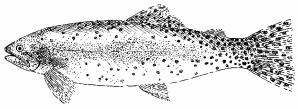
General Assumptions and Methodologies:

- Water quality objectives for Tomales Bay are currently contained in the Basin Plan (RWQCB 1995a), which applies to all waters in the San Francisco Bay area Basin. Many of the objectives in the Basin Plan have components or sub-objectives that are very specific to the San Francisco Bay estuary or certain locations within the estuary. For these objectives, the most applicable sub-objective has been chosen for comparison with Project Area and Tomales Bay waters.
- Basin Plan water quality objectives cover at least 19 different water quality parameters, including bacteria, bioaccumulation, biostimulatory substances, color, dissolved oxygen, floating material, oil and grease, pH, radioactivity, salinity, sediment, settleable material, sulfide, suspended material, taste and odors, temperature, toxicity, turbidity, and unionized ammonia. USEPA objectives include standards for nitrates and nitrites.
- The Tomales Bay watershed has been declared impaired by the RWQCB under Section 303(d) of the Clean Water Act for nutrients, sediment, pathogens, and mercury. Lagunitas Creek has been declared impaired for sediment, nutrients, and pathogens. The RWQCB has adopted criteria for the Pathogen TMDL, which identifies ambient water concentrations for fecal coliform in the watershed streams (200MPN/100ml[log mean]), at the Green Bridge (95 MPN/100ml[log mean]) and in Tomales Bay (14 MPN/100ml [median value]).
- The purpose of the proposed project is to restore natural hydrologic functions and processes, such as water quality improvement. One of the objectives of the project is to take a watershed-based approach to restoration such that restoration efforts maximize not only the opportunity to improve water quality within the Project Area, but within the entire Tomales Bay watershed.
- Changes in water quality conditions were not conducted as part of the hydrodynamic modeling, with the exception of salinity, but modeling results and other hydrologic information collected can be used to qualitatively predict changes in water quality conditions.
- Because changes in salinity conditions are generally considered a neutral effect and not an impact in and of itself, any evaluation of potential impacts related to changes in salinity in the Project Area will be assessed relative to specific impact topics (e.g., California red-legged frog under Wildlife Resources).
- Changes in functional capacity for the Project Area to intercept and filter pollutants in flood flows from upstream portions of the watershed are evaluated under Water Resources – Hydraulics and Hydrologic Resources, Hydrologic Functions – Floodplains.

Listed below are methodologies for significance criteria related to water quality, including specific assumptions or details on methodologies.

Changes in Water Quality Conditions – Project Area: Impact thresholds focus on change in overall water quality conditions in the Project Area, including changes in the number or frequency of exceedances of water quality objectives during, immediately after, and some time after construction (Table 51). Evaluation of exceedances of Basin Plan or USEPA water quality objectives focuses on potential changes in the number of objectives that are violated on a regular or consistent basis in the East Pasture, West Pasture, Lagunitas Creek, Tomasini Creek, and Olema Marsh.

Exceedance is determined based on recorded values from Park Service or other data exceed Basin Plan or USEPA objectives. Objectives are defined as being infrequently (≤ 25 percent of values), occasionally (≤ 50 percent of values), regularly (≤ 75 values), or consistently (>75 percent) exceeded (see Table 8 in Chapter 3 under Water Resources – Water Salinity and Water Quality). This impact indicator specifically focuses on changes in water quality conditions that result from the proposed project.



For certain nutrients, there are either no objectives or very high ones aimed specifically at human health concerns. For example, for nitrates, USEPA objectives for human health are high enough (>10 mg/L) that measurable change would also be masked. There are no Basin Plan or USEPA objectives for dissolved phosphates or ammonia, except for toxic forms of nitrogen such as unionized ammonia and nitrites. The RWQCB, however, is proposing to develop a TMDL for nutrients, which can, in excess, cause ecological impacts, in addition to being harmful to human health. Nutrients that do not have objectives such as ammonia and phosphates are also analyzed in this section.

Potential changes are semi-quantitatively evaluated using an understanding of current water quality conditions; sources of current water quality problems (e.g., dairy, septic, non-point source surface run-off, and physical factors such as long water residence time, etc.); expected changes in loading with implementation of the proposed project; rate of decline in various pollutants with time; and the potential for future loading of pollutants with overbank flooding during storms and tidal flushing. In addition, the number of exceedances or overall ambient concentrations of water quality parameters within other Tomales Bay reference wetlands was also used in analysis.

TABLE 51. WATER QUALITY – PROJECT AREA

Source: RWQCB Basin Plan, Park Service Management Policies, Marin CWP, Community Plan Nature: Beneficial, Adverse Context: Project Area Duration: Construction, Short-Term, Long-Term	
No Impact	There would be no potential for impact to water quality associated with the proposed project.
Negligible	*Beneficial*: The proposed project would result in a negligible or barely detectable improvement in water quality conditions such that the frequency of exceedance of Basin Plan and USEPA objectives in the Project Area would decrease slightly (≤ 10 percent) relative to existing conditions. *Adverse*: The proposed project would result in a negligible or barely detectable deterioration in water quality conditions such that the frequency of exceedance of Basin Plan and USEPA objectives in the Project Area would increase slightly (≤ 10 percent) relative to existing conditions.
Minor	*Beneficial*: The proposed project would result in a minor improvement in the water quality conditions such that the frequency of exceedance of Basin Plan and USEPA objectives in the Project Area would decrease measurably (> 10 and ≤25 percent) relative to existing conditions. *Adverse*: The proposed project would result in a minor deterioration in water quality conditions such that the frequency of exceedance of Basin Plan and USEPA objectives in the Project Area would increase measurably (> 10 and ≤25 percent) relative to existing conditions.
Moderate	*Beneficial*: The proposed project would result in a moderate improvement in water quality conditions such that the frequency of exceedance of Basin Plan and USEPA objectives in the Project Area would decrease appreciably (> 25 and ≤50 percent) relative to existing conditions. *Adverse*: The proposed project would result in a moderate deterioration in water quality conditions such that the frequency of exceedance of Basin Plan and USEPA objectives in the Project Area would increase appreciably (> 25 and ≤50) relative to existing conditions.
Major or Substantial	*Beneficial*: The proposed project would result in a major improvement in water quality conditions such that the frequency of exceedance of Basin Plan objectives in the Project Area would decrease strikingly (>50 percent) relative to existing conditions. *Adverse*: The proposed project would result in a major deterioration in water quality conditions such that the frequency of exceedance of Basin Plan objectives in the Project Area would increase appreciably (> 50 percent) relative to existing conditions.

Changes in Water Quality Conditions in Watershed: This impact indicator focuses on potential change in water quality conditions in the southern portion of the Tomales Bay watershed with construction or implementation of the proposed project. Changes in water quality downstream of the Project Area would result from changes in the quality of water flowing out of Project Area and changes in the functional capability of the Project Area to receive waters from upstream portions of the watershed and to filter and store or transform sediment, nutrients, and contaminants from these waters. This impact indicator does not attempt to assess whether water quality objectives or guidelines would be met through potential implementation,

although these are used as a guide, along with conditions in natural wetlands, to assess which changes might be beneficial or adverse. This analysis represents a semi-quantitative estimation of changes expected under the various alternatives based on extensive baseline data, hydraulic modeling results, and professional judgment regarding the effect of any changes on water quality (Table 52). This analysis takes into account several pieces of information, including: 1) cumulative volume of floodwaters during a 2-year flood event as estimated through hydraulic modeling of the various alternatives; and 2) estimated loading rate of nutrients, pathogens, and sediment during flood events based on RWQCB pathogen study (RWQCB 2001) and literature-derived estimates of nutrient retention, uptake, and transformation (Kadlec and Knight 1996). Daily sediment yields and sediment deposition rates (tons/day) on floodplains as evaluated under Sediment Transport Processes under Water Resources – Hydrologic Processes.

TABLE 52. WATER QUALITY - WATERSHED

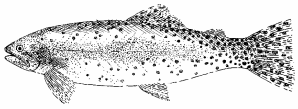
Source: RWQCB Basin Plan, Park Service Management Policies, Marin CWP, Community Plan Nature: Beneficial, Adverse Context: Project Area Duration: Construction, Short-Term, Long-Term	
No Impact	There would be no potential for impact to water quality downstream of the Project Area associated with the proposed project.
Negligible	A barely detectable change in water quality conditions would be expected downstream of the Project Area based on changes in conditions in Project Area waters and functional capacity. Changes would be in the range of natural variability for conditions in natural wetlands in Tomales Bay and surrounding watersheds.
Minor	A measurable change would be expected downstream of the Project Area based on changes in conditions in Project Area waters and functional capacity. Change would be expected to exceed the range of natural variability by ≤ 10 percent. If adverse change occurs, water quality conditions would not exceed Basin Plan objectives.
Moderate	An apparent and measurable change would be expected downstream of the Project Area based on changes in conditions in Project Area waters and functional capacity. Change would exceed the range of natural variability by ≤ 20 percent. If an adverse change occurs, water quality conditions might exceed Basin Plan objectives.
Major or Substantial	A substantial and major change would be expected downstream of the Project Area based on changes in conditions in Project Area waters and functional capacity. Change would exceed the range of natural variability by > 20 percent. If an adverse change occurs, water quality conditions would probably exceed Basin Plan objectives.

Impact Analysis

TABLE 53. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR WATER RESOURCES – WATER QUALITY

All impacts would be considered Project Area and are separately analyzed for Construction and Short-Term/Long-Term.

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Project Area Water Quality Construction	Adverse - Negligible	Adverse - Negligible	Adverse - Negligible	Adverse - Negligible	Adverse - Negligible
Short-Term	Beneficial - Negligible	Beneficial – Minor	Beneficial - Minor	Beneficial - Negligible	Beneficial - Negligible
Long-Term	Beneficial - Minor	Beneficial - Moderate	Beneficial - Moderate	Beneficial - Major	Beneficial - Major
Watershed Water Quality Construction	Adverse - Negligible	Adverse - Negligible	Adverse - Negligible	Adverse - Negligible	Adverse - Negligible
Short-Term	Beneficial- Negligible	Beneficial- Negligible	Beneficial- Negligible	Beneficial- Minor	Beneficial- Minor
Long-Term	Beneficial- Negligible	Beneficial - Minor	Beneficial - Moderate	Beneficial - Moderate	Beneficial - Moderate



No Action Alternative

Analysis: The No Action Alternative would generally have negligible to minor effects on water quality in the Project Area and the southern portion of the Tomales Bay watershed (Table 53). Under the No Action Alternative, levees, tidegates, and culverts in the Giacomini Ranch are not breached or removed, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. The remainder of the levees in the East Pasture and West Pasture would remain, although there would be no levee maintenance. Olema Marsh is also not restored, and there would be no new public access facilities. There would be no public access facilities.

Project Area-Overview: The No Action Alternative would have minor beneficial effects on water quality in the Project Area and negligible beneficial effects in the watershed, largely because of the elimination of intensive agricultural management practices. In Olema Marsh, where there is no agricultural use, conditions would be expected to remain fairly similar to baseline conditions.

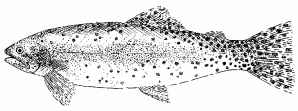
Under the existing purchase agreement with the Giacomini Trust, the Giacomini Ranch dairy had a 7-year Reservation of Use agreement that allowed the Giacomini family to continue dairying until the agreement expires in spring 2007. At that time, the dairy will close, and agricultural management practices associated with dairying will cease. These management practices include crossing of Lagunitas Creek by Giacomini Ranch dairy cows; infrequent discharge of waters in East Pasture ditch system to Lagunitas Creek; periodic maintenance of levees and creek crossings; frequent dredging of ditches creeks for improved water conveyance and pasture drainage; and shallow and concentrated spreading of manure.

Under the No Action Alternative, there is a potential for leased grazing of dairy heifers or beef cattle on the Giacomini Ranch lands in the future, which would be in accordance with the parks' GMP. Leasing would undergo a separate environmental review process, but it is likely that, if lease or leases were approved, that the Seashore would institute restrictions on resource setbacks or setbacks from creeks and certain wetland areas, as well as the intensity, duration, and timing of grazing. In addition, certain creeks in the West Pasture would continue to be dredged to eliminate flood risks to adjacent private residences.

Agricultural management practices have dramatically affected water quality conditions in the Project Area, particularly the East Pasture. Within the Project Area, monitoring has shown occasional, regular, or consistent exceedance of Basin Plan or USEPA objectives for fecal coliforms, unionized ammonia, nitrates, nitrites, dissolved oxygen, and pH. Water quality conditions within the Project Area are generally not eutrophic, but there are occasionally spikes in nutrients and toxic nutrients, and concentrations of pathogen indicators such as fecal coliform are consistently high. Certain ditches within the Giacomini Ranch have extremely poor water quality, with oxygen levels at levels low (<< 5 mg/L) enough to cause mortality to aquatic organisms. General mechanisms for delivery of pollutants from the Project Area to the Bay include the cattle crossing areas, pumping of ditches, and general outflow through leaky tide gate facilities.

Water quality conditions are generally most limited in the pasture ditches, which have been constructed to maintain drainage and groundwater level. Elimination of frequent ditching would decrease the production of organic matter whose breakdown generates the chronically low or almost non-existent levels of oxygen within waters of East Pasture ditches that causes consistent exceedance of Basin Plan dissolved oxygen objectives. Decomposition of organic matter may also be responsible for the occasional exceedances of oxygen objectives in the vegetation-choked, peat-rich substrates of Olema Marsh. As with natural wetlands, oxygen levels would be expected to infrequently drop into hypoxic (low) conditions during summer nights when warm temperatures during the day boosts phytoplankton and algal productivity within shallower water features, causing spikes in oxygen demand or respiration at night that temporarily reduces available oxygen. These periods of high productivity are often accompanied by sharp elevations in pH greater than 8.5 that would continue to cause infrequent exceedance of Basin Plan pH objectives. In addition, some of groundwater-fed drainages would probably continue as they do now to show slightly lower pH that infrequently dips below 6.5. In keeping with Basin Plan project-related objectives, this alternative would not be expected to cause change greater than 0.5 pH in any of the hydrologic units within the Project Area.

Project Area -Nutrients: With elimination of intensive dairying, infrequent pulses of nitrates, nitrites, and unionized ammonia in the East Pasture that exceed Basin Plan and USEPA objective would be eliminated or practically eliminated. The East Pasture had at least six instances where nitrates exceeded USEPA objectives of 10 mg/L, well above the ambient concentrations of most natural systems, even if slightly eutrophic

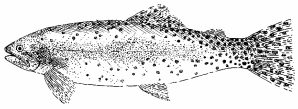


(Parsons, *in prep*.). There were also five instances in the East Pasture where nitrites exceeded objectives for aquatic life of 0.5 mg/L, and at least one where nitrites exceeded USEPA objectives of 1 mg/L. The substantial reduction in nutrient source loading with elimination or reduction in grazing intensity, along with discontinuation of manure spreading practices, would be expected to eliminate exceedances of these objectives. Low oxygen levels in ditches caused by oxygen demand generated by frequent ditching and generation of decomposing organic matter probably played a role in infrequent exceedance of nitrite and unionized ammonia objectives (Parsons, *in prep*.). Extremely low levels or the absence of oxygen in waters can prohibit the conversion of nitrites to nitrates, allowing this typically very transient form of nitrogen to persist and potentially cause negative impacts on aquatic organisms. Increases in dissolved oxygen within East Pasture waters would be expected to practically eliminate, if not totally eliminate, violation of nitrite objectives. Even in reference or natural marshes, nitrites are occasionally detected due to temporary hypoxia, probably during the summer when large diel variations in oxygen production and demand play havoc with oxygen levels (Parsons, *in prep*.).

Low oxygen also affects the conversion of ammonia to nitrites, with low oxygen conditions favoring ammonia. While ammonia occurred at dramatically lower concentrations in the Project Area relative to nitrates and was often undetectable, the East Pasture had among the highest ammonia concentrations, which is undoubtedly due to the hypoxia prevalent in most of the ditches and ditched former sloughs (Parsons, *in prep*.). Under warm temperatures and high pH, ammonia converts to another toxic nutrient form, unionized ammonia. The East Pasture had one instance when unionized ammonia concentrations exceeded Basin Plan maximum objectives of 0.16 mg/L and four instances when concentrations exceeded the median objective of 0.025 mg/L (Parsons, *in prep*.). In addition, the downstream-most sampling location on Lagunitas Creek also had very high unionized ammonia concentrations on one occasion, which appeared to be related to the very infrequent episodes of pumping of East Pasture ditch waters into the creek (Parsons, *in prep*.). Based on nutrient concentrations and patterns in natural or undiked wetlands in Tomales Bay, these episodes would be eliminated under the No Action Alternative through increased conversion of ammonia to nitrates through considerable increases in oxygen concentrations and a decrease in overall nutrient loading.

Discontinuation of intensive agricultural management practices would not eliminate all sources of nutrient loading to the Project Area. Even with levees largely disconnecting the Giacomini Ranch from Lagunitas Creek and Tomasini Creek, the West Pasture would continue to have influxes of nitrates from Inverness Ridge drainages such as Fish Hatchery Creek, which flow underneath Sir Francis Drake Boulevard and into the West Pasture. Fish Hatchery Creek is the largest tributary in the West Pasture and is not leveed, so it, therefore, frequently floods overbank into the pasture. A slightly smaller drainage, the 1906 creek, runs through one of the private properties before it flows into the extensive freshwater marsh in the northern portion of the West Pasture adjacent to Sir Francis Drake Boulevard. This marsh also receives hydrologic inputs from groundwater emerging at the base of the Inverness Ridge, as well at least one other small drainage. Nitrate concentrations in creeks regularly (> 50 percent) exceed 1 mg/L, the upper threshold established by the AWWA (1990) for moderate aquatic organism diversity and avoidance of algal blooms in estuaries. Maximum nitrate concentrations in these creeks reached as high as 6.7 mg/L (Parsons, *in prep*.). Nitrate concentrations in groundwater-fed areas infrequently (> 25 percent) exceed 1 mg/L, with concentrations ranging as high as 2.4 mg/L (Parsons, *in prep*.). Similar conditions exist in Olema Marsh, where nitrate concentrations regularly exceed 1 mg/L in portions of Bear Valley Creek directly upstream of the marsh (Parsons, *in prep*.). Because of levees and/or tidegates/culverts, most of the waters flowing into the Project Area are either retained entirely or, in the case of the West Pasture and Tomasini Creek, have longer residence times due to inefficient conveyance of waters through culverts.

While loading or total volume of nutrients flowing into the Project Area remains relatively low compared to larger creeks such as Lagunitas, these sources still represent the primary hydrologic contribution to the West Pasture, except during larger storms such as 12-year flood events when Lagunitas Creek flows are sufficient to crest the West Pasture levees and flow onto the currently diked floodplain. Even under grazed conditions and seemingly higher-than-normal nutrient loading from agricultural sources, nitrate concentrations and loading consistently decreased on Fish Hatchery Creek downstream of the sampling location located at the Project Area boundary, suggesting that nitrates were being retained either in the channel during lower flows or on the floodplain during higher flows. Nitrate concentrations decreased by an average of 1.0 mg/L, with the median reduction 0.75 mg/L (Parsons, *in prep*.). A similar trend was observed in Olema Marsh at upstream and downstream portions where Bear Valley Creek flowed into and out of the marsh. Nitrate concentrations decreased, on average, by 0.85 mg/L between the upstream and downstream portions of the marsh (Parsons, *in prep*.).



Research on other systems has shown that, while ammonia and total nitrogen have fairly high retention rates (~21 – 76 %) in a variety of aquatic systems from treatment wetlands to floodplains (Behrendt 1996; Kadlec and Knight 1996; De Witt 1999; Seitzinger et al. 2002; van der Lee et al. 2004), nitrates often have fairly low retention rates, at least on active floodplains and floodplain terraces, because they remain in solution rather than bound or sorbed to sediment particles as do other nutrients such as ammonium, organic nitrogen, and phosphates and therefore tend not to get "trapped" (van der Lee et al. 2004). Flattening of the Fish Hatchery Creek stream gradient as it flows into the West Pasture may decrease downstream velocities and increase the potential for nitrates to be assimilated by aquatic plants or phytoplankton in the stream channel or converted from nitrates to nitrogen gas. With removal or reductions in number of cattle, the efficiency of in-stream and possibly floodplain wetlands in decreasing the relatively small, but key, loading of nitrates from upstream sources should improve slightly under the No Action Alternative, but concentrations would probably still occasionally exceed 1 mg/L.

Under the No Action Alternative, the East Pasture remains largely hydrologically disconnected from any fluvial inputs from Lagunitas and Tomasini Creeks, with the exception of the 11-acre restored area in the northern portion described above. Primary hydrologic sources for the East Pasture, therefore, are limited to direct precipitation, surface run-off, emergent groundwater from the base of the Point Reyes Mesa terrace, non-point surface run-off from the town of Point Reyes Station, and irrigation waters during the summer. While cattle would still represent a source of nutrient loading, the intensity of grazing and management would decrease appreciably. Nutrients such as ammonium, nitrates, and phosphates, all of which are high under baseline conditions relative to other hydrologic units within the Project Area, would be affected less by continued influx of new nutrients and more by the rate at which moderate to excessively high nutrients in waters and soils could be expected to decrease over time without active removal of "hot soils" or hydrologically reconnecting ditches and sloughs to flush them out.

Few studies appeared to have addressed the issue of the timeframe over which nutrients and constituents of agriculturally managed soils and water such as fecal coliform decrease in response to removal or reduction in intensity of agriculture. In general, nutrients within the water column would be expected to transition relatively quickly into other nutrient forms or to be uptaken by plants and phytoplankton. However, flux out of soils into overlying waters could lengthen the timeframe over which nutrient concentrations would decrease within the East Pasture waters. Certain nutrients such as phosphates become soluble in soils and available for flushing into overlying waters when conditions become anaerobic or low in oxygen, which typically occurs during periods of persistent or repeated flooding or ponding. Other constituents such as metals are tightly bound under the reduced, slightly acidic to neutral pH conditions characteristic of flooded wetland soils.

With the exception of the drainage ditches and ditched sloughs, most of the East Pasture is only surface flooded temporarily or seasonally, although soil saturation in response to rainfall or receding surface often persists until early June (Parsons, *in prep*.). Some of these areas are subsequently flooded or spray irrigated in the summer. There are a few areas along the eastern perimeter of the East Pasture where soil saturation persists permanently or semi-permanently due to the emergence of groundwater flows. Through most of the pasture, soils would remain oxidized for a large portion of the year, which would encourage rapid breakdown of organic matter into oxidized inorganic nutrients such as nitrates and either subsequent assimilation of these nutrients by plants or conversion into nitrogen gas. Under oxidized conditions, the pool of undecomposed organic matter and inorganic nutrients is typically low, because it is expended quickly, as is evident from the comparatively low of organic matter in upland versus wetland soils. Within the East Pasture, it is likely most of these nutrients would be "lost" through plant uptake, with the moderately to excessively high nutrient load favoring establishment of weedy species that proliferate quickly under high nutrient conditions. This issue is discussed in more detail under the Vegetation Resources section of this chapter.

Project Area-Pathogens: Perhaps, the most pervasive issue or problem under baseline conditions is fecal coliform, which has been traditionally used an indicator of pathogen or bacterial contamination levels. Fecal coliform concentrations in all hydrologic units of the Project Area, including Olema Marsh, consistently (>75 percent) to regularly (> 50 percent) exceed TMDL objectives for Lagunitas Creek of 200 MPN/100 ml , as well as the 95 MPN/100 ml load-based allocation for Lagunitas Creek at the Green Bridge (established in 2005). Within the East Pasture, fecal coliform concentrations regularly surpass the 2,000 MPN/100 ml Non-Contact Recreational use threshold. As with nutrients, removal or reductions in the number of cattle would substantially decrease coliform loading. However, results of some limited testing in the Project Area for surfactants that are commonly incorporated into detergents would suggest that leaking septic systems, as well as cattle, may contribute to coliform or pathogen loading to the Project Area. Fluvial or creek water draining non-agricultural subwatersheds such as the Inverness Ridge, as well as groundwater from the Inverness Ridge

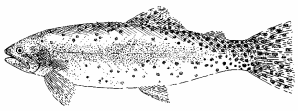
and Point Reyes Mesa and non-point source run-off from Point Reyes Station, regularly to consistently exceed TMDL objectives for Lagunitas Creek of 200 MPN/100 ml. Another potential source is wildlife. Unlike nitrates, which decreased at the downstream end of Olema Marsh, fecal coliform generally increases from upstream to downstream, suggesting some localized contribution. These sources could include wildlife such as waterfowl that commonly use the marsh or leaking septic systems, as Olema Marsh also receives hydrologic inputs from small drainages and emergent groundwater off the Inverness Ridge. These sources would be expected to continue to influence the Project Area under the No Action (and other) Alternatives.

Unlike nutrients, which are typically rapidly assimilated or converted, bacteria can persist for an extended period of time in both water and soils. In one study, *E. coli* -- another bacteria that has become more popular as a pathogen indicator -- lived in lake waters for at least 6 to 7 days, but in nutrient-rich river water, *E. coli* survived in excess of 3 weeks and was believed to persist for as long as 2 months in sediment (Palmateer and Huber 1985; Huron County Science Committee 2005). Under these conditions, coliform concentrations would be expected to slowly decrease particularly in the East Pasture, although pathogens would not be eliminated due to the potential retention of at least limited grazing and septic-influenced hydrologic inputs. Over the long-term, the East Pasture would be expected to have lower coliform levels than the West Pasture due to the fact that it would still be leveed off from Lagunitas and Tomasini Creeks, which would have much higher loading rates than the seeps and non-point source run-off that currently drains into the pasture. While leveed off from Lagunitas Creek, the West Pasture would be more highly influenced by Fish Hatchery Creek and the other drainages, which have higher loading rates.

Pollutant Retention and Effects on Tomales Bay: Under flood flow conditions, nutrient- and pathogen-laden waters would flow into both the East and West Pastures. The East Pasture would flood during a relatively small to moderate-sized flood events (3.5 year – 7 year), while the West Pasture levee would require considerably more flow to overtop (12 year; KHE 2006a). Floodwaters would overtop levees and spill onto the floodplain, dropping a considerable amount of suspended sediment near the levees with the abrupt drop in stream power (KHE 2006a). These sediments are often associated with nutrients such as ammonium, organic nitrogen, and phosphate; pathogen indicators such as fecal coliform and *E. coli*; and contaminants such as metals. Research on rivers in Europe, where nitrates are the predominant form of nitrogen, has shown that nitrate retention on floodplains is extremely low, because it is not associated with sediment and tends to remain free in solution (van der Lee et al. 2004). While sediment and nutrient loading often show a linear relationship with streamflow or discharge, deposition of sediment and sediment-associated nutrients, pathogens, and contaminants onto floodplains appear to display more of a non-linear relationship in which at some specific threshold of flow velocities become high enough that most of the sediments, nutrients, pathogens, and contaminants are transported through floodplains rather than retained. In a study on Missouri creeks, Heimann (2001) found that more suspended sediment deposition occurred under smaller floods such as 5-year events than larger ones such as 25-year events, because flood flow velocities on the floodplain were lower.

The optimal flow at which trapping efficiency of the Giacomini Ranch floodplains is maximized is unknown. While nutrient and pathogen loading rates for a 3.5-year flood event – the smallest flood event capable of overtopping the Giacomini Ranch levees -- cannot be estimated from existing data, instantaneous loading on the falling limb (~5,000 cfs) of a 2.25-year flood event in 2006 was estimated at approximately 10 million MPN per second for fecal coliform and 220 mg per second for nitrates (Parsons, *in prep*.). Phosphate data was not available for this same storm event, but phosphate loading during flows that recur on an annual basis (~225 cfs) totaled approximately 2.5 mg per second (Parsons, in prep.). Even with levees, then, some floodplain deposition of sediment, nutrients, pathogens, and contaminants would occur, but the frequency of these overbank flooding events would be substantially lower due, because higher water levels would be required to initiate floodplain flooding, particularly in the West Pasture (~12-year flood event). At some probably much higher flow, increased velocities might begin to preclude deposition even if floodplains are flooded.

Because Lagunitas Creek would occasionally overflow into the Giacomini Ranch pastures, this alternative would be expected to have, over the long-term, at least a negligible beneficial effect on water quality downstream of the Project Area in southern Tomales Bay. Currently, overbank flooding during larger storm events may increase loading to the watershed due to the excessive amount of nutrients, pathogens, and manure present, at least in the East Pasture. A similar effect would potentially be expected over the short-term during larger storm events, with floodwaters moving through the Project Area and causing discharge of nutrient- and pathogen-laden waters to downstream areas of Lagunitas Creek. With a reduction or elimination of grazing and elimination of intensive agricultural management practices, overbank flooding would be



expected to contribute positively to the watershed by filtering sediment, nutrients, pathogens, and contaminants, which is one of the more functions that wetlands play. The degree that water quality conditions in the bay would be improved is tempered to some degree by the relative infrequency that the Giacomini Ranch would flood. There would be little interaction between Tomasini Creek and the East Pasture.

Under the No Action Alternative, it would take additional time for the existing loads of nutrients and pathogens, particularly in the East Pasture, to dissipate to levels characteristic of other lightly grazed and/or open space areas.

Possible Additional Mitigation Measures: No additional mitigation measures are proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: There are at least three currently proposed projects that would have the potential to cause cumulative impacts should the No Action alternative be implemented, the Bear Valley Creek Watershed Enhancement Project, Chicken Ranch Beach Enhancement and the East Shore Wastewater Improvement Project, generally described in Table 23 of this chapter. The Bear Valley Creek Project proposes to replace failing or underperforming hydrologic infrastructure at a number of locations on Bear Valley Creek within the Seashore boundaries. There is no definitive timeframe for construction of this project, but preliminary design for this project would be expected to have a cumulatively beneficial effect through improvement of hydrologic and ecological processes and functions in the upper portions of the Bear Valley Creek subwatershed, upstream of Olema Marsh. This project would have negligible effect to minor effects on water quality for the Bear Valley subwatershed and Project Area. The East Shore Wastewater Improvement Project would construct a community wastewater system to replace substandard and marginally operating septic systems for 91 properties along the east shore of southern Tomales Bay. Another creek and wetland restoration project is proposed for Chicken Ranch Beach, a small drainage on the western shore of Tomales Bay that consistently has high pathogen loading to the bay. The Tomales Bay Watershed Council is working with local agencies to identify and reduce sources of loading and restore the lower floodplain area, which has been negatively impacted by fill. Cumulatively, the proposed project, in combination with these other projects, would be expected to have a minor to perhaps even moderate beneficial effect on water quality within southern Tomales Bay.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The No Action alternative would generally result in generally negligible to minor effects on water quality in the Project and the southern portion of the Tomales Bay watershed. The only changes under this alternative would be a small 11-acre wetland restoration component that is required under the Park Service's existing mitigation agreement with CalTrans, reduction in intensity or elimination of grazing, and the discontinuation of agricultural management practices that have had negative effects on water quality. Nutrient and pathogen loading in water would decrease slowly, because of the possible interaction between soil and water that could continue to introduce nutrients and pathogens into overlying waters. Direct loading of nutrients and pathogens associated with the active dairy operations would end, and generally improve water quality conditions within the Project Area. Source loading of nutrients and pathogens from other sources such as creeks and drainage and emergent groundwater potentially affected by leaking septic systems, non-point source run-off from the town of Point Reyes Station, and wildlife use of marsh areas could remain. In addition, there is potential under the No Action Alternative for leased grazing of dairy heifers or beef cattle through a separate environmental review process, although grazing would be expected to be lower in intensity and regulated more tightly in terms of minimizing resource impacts. During larger flood events ranging from 3.5- to 12-year flood events, floodwaters from Lagunitas Creek would reach levels high enough to overtop levees and flow onto floodplains, where sediment-associated nutrients, pathogens, and contaminants would probably be retained depending on velocity of waters. Over the short-term, loading to Lagunitas Creek during storm events where overbank flooding occurs may increase through floodwaters moving through the Project Area and causing discharge of the still nutrient- and pathogen-laden waters to downstream areas of Lagunitas Creek. However, over the long-term, overbank flooding onto floodplains would be expected to decrease nutrient and coliform loading to southern portions of the Tomales Bay watershed. While this would improve conditions in the bay, the effect would probably be relatively minor,

with the frequency of flooding being relatively low (3.5- to 12-year events). Also, with Tomasini Creek still leveed off from the East Pasture, there would be little chance for reduction of loads from this source.

Alternative A

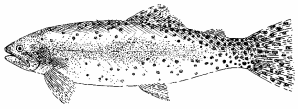
Analysis: Alternative A would generally have negligible to moderate effects on water quality in the Project Area and the southern portion of the Tomales Bay watershed. Under Alternative A, only the East Pasture would be restored, with new public access facilities limited to the eastern and southern perimeters of the East Pasture. The southern perimeter trail includes a bridge crossing of Lagunitas Creek near the old summer dam, and evaluation of a planning corridor in the West Pasture between White House Pool and Inverness Park. There would be no restoration in the Olema Marsh. The levees along and tidegate/culvert in the West Pasture and Tomasini Creek would be retained. In the East Pasture, restoration would involve breaching of levees in the East Pasture along Lagunitas Creek, and excavation of new tidal channels. The southwestern corner of the creek bank would be regraded to a more stabile profile. Most of the actions under this alternative focus on removal or restoration of agricultural infrastructure such as filling of ditches, ripping of compacted roads, fence removal, and removal of pumps, pipelines, and concrete spillways.

Project Area-Overview: During the short- and long-term, Alternative A would have minor to moderate beneficial effects on water quality in the Project Area and negligible to minor beneficial effects in the watershed, because of the elimination of intensive agricultural management practices. Discontinuation of agricultural operations and removal of dairy infrastructure, roads and ditches would reduce potential for exceedance of Basin Plan and USEPA water quality objectives from actions within the Project Area. In general, the breaching of levees in the East Pasture will increase the frequency of flooding into the area. One role this area will play in the watershed water quality condition is to expand potential areas for deposition and detention of pollutants. Under Alternative A, there is no potential for leased grazing, thereby eliminating another potential source of nutrients and pathogens to the Project Area and further reducing nutrient loading. Also, a 13-acre area in the East Pasture where manure has been heavily spread would be excavated, and the nutrient-laden soils would be used to fill in the manure ponds on the dairy mesa, which would eliminate another potential source of residual nutrients and possibly pathogens from the East Pasture.

Alternative A would involve removal of the one-way tidegate on the East Pasture Old Slough, but a berm blocking drainage of slough waters would also be removed. This would increase hydrologic connectivity with Lagunitas Creek. Road and ditch infrastructure in the East Pasture will be removed. Creation of tidal channels will convey tidal water into and through parts of the East Pasture, and minimizing stagnant conditions that can lead to poor water quality in terms of low oxygen in waters and high nutrients and even toxic nutrients. Some increase in ponding and water residence time would be expected along the eastern perimeter trail, where construction of a berm trail would likely cause ponding of surface run-off and emergent groundwater despite inclusion of culverts to improve conveyance. Impacts during construction would be characterized as negligible adverse, because BMPs would be instituted to reduce potential impacts associated with incidental fallback of sediment into the creek.

Project Area-Nutrients and Pathogens: Within the Project Area, removal of direct pollutant sources from the Project Area, and improved hydraulic connectivity through the Project Area would be expected to have a more dramatic effect on reduction in nutrients, including nitrates, and pathogen indicators such as fecal coliform than the No Action Alternative. Over the long-term, the East Pasture would still be expected to only occasionally (>25 percent and <50 percent) exceed AWWA nitrate objectives of 1 mg/L, however, unlike under baseline conditions, this would occur when nitrates rather than ammonia would be the prevalent form of nitrogen. In addition, additional efforts to remove sources of contamination would increase effects on coliform concentrations, which would be expected to only occasionally exceed TMDL objectives for Lagunitas Creek of 200 MPN/100 ml. In Olema Marsh, where there is no agricultural use, conditions would be expected to remain fairly similar to baseline conditions.

As discussed under the No Action Alternative, discontinuation of intensive agricultural management practices would not eliminate all sources of nutrient loading to the Project Area. Even with levees largely disconnecting the Giacomini Ranch from Lagunitas Creek and Tomasini Creek, the West Pasture would continue to have influxes of nitrates and pathogens from Inverness Ridge drainages such as Fish Hatchery Creek and the 1906 drainage and possible groundwater emerging from the base of the Inverness Ridge and flowing into the West Pasture. Under Alternative A, several breaches would be created in the East Pasture, which would increase hydrologic connectivity between Lagunitas Creek and its floodplain. In addition, the East Pasture would also



be influenced by emergent groundwater from the base of the Point Reyes Mesa terrace and non-point surface run-off from the town of Point Reyes Station, both of which appear to have moderate- to high pathogen and nutrient loads.

Nitrate concentrations in creeks and groundwater-fed areas in the Giacomini Ranch and Olema Marsh regularly (> 50 percent) to infrequently (>25 percent) exceed 1 mg/L, the upper threshold established by the AWWA (1990) for moderate aquatic organism diversity and avoidance of algal blooms in estuaries. Fecal coliform concentrations in all hydrologic units of the Project Area, including Olema Marsh, consistently (>75 percent) to regularly (> 50 percent) exceed TMDL objectives for Lagunitas Creek of 200 MPN/100 ml , as well as the 96 MPN/100 ml load-based allocation for Lagunitas Creek at the Green Bridge.

Pollutant Retention and Effects on Tomales Bay: In the East Pasture, breaching of levees would increase the frequency of overbank flooding from 3.5- to 7-year events to 1.5- to 2-year events, thereby increasing the influence of Lagunitas Creek on the East Pasture and vice versa. During these storm events, floodwaters would overtop levees and spill onto the floodplain, dropping a considerable amount of suspended sediment near the levees with the abrupt drop in stream power. Relative to the No Action Alternative or baseline conditions, stream power appeared slightly higher, but still probably not strong enough to convey sediments more than a short distance from the creek banks (KHE 2006a). In addition to being a water quality pollutant in and of itself – Tomales Bay has been declared impaired for sediment – suspended sediments are often associated with nutrients such as ammonium, organic nitrogen, and phosphate; pathogen indicators such as fecal coliform and *E. coli*; and contaminants such as metals.

The optimal flow at which trapping efficiency of the Giacomini Ranch floodplains is maximized is unknown. However, some estimates of potential instantaneous loading rates during smaller flood events can be derived from instantaneous loading rates calculated on the falling limb (~5,000 cfs) of a 2.25-year flood event in 2006. These numbers do not include additional loading that would have occurred during this same event from Olema or Bear Valley Creeks. During a storm event of this magnitude, approximately 50,000 tons per day of suspended sediment would be conveyed in Lagunitas Creek. Calculated instantaneous loading rates during this flood event totaled approximately 10 million MPN per second for fecal coliform (Parsons, *in prep*.). Phosphate data was not available for this same storm event, but phosphate loading during a winter 2006 sampling event with elevated flows (~225 cfs) that probably recur frequently on an annual basis totaled approximately 2.5 mg per second (Parsons, in prep.).

For the 2.25-year flood event, approximately 10 percent of these flood flows would be diverted into the East Pasture through overbank flooding. Through floodplain retention, suspended sediment loads within Lagunitas Creek could be reduced as much as 9.6 percent or approximately 4,775 tons/day. There are no definitive numbers for the percentage of pathogens likely to be retained on floodplains, but, as with sediments, estimates for coliforms generally appear to be high, with natural wetlands receiving untreated or partially treated municipal or stormwater discharges having a 94.2 to 99.9 percent removal rate, even with abundant use by wildlife (CH2MHill 1991 in Kadlec and Knight 1996). Retention efficiency generally exceeds 90 percent coliforms when influx concentrations are high (Kadlec and Knight 1996). Using an estimate of 90 percent of retention on East Pasture floodplains, instantaneous coliform loading in Lagunitas Creek could be reduced by as a rate as high 9 percent or 887,000 MPN per second during this portion of the storm event. Under this alternative, there would continue to be no overbank flooding into the West Pasture during a flood event of this size. During this storm, flows of approximately 5,000 cfs were sustained for at least one hour at the time of sampling. If overbank flooding could have occurred, coliform loading in Lagunitas Creek could have been reduced by 53 million MPN during just this one hour.

During the flood event described above, calculated instantaneous loading rates totaled approximately 220 mg per second for nitrates (Parsons, *in prep*.). However, nitrates may not be as readily retained by floodplains. Rather being sorbed to suspended sediment as are coliforms and phosphates, nitrates remain soluble and have, on some larger river systems, been found to have very low rates of retention (2 – 3%) on floodplains unlike other forms of nitrogen such as organic nitrogen and ammonia (van der Lee et al. 2004). The proportion of nitrogen removed from through a network of streams in an East Coast watershed ranged from 37 – 76 percent, but these numbers included ammonia and organic nitrogen (Seitzinger et al. 2002). Sampling has not been conducted on Lagunitas Creek for organic nitrogen, but ammonia is almost always below detection limit, as it is for almost all of the Project Area except for the East Pasture, suggesting that waters are generally well-oxidized, thereby converting ammonia to nitrates, and that the largest sources of these nutrients comes from some distance away. Ammonia often occurs in areas that are proximate to large sources of manure from livestock or fecal matter from wildlife, while nitrates are commonly associated with

the influence of agricultural and residential fertilizers, septic systems, landfill leachate, commercial or industrial wastewater, and acid rain. Assuming a trapping efficiency rate of approximately 3 percent, the instantaneous loading rate of nitrate onto floodplains during the 2006 flood event would equate to roughly a 0.3 percent reduction in nitrate loads in Lagunitas Creek or a decrease of approximately 0.65 mg per second or a total of 39 mg per hour.

Some nitrate retention does appear to occur with Project Area streams and associated wetlands. Even under grazed conditions and seemingly higher-than-normal nutrient loading from agricultural sources, nitrate concentrations and loading consistently decreased on Fish Hatchery Creek downstream of the sampling location at the Project Area boundary, suggesting that nitrates were being retained either in the channel during lower flows or on the floodplain during higher flows. Nitrate concentrations decreased by an average of 1.0 mg/L, with the median reduction 0.75 mg/L (Parsons, *in prep*.). A similar trend was observed in Olema Marsh at upstream and downstream portions where Bear Valley Creek flowed into and out of the marsh. Nitrate concentrations decreased, on average, by 0.85 mg/L between the upstream and downstream portions of the marsh (Parsons, *in prep*.). The average percent reduction was almost identical between these two systems – approximately 37 percent. The flat gradients present in both of these systems may increase residence time sufficiently to promote assimilation of nitrates by aquatic plants or phytoplankton in the stream channel or conversion from nitrates to nitrogen gas through denitrification. Conversely, in Tomasini Creek, during approximately 50 percent of the sampling events, nitrate concentrations were higher downstream than upstream, and during 75 percent of the events, fecal coliform concentrations were also dramatically higher – on average, 544 percent -- downstream. These results point to a source of nitrates and coliforms being downstream of Mesa Road within the Project Area boundary. Dairy cattle rarely, if ever, cross over the levee to graze on the small fringing floodplain, so the source is believed to be leaking septic systems and other influences from residential development originating from either the worker housing or homes on the Point Reyes Mesa. Movement of these nutrients and pathogen indicators into the Project Area is enhanced by the existing seasonal to almost year-round groundwater and permeable gravel layers within this coastal marine terrace.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

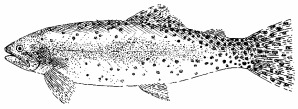
Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be identical to those described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Active restoration efforts under Alternative A, combined with discontinuation of intensive agricultural management and grazing throughout the Giacomini Ranch, would increase the benefits of this alternative on water quality in the Project Area relative to the No Action Alternative. Alternative A would be expected to have moderate beneficial effects over the long-term on water quality in both the East and West Pastures, however, there would be no to very negligible improvement in water quality conditions in Tomasini Creek. Increased overbank flooding in the East Pasture (reduced from 3.5 to 1.5 year flooding frequency) would increase floodplain detention and capture of many Bay pollutants. On floodplains, nutrients would be assimilated or uptaken by plants, converted to nitrogen gas, or would remain, as would most contaminants such as metals, within the sediment bound with varying degrees of strength to clays, silts, organic matter, and mineral complexes such as pyrite. Pathogens could persist in soils, but exposure to ultraviolet light can dramatically reduce pathogen levels (Palmateer et al. 1989).

As explained under the No Action Alternative, short-term effects would be less dramatic than long-term ones, because of the time expected to be required to bring water (and soil) conditions within the range characteristic of natural wetlands and grasslands. In addition, flooding of the East Pasture during storms may result in pulses of sediment, nutrients, and pathogens to downstream waters of Lagunitas Creek after construction is completed. These pulses would be expected to be transient in nature and not last more than 2- to 3 years. For this reason, short-term beneficial effects would be characterized as minor within the Project Area and negligible on a watershed scale. Negligible adverse effects may also occur during construction from



temporary installation of coffer dams and accidental fallback of sediment into waters from excavation of levees along Lagunitas Creek. However, Best Management Practice (BMPs) would be instituted to minimize the effects of these actions on water quality within and downstream of the Project Area.

A much greater frequency of flooding by Lagunitas Creek of the East Pasture would be expected to have, over the long-term, a minor beneficial effect on water quality downstream of the Project Area in southern Tomales Bay. With elimination of grazing and elimination of intensive agricultural management practices, overbank flooding would be expected to contribute positively to the water quality of the southern portion of Tomales Bay by filtering sediment, nutrients, pathogens, and contaminants, which is one of the more functions that wetlands play. The extent to which this alternative could improve water quality conditions of the bay is restricted by the continued presence of levees, tidegates, and culverts in the West Pasture, Tomasini Creek, and Olema Marsh, as well as the continued influx of high loads of nutrients and pathogens from small creeks, drainages, and emergent groundwater into the Project Area. However, over the long-term, overbank flooding onto floodplains would be expected to have at least a minor beneficial effect on water quality within the southern portion of Tomales Bay by decreasing [of sediment, coliform, phosphate, and certain forms of nitrogen, with reductions in suspended sediment and instantaneous coliform loading estimated to be as high as 10 percent and 9 percent, respectively, during approximately 2-year flood events.

Alternative B

Analysis: As with Alternative A, Alternative B would generally have negligible to moderate effects on water quality in the Project Area and the southern portion of the Tomales Bay watershed (Table 53) Under Alternative B, the East and West Pastures would be restored, but not Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture. The southern perimeter trail includes a bridge crossing of Lagunitas Creek near the old summer dam, and evaluation of a planning corridor in the West Pasture between White House Pool and Inverness Park. In addition, a viewing area would replace the informal existing trail on the West Pasture north levee, which would be removed. Restoration would involve complete removal of levees in the East Pasture along Lagunitas Creek and excavation of even more new tidal channels. Breaches would be created in the West Pasture levee. The southern East Pasture creek bank would be restored through removal of rip-rap bank stabilization and regraded, where needed, to a more stabile profile. Lowering of levees between the East Pasture and Tomasini Creek would allow overflow during flood events, but otherwise Tomasini Creek would remain in its current channel with tidegate/flashboard dam structure still in place. As with Alternative A, this alternative would involve removal of agricultural infrastructure and discontinuation of agricultural management practices.

Project Area-Overview: Alternative B would have very similar beneficial effects to Alternative A on water quality in the Project Area and watershed relating to the removal of agricultural infrastructure and features (e.g., manure disposal area) in the East Pasture and elimination of intensive agricultural management practices in both pasture. Infrastructure removal and elimination of agricultural management practices would reduce potential for water quality and exceedance of water quality objectives are discussed in detail under the No Action Alternative and Alternative A. However, under Alternative B, the West Pasture levee would be breached, and the tidegate and concrete spillway would be removed, which would increase hydrologic connectivity with Lagunitas Creek and downstream areas with the West Pasture. Breaches of levees in the West Pasture would increase turnover of waters and minimize stagnant conditions that can lead to poor water quality in terms of low oxygen in waters and high nutrients and even toxic nutrients. In addition, the eastern perimeter trail would be constructed as a boardwalk rather than as a culverted berm trail, which would decrease ponding of surface run-off and emergent groundwater flowing off the Point Reyes Mesa. Conversely, creation of a freshwater marsh in the Tomasini Triangle would increase considerably residence time of some surface waters and emergent groundwater within at least 5.4 acres of the East Pasture, however, sustained inundation through at least the summer is necessary to create conditions conducive to supporting breeding and rearing of California red-legged frog (*Rana aurora draytonii*), a federally threatened species.

Project Area-Nutrients and Pathogens: This alternative would be expected to have a greater reduction of nutrients, including nitrates, and pathogen indicators such as fecal coliform than Alternative A. The change is less dramatic under this alternative perhaps because the West Pasture was not as intensely managed from an agricultural perspective as the East Pasture and already had limited exchange of waters with downstream areas. Over the long-term, the East and West Pastures would be expected to continue to have occasional (>25 percent and <50 percent) exceedances of AWWA (1990) nitrate objectives of 1 mg/L. This is the frequency at which this objective has been exceeded during the past four years of monitoring some of the

natural, undiked wetlands in Tomales Bay, including Walker Creek marsh, which is exposed – as would be the Project Area – to high nutrient and pathogen loading from creeks, drainages, and other sources (Parsons, *in prep*.). Even Limantour Marsh, which is not subject to some of the same negative influences from dairying or other forms of agriculture and leaking septic systems, infrequently exceeds the AWWA (1990) upper threshold on nitrates for maintaining non-eutrophic conditions within estuaries (Parsons, *in prep*.). Ultimately, the degree of change that can be effected in the Project Area in terms of water quality improvement will be constrained by conditions with source creeks and other hydrologic sources. Data collected by the Park Service on water quality within reference wetlands in the watershed suggests that, for many of the objectives such as pH, dissolved oxygen, turbidity, and pathogens regulated under the Basin Plan (RWQCB 1995a), the range of natural variability is large and approaches or – in the case of pathogens – exceeds the numerical thresholds or limits imposed by water quality objectives (Parsons, *in prep*.).

Given these constraints, the degree of change effected under Alternative B relative to Alternative A is also much less dramatic for pathogens. As discussed under the No Action Alternative and Alternative A, "natural" water quality conditions within source creeks such as Lagunitas, Bear Valley, Fish Hatchery, Tomasini, and other drainages upstream of the Project Area or groundwater emerging at the base of the Inverness Ridge and Point Reyes Mesa often already exceeds TMDL and Basin Plan objectives. This is particularly true for the Lagunitas Creek TMDL concentration objective of 200 MPN/100 ml, which is regularly (>50 percent) to consistently (>75 percent) exceeded during single time sampling events within hydrologic sources to the Project Area at sampling locations that are upstream or at the perimeter of the Giacomini Ranch and Olema Marsh. The TMDL objective technically applies to a geometric mean for a series of samples collected within 30 days, while water quality monitoring was conducted quarterly during different seasons, as well as during storm events, to define ambient conditions. However, the geometric mean for all the samples collected in four years also exceeded the Lagunitas Creek TMDL objective.

Under this alternative and Alternative A, coliform loads in the East Pasture would drop from consistently exceeding the TMDL objective for Lagunitas Creek to perhaps only occasionally exceeding this objective. Within the West Pasture, coliform loads would decrease, but would still be expected to regularly exceed the TMDL objective. As with nitrates, the larger degree of improvement projected for the East Pasture relative to the West Pasture relates primarily to the relative influence of continued loading from creeks, groundwater, and other hydrologic sources. Waters within the West Pasture would continue to be affected by seasonal to year-round -- if relatively low in terms of overall loading rate -- influx of coliforms from Fish Hatchery Creek, the 1906 drainage, other small drainages, and groundwater from the Inverness Ridge. Tomasini Creek would remain isolated in its leveed channel that is hydrologically disconnected from the East Pasture would not effect conditions in the East Pasture. Most of the hydrologic sources to the East Pasture either have very low loading rates despite almost year-round flow or are high loading (Lagunitas Creek), but only flood the East Pasture, on average, every 2 years. However, retention of this levee would also prevent the East Pasture from improving water quality of Tomasini Creek before these waters are discharged to Tomales Bay.

Pollutant Retention and Effects on Tomales Bay: Some of the other major changes under Alternative B relative to Alternative A relate to the frequency of overbank flooding from Lagunitas Creek and the volume of Lagunitas Creek floodwater that could be diverted onto Giacomini Ranch floodplains. Breaching of the West Pasture levee would increase the frequency of overbank flooding from 12-year events to 2-year events, thereby increasing the influence of Lagunitas Creek on the West Pasture.

While levees would be completely removed on the East Pasture, the frequency of overbank flooding from Lagunitas Creek into the East Pasture would still be identical to that under Alternative A, ranging from 1.5- to 2-year flood events. However, the volume of floodwaters conveyed through the East Pasture would increase and thereby potentially increase the benefits of this alternative to water quality. Based on hydraulic modeling, cumulative floodwater volume from Lagunitas Creek conveyed into the East Pasture during a 2-year event would climb from approximately 10 percent under Alternative A to approximately 18 percent under Alternative B (KHE 2006a). The East Pasture accounts for more than 99 percent of the reduction in cumulative floodwater volume in Lagunitas Creek under a 2-year event (KHE 2006a).

During these storm events, floodwaters would overtop creek banks or remaining levees and spill onto the floodplain, dropping a considerable amount of suspended sediment near the creek bank or levees because of an abrupt drop in stream power (KHE 2006a). Little difference existed between Alternative A and B in terms of reduction in stream power and likelihood for the East Pasture floodplain to be depositional in nature, however, relative to the No Action Alternative or baseline conditions, stream power appeared slightly higher, but still probably not strong enough to convey sediments more than a short distance from the creek banks (KHE

2006a). In addition to being a water quality pollutant, suspended sediments are often associated with nutrients such as ammonium, organic nitrogen, and phosphate; pathogen indicators such as fecal coliform and *E. coli*; and contaminants such as metals.

The optimal flow at which trapping efficiency of the Giacomini Ranch floodplains is maximized is unknown. However, some estimates of potential instantaneous loading rates during smaller flood events can be derived from instantaneous loading rates calculated on the falling limb (~5,000 cfs) of a 2.25-year flood event in 2006 are described under Alternative A. During 2-year flood events, estimated suspended sediment loads in Lagunitas Creek could be reduced by as much as 18 percent, with approximately 8,500 tons/day deposited on East Pasture floodplains and another 1.7 tons/day deposited on West Pasture floodplains, Using an estimate of 90 percent retention for coliforms on East Pasture floodplains, instantaneous coliform loading in Lagunitas Creek could be reduced at rate as high as 16 percent or 1.6 million MPN per second during this portion of the storm event. During this storm, flows of approximately 5,000 cfs were sustained for at least one hour at the time of sampling. If overbank flooding could have occurred, coliform loading in Lagunitas Creek could have been reduced by 96 million MPN during just this one hour. As noted earlier, most of the cumulative floodwater volume from overbank flooding of Lagunitas Creek would flow into the East Pasture. Under this alternative, much less than 1 percent of the cumulative floodwater volume would end up in the West Pasture (KHE 2006a).

During the flood event described above, calculated instantaneous loading rates totaled approximately 220 mg per second for nitrates (Parsons, *in prep*.). However, nitrates may not be as readily retained by floodplains. Assuming a trapping efficiency rate of approximately 3 percent, the instantaneous loading rate of nitrate in Lagunitas Creek during an approximately 2-year event would be reduced by 0.5 percent relative to 0.3 percent under Alternative A due to retention on floodplains in the East Pasture, resulting in a total reduction in instantaneous nitrate loading rates of 1.2 mg per second or 70 mg during a one-hour period. Contributions from overbank flooding of the West Pasture would be extremely negligible (<<< 0.1 mg/s) under this alternative.

As discussed under the No Action Alternative and Alternative A, some nitrate retention does appear to occur with Project Area streams and associated wetlands. The flat gradients present in the West Pasture and Olema Marsh may increase residence time sufficiently to promote assimilation of nitrates by aquatic plants or phytoplankton in the stream channel or conversion from nitrates to nitrogen gas through denitrification. Conversely, in Tomasini Creek, during approximately 50 percent of the sampling events, nitrate concentrations were higher downstream than upstream, and during 75 percent of the events, fecal coliform concentrations were also dramatically higher – on average, 544 percent -- downstream. This pattern in the data points to a localized source of nitrates and coliforms, downstream of Mesa Road. Under Alternative B, some of the relatively minor loading of nutrients and coliforms from non-point source run-off from the town of Point Reyes Station and emergent groundwater on the East Pasture perimeter just north of the dairy facility may be ameliorated by the proposed construction of a freshwater marsh (Tomasini Triangle freshwater marsh) to offset expected losses of the freshwater marsh in the West Pasture adjacent to Sir Francis Drake Boulevard from increased salinity intrusion.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be identical to those described under the No Action Alternative.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: As with Alternative A, Alternative B would have much greater benefits to water quality in the Project Area than the No Action Alternative. Alternative B would be expected to have moderate beneficial effects on water quality in both the East and West Pastures, however, there would continue to be no to very negligible improvement in water quality conditions in Tomasini Creek. Increased overbank flooding from Lagunitas Creek would not be expected to reduce Project Area water quality, because most of these nutrients,

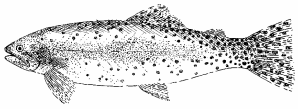
pathogens, and contaminants would be deposited along with suspended sediment on the floodplains and not necessarily in Project Area waters and would be assimilated, converted, or remain bound to sediments. As explained under the No Action Alternative, short-term effects would be less dramatic than long-term ones, because of the time expected to be required to bring water (and soil) conditions within the range characteristic of natural wetlands and grasslands. In addition, flooding of the East Pasture during storms may result in pulses of sediment, nutrients, and pathogens to downstream waters of Lagunitas Creek after construction is completed. These pulses would be expected to be transient in nature and not last more than 2- to 3 years. For this reason, short-term beneficial effects would be characterized as minor as opposed to major. Negligible adverse effects may also occur during construction from temporary installation of coffer dams and accidental fallback of sediment into waters from excavation of levees along Lagunitas Creek. However, Best Management Practice (BMPs) would be instituted to minimize the effects of these actions on water quality within and downstream of the Project Area.

From a Lagunitas Creek perspective, the combination of the increased frequency of overbank flooding -- which occurs under Alternative A, as well – and the much greater cumulative floodwater volume routed through the East and West Pastures under Alternative B would increases the potential water quality benefits of this alternative to the watershed relative to Alternative A. Alternative B would be expected to have at least a minor beneficial effect on water quality downstream of the Project Area in southern Tomales Bay. With elimination of grazing and elimination of intensive agricultural management practices, overbank flooding would be expected to contribute positively to the water quality of the southern portion of Tomales Bay by filtering sediment, nutrients, pathogens, and contaminants, which is one of the more functions that wetlands play. Over the long-term, overbank flooding onto floodplains would be expected to have at least a minor beneficial effect on water quality within the southern portion of Tomales Bay by decreasing loading of sediment, coliform, phosphate, and certain forms of nitrogen, with reductions in suspended sediment and instantaneous coliform loading estimated to be as high as 18 percent and 16 percent, respectively, during approximately 2-year flood events.

Alternative C

Analysis: Alternative C would have negligible to major effects on water quality in the Project Area and the southern portion of the Tomales Bay watershed (Table 53). Under Alternative C, the East and West Pastures would be restored, along with Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, although access along the eastern perimeter would be scaled back through removal of the through-trail component. The southern perimeter trail includes a bridge crossing of Lagunitas Creek near the old summer dam, and evaluation of a planning corridor in the West Pasture between White House Pool and Inverness Park. Restoration would involve complete removal of levees in the East and West Pastures along Lagunitas Creek and excavation of even more new tidal channels. A small tidal channel would be initiated off Lagunitas Creek, as well as in the interior of the East Pasture. Tomasini Creek would be realigned into one of its historic alignments midway through the East Pasture. In Olema Marsh, an adaptive restoration approach would be undertaken, with initial excavation of a shallow berm and the Bear Valley Creek channel to improve hydraulic connectivity and improve drainage of currently impounded waters. As with the other alternatives, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

Project Area-Overview: Alternative C would have very similar beneficial effects to the other alternatives on water quality in the Giacomini Ranch portion of the Project Area. The numerous effects that infrastructure removal and elimination of agricultural management practices would have on water quality and exceedance of water quality objectives are discussed in detail under the No Action Alternative and Alternative A. The effects of most of the restoration efforts, which include partial or complete removal of levees, tidegates, and culverts and excavation of new tidal channels, are fully discussed under Alternative B. As with Alternative B, this alternative would be expected to have a minor to moderate effect on reducing frequency of exceedances of Basin Plan objectives for dissolved oxygen, nitrates, nitrites, unionized ammonia, and fecal coliform. Ultimately, the degree of change that can be effected in the Project Area in terms of water quality improvement will be constrained by conditions with source creeks and other hydrologic sources. Data collected by the Park Service on water quality within reference wetlands in the watershed suggests that, for many of the objectives such as pH, dissolved oxygen, turbidity, and pathogens regulated under the Basin Plan (RWQCB 1995a), the range of natural variability is large and approaches or – in the case of pathogens – exceeds the numerical thresholds or limits imposed by water quality objectives (Parsons, *in prep*.). New



activities associated with the Tomasini Creek and Olema Marsh areas would result in potential impacts to water quality conditions.

Project Area-Tomasini Creek: Currently, Tomasini Creek is leveed to run along the edge of the Point Reyes Mesa until its outlet with Lagunitas Creek and southern Tomales Bay near Railroad Point. The creek has only a very narrow fringing floodplain on the inboard of the levee, with flooding from overtopping or breaching of levees into the East Pasture much less common than with Lagunitas Creek. Under this alternative, Tomasini Creek would be reconnected to its historic floodplains, with size of this new floodplain in the East Pasture estimated at 64 acres. The existing channel and the tidegate/flashboard dam structure that regulates low flows in Tomasini Creek would be retained, because the creek supports a federally endangered fish species. However, it would become more of a backwater slough that would only receive flood flows from Tomasini Creek during large storm events. Otherwise, this backwater slough would continue to be almost fully tidal, with the malfunctioning tidegate/flashboard dam structure only truncating low flows, and salinities would continue to be dampened by the persistent groundwater flow from the Point Reyes Mesa, thereby maintaining brackish conditions.

Rerouting of Tomasini Creek would have beneficial effects on not only water quality within the creek, but within the southern portion of Tomales Bay. Tomasini Creek was one of the few areas in which nitrate and pathogen loads were higher downstream in the Project Area than upstream of the Project Area. During approximately 50 percent of the water quality sampling events between 2002 and 2006, nitrate concentrations were higher downstream than upstream, and during 75 percent of the events, fecal coliform concentrations were also dramatically higher – on average, 544 percent – downstream (Parsons, *in prep*.). These results point to a source of nitrates and coliforms being downstream of Mesa Road within the Project Area boundary. Dairy cattle rarely, if ever, cross over the levee to graze on the small fringing floodplain, so the source is believed to be leaking septic systems and other influences from residential development originating from either the worker housing or homes on the Point Reyes Mesa. Movement of these nutrients and pathogen indicators into the Project Area is enhanced by the existing seasonal to almost year-round groundwater and permeable gravel layers within this coastal marine terrace. Realigning Tomasini Creek near the Hunt Shack would most likely result in much lower loads of nutrients and pathogens being routed through the East Pasture, at least from the Point Reyes Mesa residential development, and would decrease the potential for these more polluted waters downstream of the Hunt Shack to be exchanged to Tomales Bay, because flood flows, which are more likely to convey nutrient loads to downstream sources, would be diverted into the East Pasture. Tidal action can also cause exchange of waters, but the retained tidegate/flashboard dam system tends to minimize outflow to some degree by truncating the lower part of the tidal range.

The quality of waters within the rerouted portion of Tomasini Creek would be improved through overbank flooding and related deposition of sediment, nutrients, pathogens, and contaminants onto the East Pasture floodplain. While Tomasini Creek has high concentrations of nutrients and coliforms just as do most of the other creeks and drainages, Tomasini Creek also is influenced by historic or potentially ongoing leakage from the now-closed West Marin Landfill, located upstream in the Tomasini Creek watershed. The landfill reputedly does not have the liner now required of all landfills and violates state regulations requiring a minimum of 5 feet between the bottom of the landfill and the groundwater table. The RWQCB documented the presence of leachates and cation/anion salts among other contaminants in Tomasini Creek more than one mile downstream from the landfill and just upstream of the Project Area boundary (David Elias, RWQCB, *pers. comm*.). A sediment screening study conducted in the Project Area in 2003 found detectable concentrations of cadmium within creek sediments just upstream of Mesa Road, the only detection of cadmium within the Project Area (Parsons and Allen 2004a). However, cadmium levels did not exceed standards associated with frequent or infrequent toxicity to aquatic organisms (Parsons and Allen 2004a). Rerouting of Tomasini Creek into the East Pasture would increase loading of not only nutrients and pathogens, but more toxic contaminants that are not typically a concern in rural areas such as Tomales Bay: the landfill reputedly accepted wastes for a while from other areas in the San Francisco Bay region. Without more data, it is difficult to predict the magnitude of the problem posed by the landfill. However, wetlands and their reduced or anaerobic soil environments are extraordinarily efficient in trapping and binding contaminants, as well as nutrients and pathogens, for long periods of time, as long as wetland conditions are not radically altered (e.g., dewatered). By routing flows onto East Pasture floodplains, these contaminant, nutrient, and pathogen loads are diverted from reaching Tomales Bay and decreasing water and sediment quality conditions in the southern portions of the watershed. In terms of minimizing impacts to aquatic life, floodplains are a more stable reservoir for contaminants than stream channels and bays, which are subject to more frequent erosion and redistribution of contaminated sediments.

Project Area-Olema Marsh: One of the other large changes that would occur under Alternative C comes with lowering of the water surface levels within Olema Marsh through improving hydraulic connectivity of Bear Valley Creek within Olema Marsh with Lagunitas Creek. As was discussed in detail under Soil Resources, the adaptive restoration approach proposed for Olema Marsh would result in a dramatic lowering of water surface levels in this highly impounded marsh. Water surface levels are currently perched almost 4 feet higher than the culvert invert for Bear Valley Creek at Levee Road for a number of reasons, including elimination of drainage from the western culvert, poor drainage from the eastern culvert due to low capacity and a berm near the outlet that acts as a funnel, and total submergence of the culverts at Bear Valley Road (KHE 2006b). The first phase of the adaptive restoration program would be to remove the berm and to shallowly excavate a more defined flow path for Bear Valley Creek within the marsh. These actions would lower water surface levels as much as 1- to 4 feet (KHE 2006b). As waters drain down, approximately the upper 1- to 2 feet of the marsh surface, which appear to be largely peat or undecomposed organic matter, would be dewatered and exposed to air. Through oxidation, the surface layer of these peat soils would begin to break down and decompose, causing a lowering of the marsh surface through subsidence or compaction. Subsidence rates are difficult to predict, but based on general elevations of the marsh soil surface from topographic surveys conducted, Olema Marsh could subside by approximately 0.7 to 1.7 feet.

Oxidation of peat and mineral soils triggers a range of biogeochemical reactions, some of which have important implications for water quality. Oxidation of impounded soils, particularly peat soils or soils that were historically exposed to tidal influence, can dramatically affect nutrient conditions within soils. Rapid decomposition of peat and organic-rich mineral soils can generate a pulse in mineralization or production of inorganic nutrients, with pH often driving which nutrient forms are the most prevalent (Delaune and Smith 1985, Anisfeld and Benoit 1997, Portnoy 1999, Sommer and Horwitz 2001, Parsons and Martini-Lamb 2003). Oxidation often results in a lowering in soil pH because of the production of humic acids and other types of acids, and these acids can shift the nutrient pathway away from nitrification or the production of nitrates from ammonia. In addition, introduction of saltwater can decrease binding of ammonium in soils through the higher ionic strength of saltwater (Portnoy 1999). Nutrients produced through breakdown of organic matter or such as ammonium and phosphate can either remain in drained soils, or they can be flushed into overlying waters when soils are flooded again (Delaune and Smith 1985, Portnoy 1999). Often, these pulses are very sharp, but relatively short-lived, lasting a matter of weeks (Anisfeld and Benoit 1997, Parsons and Martini-Lamb 2003). Nutrient efflux into overlying waters may also be spatially variable, with areas exposed to tidal influence having higher rates of efflux because of cation exchange.

In addition to nutrient pulses, inundation of recently dewatered or drained soils can cause pH within overlying waters to plummet, at least temporarily. The severity of this reduction in pH depends on the soil substrate and the degree of current or historic tidal influence. The pH in overlying waters often drops lower in saline or tidally influenced soils (pH ~2-4 with pH 7 considered normal or neutral) than in freshwater wetland or peat soils (pH ~5.0), because oxidation of pyrite and other iron-sulfur compounds in tidally influenced soils leads to extensive production of additional acidic compounds (e.g., sulfuric acid and ferrous iron; Delaune and Smith 1985). In freshwater wetlands, acidity is primarily produced by breakdown of peat into humic acids. The peat underlying Olema Marsh is expected to be relatively fresh or low salinity in nature, at least within surface layers, because tidal influences have been largely precluded or at least limited since construction of Levee Road in the late 1800s. However, estuarine-derived muds and peat probably underlie the peat at some unknown depth. Therefore, pHs generated by breakdown of organic matter would be expected to be closer to 5 than 2-4. The persistence of acidic conditions within overlying waters depends to a large degree on the influx rate of waters high in carbonates such as seawater, groundwater, or streams, with acids typically quickly buffered in wetlands with some consistent source of water. Low pHs typically persist for longer periods of time in systems with no to very low sources of inflowing water, because acid concentrations greatly exceed that of available carbonates. **Permanent Bear Valley Creek inflow, combined with persistent subsurface groundwater inflow from the Inverness Ridge, would be expected to buffer acids within a short time of being produced, although there could be some spatial variability within the marsh where lower pHs would persist.**

Decomposition of peat soils can also affect water quality by releasing soluble, partly decomposed organic matter into overlying waters, thereby increasing oxygen demand and decreasing dissolved oxygen levels (Anisfeld and Benoit 1997). A similar phenomenon was observed in the East Pasture drainage ditches: organic matter is constantly introduced into ditch waters by frequent dredging, which disturbs both rooted and floating vegetation and undecomposed organic matter in ditch soils. In ditches, dissolved oxygen levels rarely exceed 5 mg/L and are typically below 2 mg/L. Dissolved oxygen within Olema Marsh waters would be

expected to drop in response to decomposition of peat soils, with effects being more prolonged than that for pH and possibly extending through the second year after restoration is completed.

These same biogeochemical processes have implications for contaminants, as well as nutrients. Under oxidized conditions, many marsh soils will release sediment-bound contaminants into overlying waters. Oxidation in and of itself does not necessarily lead to release of metals, but oxidation combined with a sharp decrease in pH as is often observed in saline soils can encourage a "pulse" of formerly sediment-complexed metals into the water column. Studies have documented releases of a variety of metals, including silver, aluminum, cadmium, chromium, copper, iron, manganese, nickel, lead, selenium, and zinc (Delaune and Smith 1985, Soukup and Portnoy 1986, Gambrell et al. 1991, Anisfeld and Benoit 1997). Release of contaminants such as metals appears to be higher from saline or saltwater wetland soils than freshwater wetland ones, probably because of the lower pHs often present in oxidized tidally influenced soils (pH ~3-4) than in freshwater wetland ones (~5.1; Delaune and Smith 1985). Soils high in humic acids or organic carbon also tend to bind metals (Syrovetnik and Neretnieks 2002), as well as organic contaminants such as DDT and chlorinated benzenes.

The potential for a pulse in metal or organic contaminants into overlying waters following draining and oxidation of Olema Marsh soils would appear relatively minor given the relatively low probability of any historic or current exposures to organic contaminants or metals, even metals such as nickel, chromium, and valanium that are naturally high in the ultramafic or serpentine soils found in the Franciscan Formation, which is prevalent throughout the San Francisco Bay region and the eastern side of Tomales Bay, including the Bolinas Ridge (Hornberger et al. 1999) The sediment screening survey conducted in the Project Area in 2003 did show ubiquitously high levels of nickel and chromium in the Project Area, except in Fish Hatchery Creek (Parsons and Allen 2004a). The upper portions of Fish Hatchery Creek, as well as Bear Valley Creek, drain completely off the Inverness Ridge, which is dominated by granitic rock such as quartz-diorite and granodiorite that probably contains low levels of metals relative to the Franciscan Formation (G. Kamman, KHE, *pers. comm*.).

Over time, subsidence would be expected to reach equilibrium with water surface levels, but while subsidence can occur relatively rapidly, the long-term effects of drainage on sediment nutrient pools and fluxes into overlying waters can persist for some time, with effects noted in some marshes even 10 years after marshes had been drained (Portnoy 1999). Within the short-term, assumed to be at least 10- to 15 years for this impact indicator, a large degree of variability in water quality conditions would be expected, primarily in nutrient loading to overlying waters as surface soils in Olema Marsh adjust to being dewatered. Pulses of phosphates from soils would not necessarily violate any Basin Plan or USEPA objectives, because there are no phosphate objectives. Pulses of ammonia could cause exceedances of the unionized ammonia objective, although periods of low pH would restrict unionized ammonia production. Depending on oxygen levels, ammonia could also be rapidly converted to nitrates either within the marsh or downstream of the marsh in Lagunitas Creek. Sharp pulses in nitrates caused by conversion from ammonia could cause exceedance of the USEPA objectives for nitrate concentrations exceeding 10 mg/L. Low oxygen levels would favor ammonia or potentially production of nitrites, a typically transient form of nitrogen that is toxic to people and wildlife and is regulated by the USEPA.

Declines in pH would be expected to be a much more transient issue and unlikely to persist for more than a few weeks to a month, given the steady influx of carbonate-rich waters into the Olema Marsh capable of buffering acids produced. These temporary declines in pH would exceed Basin Plan objectives for pH both in terms of ambient pH objectives that specify a range of 6.5-8.5 and project-related objectives of not causing more than a 0.5 change in pH. While pH changes would not be expected to extend much outside Olema Marsh itself, nutrient spikes would affect both the marsh and Lagunitas Creek, at least temporarily increasing loading rates to southern Tomales Bay. For this reason, short-term effects of this alternative in Olema Marsh water quality would be characterized as minor to moderate and adverse. From an overall project perspective, these negative effects are buffered over the short-term by the marked improvement in water quality conditions in the Giacomini Ranch under all alternatives.

Over the long-term, the proposed actions would be expected to have a beneficial effect on water quality within Olema Marsh, as the marsh came into equilibrium with changed water surface level conditions. Currently, Olema Marsh occasionally (>25 percent and <50 percent) exceeds Basin Plan objectives for minimum oxygen levels within waters, with long residence times and high primary productivity apparently causing episodes of hypoxia or low oxygen, even during the day (Parsons, *in prep*.). As with Lagunitas Creek, Bear Valley Creek and Olema Marsh also regularly exceed AWWA (1990) standards for minimization of eutrophic conditions

within estuaries, with nitrate concentrations exceeding 1 mg/L more than 50 percent of the time (Parsons, *in prep*.). As discussed under the other alternatives, nitrate concentrations decreased, on average, by 0.85 mg/L or 37 percent between the upstream and downstream portions of the marsh (Parsons, *in prep*.).

Fecal coliform was more variable, with instantaneous loading rates sometimes increased at downstream sampling locations, which suggests localized contribution to coliform loads from waterfowl that commonly use the marsh or leaking septic systems. The flat or low topographic gradients present in this system may increase residence time sufficiently to promote assimilation of nitrates by aquatic plants or phytoplankton in the stream channel or conversion from nitrates to nitrogen gas through denitrification: floodplains have not necessarily been found in other systems to be very effective in trapping nitrates (van der Lee et al. 2004), with stream channels and floodplains most effective in trapping sediment-associated forms of nitrogen such as ammonia and organic nitrogen. While the proposed actions would change the structure of Olema Marsh, it would still be expected to remain largely a freshwater marsh with pockets of brackish marsh that would still be subject to flooding and therefore should continue to have beneficial effects on reducing nitrates. Ultimately, exceedance of AWWA nitrate standards would be expected to decrease in frequency to only occasionally exceeding these objectives. Fecal coliform concentrations would decrease slightly, but with major sources of coliforms present both upstream on Bear Valley Creek and potentially on the perimeter from small drainages and groundwater, the degree of reduction really possible is limited.

Pollutant Retention and Effects on Tomales Bay: Under Alternative C, the West Pasture levee would be completely removed, and tidal channel excavation would be increased in the East Pasture, which would increase conveyance and exchange of waters. While levees would be completely removed, the frequency of overbank flooding from Lagunitas Creek into the East Pasture would still be identical to that under Alternative B (2-year flood events). However, the volume of floodwaters from Lagunitas Creek conveyed through the West Pasture would increase slightly, although the East Pasture still accounts for more than 99.9 percent of the reduction in cumulative floodwater volume in Lagunitas Creek under a 2-year event (KHE 2006a). Based on hydraulic modeling, cumulative floodwater volume from Lagunitas Creek conveyed into the West Pasture during a 2-year event would climb from much less than 1 percent under Alternative B to approximately 0.5 percent under Alternative B (KHE 2006a). Potential retention of suspended sediment on West Pasture floodplains during a 2.25-year flood event would increase from approximately 1.75 tons/day under Alternative B to 227 tons/day. Calculated fecal coliform loading rates during this same flood event would jump more than 1,000 percent relative to Alternative B to approximately 42,000 MPN/s or 2.5 million MPN during a one-hour period. There would be negligible to minor increases relative to Alternative B in flood-related loading to the East Pasture, as well, for sediment (~1,000 tons/day) and fecal coliform, with Lagunitas Creek instantaneous loading rates of fecal coliform being reduced by as much as 18 percent or 1.7 million MPN per second or 103 million MPN per hour. Suspended sediment loads within Lagunitas Creek would be reduced by as much as 19 percent, a 1 percent increase relative to Alternative B.

Possible Additional Mitigation Measures: It should be noted that potential water quality impacts described for the Olema Marsh system would be transient and transitional. The continuous inflow of waters to the area from upland freshwater sources, as well as tidal influence, would buffer the potential pH variations and limit these to very localized, short-duration events. However, possible additional mitigation measures might also include actions that could be used to implement more gradual change in water surface levels in Olema Marsh. Through a gradual reduction in water surface levels, potential acute water quality impacts described above would be minimized. Currently, water level in the Olema Marsh is controlled by an extensive fill area or vegetated berm directly at outflow location under Levee Road. An initial treatment might be to cut through this sill and improve a flow path through the Project Area, but not to remove it entirely so that water levels would drop more gradually. In order to minimize some of the identified water quality impacts in the Olema Marsh, actions to remove established vegetation and initiate establishment of a flow path would be used to allow headcutting and channel downcutting over time. The reduction of water level in the marsh would be less predictable, but would occur over a longer period of time.

Effectiveness of Possible Additional Mitigation Measures: By instituting a more gradual reduction in water surface levels, some of the adverse effects associated with pulses in nutrients and acids that would further impact vegetation communities in Olema Marsh might be lessened or tempered to some degree. However, ultimately, the water quality conditions will be impacted to some degree with or without this mitigation measure. While slowing down the process might minimize potential poor water quality events, it may lengthen the time that it takes for a new equilibrium to be established. Because the identified impacts

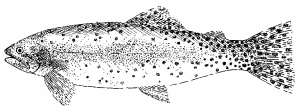
would be very localized and transient, the extent and duration of this potential measure may delay achievement of equilibrium conditions and improved water quality.

Cumulative Impacts: There are at least three currently proposed projects that would have the potential to cause cumulative impacts should the Alternative C be implemented, the Bear Valley Creek Watershed Enhancement Project, Chicken Ranch Beach Enhancement and the East Shore Wastewater Improvement Project, generally described in Table 23 of this chapter. The Bear Valley Creek Watershed Enhancement Project would have negligible short term effects on sediment in association with temporary construction impacts. The East Shore Wastewater Treatment Project, will reduce potential of direct waste discharge from more than 100 septic systems in the Marshall area of Tomales Bay. Efforts to address pathogen loading and habitat impacts at Chicken Ranch Beach (Third Valley Creek in Inverness) would result in direct water quality benefits to the Bay. Overall, these projects, in combination with the actions proposed under Alternative C would benefit water quality conditions in Tomales Bay. The conditions associated with the Olema Marsh (described above) are transient in nature and would be localized to the Marsh itself. Cumulatively, the actions under Alternative C, and other projects identified here would result in minor short term benefits, and as Olema Marsh reaches equilibrium condition, long-term benefits to water quality would be cumulatively moderate in the southern portions of Tomales Bay.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: As with Alternative B, Alternative C would have much greater benefits to water quality over the long-term in the Project Area than the No Action Alternative. Alternative C would be expected to have major beneficial effects over the long-term on water quality in both the East and West Pastures, as well as in Tomasini Creek and Olema Marsh. There would be some moderate adverse effects to water quality over the short-term in Olema Marsh from lowering of water surface levels within this highly impounded system and the associated biogeochemical reactions to dewatering and oxidation or breakdown of peat soils. In the case of nutrients, these short-term adverse effects would impact not only Olema Marsh, but Lagunitas Creek and southern portions of the watershed in the form of sharp spikes potentially in nutrient loading rates. However, these effects would be expected to be either very transient as in the case of declines in pH or to decline with time as in the case of nutrients as the marsh comes into equilibrium with its new conditions. From an overall project perspective, the impact of these adverse effects would be buffered by the steady improvement in water quality conditions within the Giacomini Ranch and Tomasini Creek. Negligible adverse effects may also occur during construction from temporary installation of coffer dams and accidental fallback of sediment into waters from excavation of levees along Lagunitas Creek. However, Best Management Practice (BMPs) would be instituted to minimize the effects of these actions on water quality within and downstream of the Project Area.

From a Lagunitas Creek perspective, the combination of the increased frequency of overbank flooding and the slightly greater cumulative floodwater volume routed through the East and West Pastures under Alternative C relative to Alternative B would increase the potential water quality benefits of this alternative to the southern portion of the watershed. In addition, the long-term improvement in water quality conditions in Tomasini Creek and Bear Valley Creek would also have positive impacts on watershed water quality. For this reason, Alternative C would be expected to have at least a moderate beneficial effect on water quality downstream of the Project Area in southern Tomales Bay. With elimination of grazing and elimination of intensive agricultural management practices, overbank flooding by Lagunitas and Tomasini Creeks onto the Giacomini Ranch floodplains would be expected to contribute positively to the water quality of the southern portion of Tomales Bay by filtering sediment, nutrients, pathogens, and contaminants, which is one of the more functions that wetlands play. The extent of improvement is limited to some degree by the continued influx of high loads of nutrients and pathogens from small creeks, drainages, and emergent groundwater into the Project Area. Over the long-term, overbank flooding from both Lagunitas Creek and Tomasini Creek onto floodplains would be expected to have at least a moderate beneficial effect on water quality within the southern portion of Tomales Bay by decreasing loading of sediment, coliform, phosphate, and certain forms of nitrogen, with reductions in suspended sediment and instantaneous coliform loading estimated to be as high as 19 percent and 18 percent, respectively, during approximately 2-year flood events.



Alternative D

Analysis: Alternative D would have identical negligible to major beneficial effects as Alternative C on water quality in the Project Area and the southern portion of the Tomales Bay watershed (Table 53). Under Alternative D as with Alternative C, the East and West Pastures would be completely restored, along with Olema Marsh. In terms of water quality, the only substantial difference would be the replacement of the Tomasini Creek Mesa Road culvert with a bridge or arch culvert, which may have some additional negligible beneficial effects on water quality in Tomasini Creek. Tomasini Creek would be completely realigned into one of its historic alignments just downstream of Mesa Road, which could eliminate potential contributions of nutrients and pathogens from the worker housing adjacent to Tomasini Creek just west of Mesa Road. In addition, there would be excavation of even more new tidal channels in the East Pasture, further increasing flow conveyance and exchange of waters with Tomales Bay. Cumulative floodwater volume would increase negligibly under this alternative in both the East and West Pastures, with negligible increases potentially in deposition of suspended sediment, pathogens, and other nutrients on Giacomini Ranch floodplains.

There would be no change in restoration approach in the West Pasture from Alternative C, and the same adaptive management approach would be undertaken in Olema Marsh, with initial excavation of a shallow berm and the Bear Valley Creek channel to improve hydraulic connectivity and improve drainage of currently impounded waters. As with the other alternatives, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

Possible Additional Mitigation Measures: Possible mitigation measures to address potential impacts of actions in the Olema Marsh are described under Alternative C.

Effectiveness of Possible Additional Mitigation Measures: Same as Alternative C.

Cumulative Impacts: Cumulative impacts would be identical to those described under Alternative C.

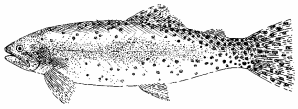
Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Alternative D would have identical negligible to major beneficial effects as Alternative C on water quality in the Project Area and the southern portion of the Tomales Bay watershed (Table 53). Under Alternative D as with Alternative C, the East and West Pastures would be completely restored, along with Olema Marsh. In terms of water quality, the only substantial difference would be the replacement of the Tomasini Creek Mesa Road culvert with a bridge or arch culvert, which may have some additional negligible beneficial effects on water quality in Tomasini Creek. Tomasini Creek would be completely realigned into one of its historic alignments just downstream of Mesa Road, which could eliminate potential contributions of nutrients and pathogens from the worker housing adjacent to Tomasini Creek just west of Mesa Road. In addition, there would be excavation of even more new tidal channels in the East Pasture, further increasing flow conveyance and exchange of waters with Tomales Bay. Cumulative floodwater volume would increase negligibly under this alternative in both the East and West Pastures, with negligible increases potentially in deposition of suspended sediment, pathogens, and other nutrients on Giacomini Ranch floodplains.

Vegetation Resources

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

Many native vegetation communities within the United States have been adversely impacted by introduction of non-native plant species, as well as a host of other anthropogenic factors such as commercial, residential, and agricultural development, and resource extraction. These activities have affected all vegetation communities, but the most highly publicized and pervasive threats are perhaps those to wetland and riparian communities. Because of the important functions wetlands and riparian areas provide to plants, wildlife, and humans, these habitats are often subject to oversight from federal, state, and local agencies.



The U.S. Army Corps of Engineers (Corps) oversees Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, both of which serve to ensure that impacts to navigable waters and special aquatic sites such as wetlands through discharge of fill or dredged material are minimized. In addition, wetlands are also regulated under other federal and state statutes and policies, including Section 401 of the Clean Water Act, the federal and California Coastal Act, the Porter-Cologne Act, and Park Service Management Policies. Some of these interpret impacts to include a much broader range of actions, including placement of material in upland areas that could affect wetlands, groundwater withdrawals, and livestock grazing. Riparian areas may or may not be considered wetlands under Section 404, but they are often regulated through establishment of "buffers" or non-development areas by other regulations and policies, including the Local Coastal Program (LCP) and California Coastal Commission (CCC) in the Coastal Zone, California Department of Fish and Game (CDFG) under Lake and Streambed Alteration Agreements, and the Point Reyes Station Community Plan. A more complete description of these policies can be found in Chapter 3 under Vegetation Resources.

Wetlands and other native vegetation communities provide habitats for native plant species, some of which have decreased dramatically in numbers or range because of development and threats from non-native species. In recognition of these threats, federal and state agencies have moved to protect individual plant species under federal and state Endangered Species Acts (ESA). The federal ESA of 1973, as amended, requires federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) before taking actions that could jeopardize the continued existence of any federally listed plant or animal species (i.e., listed as threatened or endangered) or species proposed for listing. Threats to state-listed species require consultation with CDFG. Park Service policies require parks to not only avoid impacts to threatened and endangered species, but to look for opportunities to increase, restore, or reintroduce them when these habitats or species have been threatened or extirpated (NPS 2001; Section 4.4 and 4.6). The U.S. Department of the Interior (DOI) NEPA significance criteria mandates that any actions that may have a significant impact to species listed or species proposed for listing as threatened and endangered warrant evaluation in an EIS. Through establishment of CEQA significance criteria, Marin County evaluates proposed actions for their not only their potential to reduce numbers of endangered, threatened, or rare species, but to cause substantial alterations of their habitats, whether or not they are designated as Critical Habitat by the USFWS.

Many vegetation communities and special status plant species have been severely threatened by the introduction and rapid spread of non-native invasive plant species. Park Service Management Policies (2006) direct parks to manage and, if possible and prudent, eradicate invasive species that interfere with natural processes and the perpetuation of natural features, native species or habitats (Section 4.4.4.2). In addition, "exotic species will not be allowed to displace native species if displacement can be prevented" (Section 4.4.4). DOI has defined actions that "contribute to the introduction, continued existence, or spread of noxious weeds or non-native species … or actions that may promote the introduction, growth, or expansion of the range of such species" as a criteria whether a project's actions might be significant enough to warrant an EIS.

General Assumptions and Methodologies

- The purpose of the proposed project is to restore natural hydrologic and ecological processes and functions and processes, which includes processes and functions associated with native vegetation communities.
- Changes to vegetation communities are analyzed using maps that predict long-term changes in vegetation communities based on computer-modeled changes in the extent and degree of tidal influence, as well as qualitative interpretation of the extent and strength of freshwater influences such as overbank flooding from creeks and surface flow from groundwater sources along the perimeter of the Project Area.
- For this impact topic, the duration category, "Short-Term," refers to a period of approximately 10 years during which vegetation communities would be expected to be in a transitional phase between baseline or construction and long-term conditions.

Described below are methodologies for significance criteria related to vegetation resources, including specific assumptions or details on methodologies.

Changes in Areal Extent of Native Vegetation Communities: Impact thresholds focus on change in vegetation resources in the Project Area, specifically changes in the areal extent of lands dominated or co-dominated by native vegetation communities relative to baseline conditions (Table 54). While not all non-native plant species are invasives and/or are documented to have negative effects on native plant species communities or

wildlife habitats, vegetation communities dominated by natives are considered to have more ecological integrity and be perhaps more likely to support to native wildlife through providing habitat, food, and other important relationships, some of which may yet to be documented through research. The Park Service Management Policies (2006) require parks to preserve and restore the natural abundances, diversities, dynamics, and habitats of native plant and animal populations and the communities and ecosystems in which they occur (NPS 2006; Section 4.4.1). The documented or potential importance of vegetation communities dominated by native plant species is one of the reasons that some wetland functionality assessment methodologies include native vegetation communities.

In this analysis, the percentage of the Project Area dominated or co-dominated by native plant species or associations (grouping of plants) are evaluated under the various alternatives. As defined by the Seashore vegetation mapping methodology, a plant species is considered a dominant or co-dominant component of its community when it comprises 30 percent or more of the relative cover (Schirokauer and Parravano 2003). Native species are defined using criteria in the California Invasive Plant Council and/or Jepson Manual (1993) regarding the origin of species (i.e., native, non-native, or naturalized). The Park Service conducted a detailed assessment of vegetation within the Project Area that included mapping of plant associations or groupings of one to three dominant plant species (Parsons and Allen 2004b). Plant associations consisting either wholly of native species or that had less than 25 percent cover of non-native species were mapped as native vegetation communities.

Analysis of potential changes in cover or areal extent of native vegetation communities with implementation of the various alternatives is based on maps that predict long-term changes in vegetation communities in the Project Area once equilibrium, or, more accurately, dynamic equilibrium conditions have been reached. Some of this analysis relies on information or knowledge regarding the potential invasibility of vegetation communities or which vegetation communities are less likely to support a dominant cover of non-native species. Communities that are less likely to support a dominant cover of non-native species include Tidal Salt Marsh, Tidal Brackish Marsh, Freshwater Marsh dominated by tall and medium-sized emergent species, Forested Riparian, Scrub Shrub Riparian, and Moist Grassland dominated by wildrye (*Leymus triticoides*), etc., although non-native species may occur intermixed with native species. For the duration category in vegetation communities, "Short-Term," refers to a period of approximately 10 years.

TABLE 54. NATIVE VEGETATION COMMUNITIES

Source: Park Service Management Policies, Marin CWP Nature: Beneficial, Adverse Context: Project Area Duration: Short-Term, Long-Term	
No Impact	There would be no potential for impact to vegetation communities associated with the proposed project.
Negligible	There would be a negligible change (± 10 percent) in the areal extent of native vegetation communities.
Minor	There would be a minor change (±10 – 25 percent) in the areal extent of native vegetation communities.
Moderate	There would be a moderate change (± 26 – 50 percent) in the areal extent of native vegetation communities.
Major or Substantial	There would be a substantial or major change (>50 percent) in the areal extent of native vegetation communities.

Changes in Wetlands: Impact thresholds focus on change in wetland resources, specifically changes in the areal extent of wetlands relative to baseline conditions (Table 55). Many of the functions associated with wetlands such as floodwater storage, water quality improvement, and wildlife habitat are evaluated separately in other sections. For evaluation purposes, the jurisdictional extent of wetlands subject to Corps' regulation under Section 404 of the Clean Water Act is used as the wetland boundary to assess changes relative to existing conditions. ***However, this impact indicator does NOT analyze impacts to wetlands on the basis on specific regulations issued by the Corps or other state and local agencies.*** It evaluates change on the basis of whether the proposed project would either permanently impact existing wetlands such that wetlands would be eliminated or would no longer function as wetland or would cause only temporary disturbances that would not ultimately affect wetland characteristics or wetland functioning.

Federal policy requires proposed actions to result in no net loss of wetlands, and Park Service Management Policies push parks to strive for a net gain in wetland acreage. For this reason, impact thresholds reflect this

mandate by establishing more stringent thresholds for adverse impacts. Adverse impact thresholds draw upon federal, state, and local policies. The Park Service requires a statement of finding and mitigation for any projects that may impact > 0.25 acres of "natural" wetlands except for those related to recreational facilities (e.g., overlooks, bike/foot trails, and signs) and minor stream crossings that completely span channel and wetlands (i.e., no pilings, fill, or other support structures). Under the LCP, diking, filling, and dredging in wetlands are allowable for the purpose of restoration if the alternative with the least environmental impacts is selected.

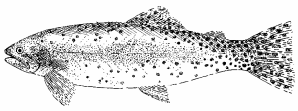
Beneficial impacts to wetlands through "net gain" in wetland acreage are evaluated using a broader range of criteria, because the high losses of wetlands that have occurred historically requires a higher percentage gain to be considered significant, particularly when viewed in a larger context such as the Tomales Bay watershed or the central California coast. Analysis of changes in cover or areal extent of wetlands is based on maps that predict long-term changes in vegetation communities in the Project Area once equilibrium, or, more accurately, dynamic equilibrium conditions have been reached.

TABLE 55. WETLANDS

Source: Section 404 and 401 of the Clean Water Act, Park Service Management Policies, Coastal Act/Marin LCP, Marin CWP Nature: Beneficial, Adverse Context: Project Area, Watershed, Supraregional (central California coast) Duration: Construction, Long-Term	
No Impact	There would be no potential change in the areal extent of wetlands associated with the proposed project.
Negligible	*Beneficial*: There would be a negligible increase (≤ 0.05 acre) in the overall areal extent of wetlands. *Adverse*: There would be a negligible decrease (≤ 0.1 acre) in the overall areal extent of wetlands.
Minor	*Beneficial*: There would be a minor increase (> 0.05 and ≤ 1 acre) in the overall areal extent of wetlands. *Adverse*: There would be a minor decrease (> 0.1 acre and ≤ 0.25 acre) in the overall areal extent of wetlands.
Moderate	*Beneficial*: There would be a moderate increase (> 1 and ≤ 5 acres) in the overall areal extent of wetlands. *Adverse*: There would be a moderate decrease (> 0.25 acre and ≤ 1.0 acre) in the overall areal extent of wetlands. If the decrease in overall areal extent of wetlands is > 1.0, the loss must be for the purpose of stream and wetland restoration activities as defined by conditions in the Corps' Nationwide Permit #27.
Major or Substantial	*Beneficial*: There would be a substantial and major increase (> 5 acres) in the overall areal extent of wetlands. *Adverse*: There would be a substantial or major decrease (> 1.0 acre) in the overall areal extent of wetlands.

Changes in Extent of Riparian and Bluff Habitat: Impact thresholds focus on change in riparian and bluff resources, specifically changes in the areal extent of riparian and bluff habitat relative to baseline conditions (Table 56). Many of the functions associated with riparian habitat such as water quality improvement and wildlife habitat are evaluated separately in other sections. Several agencies oversee activities and development in riparian habitat, including the Corps, which regulates impacts to portions of riparian habitat that are considered "wetlands;" CDFG, which regulates both wetland and non-wetland habitat on state, local, and privately owned lands; and Marin County, which has developed LCP and Community Plan policies relating to both riparian and Point Reyes Mesa bluff habitat. For analysis purposes, the extent of riparian habitat subject to LCP oversight under the Coastal Act is used as the riparian habitat boundary to assess change relative to existing conditions. This boundary may include riparian areas that would be considered both jurisdictional and non-jurisdictional wetlands by the Corps.

Within the Coastal Zone, the Streamside Conservation Area (SCA) is defined to include all riparian vegetation on both sides of the stream AND the area 50 feet landward from the edge of the riparian vegetation (Marin County Comprehensive Planning Department 1981). In no case shall the stream buffer be less than 100 feet in width, from either side of the stream, as measured from the top of the stream bank. In addition, the LCP (Marin County Comprehensive Planning Department 1981) and the Point Reyes Station Community Plan (Marin County Community Development Agency 2001) have developed some specific protection objectives regarding the Point Reyes Mesa bluff, including "preservation of the physical, ecological, and visual integrity of the bluff area located above the old railroad right-of-way through the development review process establishment of a 100-foot buffer zone extended eastward from the eastern edge of the railroad grade."



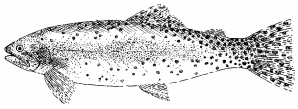
As with wetlands, because federal, state, and local policies have tried to halt the downward trend in the numbers of acres of riparian habitat, impact thresholds for adverse impacts to riparian and bluff resources reflect this regulatory agenda by establishing stringent thresholds for evaluating intensity of impacts. While thresholds cannot be interpreted as evaluating compliance with any one set of regulations or policies, thresholds for adverse impacts do draw upon federal, state, and local policies. The Park Service requires a statement of finding and mitigation for impacts >0.25 acres of "natural" wetlands, which include riparian areas that would be considered wetlands, except for projects related to recreational facilities (e.g., overlooks, bike/foot trails, and signs) and minor stream crossings that completely span channel and wetlands (i.e., no pilings, fill, or other support structures). Under the LCP, no development or vegetation removal is permitted within the SCA unless no alternatives are feasible. Similar to regulations governing impacts to wetlands, permanent loss of riparian habitat is construed as removal with no potential for future reestablishment (i.e., riparian habitat replaced with structure), whereas temporary impacts are considered those that might trim or remove vegetation and thereby temporarily decrease functionality, but would be expected to rapidly re-establish. Situations in which rapid re-growth would not occur naturally and would therefore require intervention through plantings to reestablish riparian vegetation would be considered a permanent impact.

Similar to the analysis for wetlands, beneficial impacts on riparian habitat through "net gain" of acreage are analyzed using a broader range of criteria, because gains in riparian habitat will have to be relatively high to offset the high losses suffered historically and to therefore be considered major or substantial, particularly when viewed in a larger context such as the state. Analysis of changes in cover or areal extent of riparian communities is based on maps that predict long-term changes in vegetation communities in the Project Area once equilibrium, or, more accurately, dynamic equilibrium conditions have been reached.

TABLE 56. RIPARIAN AND BLUFF HABITAT

Source: Coastal Act/Marin LCP, Community Station Plan, Park Service Management Policies CDFG Lake and Streambed Alteration Agreement Nature: Beneficial, Adverse Context: Project Area, Supraregional (California) Duration: Construction, Long-Term	
No Impact	There would be no potential for impact to riparian habitat associated with the proposed project.
Negligible	*Beneficial*: There would be a negligible increase (≤ 0.5 acre) in the areal extent of riparian habitat. *Adverse*: There would be a negligible decrease (≤ 0.1 acre) in the areal extent of riparian habitat.
Minor	*Beneficial*: There would be a minor increase (≤ 1 acre) in the areal extent of riparian habitat. *Adverse*: There would be a minor decrease (> 0.1 acre and ≤ 0.25 acre) in the areal extent of riparian habitat.
Moderate	*Beneficial*: There would be a moderate increase (> 1 and ≤ 5 acres) in the areal extent of riparian habitat. *Adverse*: There would be a moderate decrease (> 0.25 acre and ≤ 1.0 acre) in the areal extent of riparian habitat.
Major or Substantial	*Beneficial*: There would be a substantial and major increase (> 5 acres) in the areal extent of riparian habitat. *Adverse*: There would be a substantial and major decrease (> 1.0 acre) in the areal extent of riparian habitat.

Effect on Special Status Plant Species: Impact thresholds focus on effects of the proposed project on special status plant species, specifically potential changes in number of plants and areal extent of habitat relative to baseline conditions (Table 57). The Project Area does not provide habitat for any threatened or endangered plant species, but does support several plant species that are considered of concern to the Sacramento USFWS office and the California Native Plant Society (CNPS). The proposed project could affect viability of these annual species through both construction- and project-related actions. For the purposes of this analysis, separate impact indicators have been developed for construction and project-related effects. Construction-related effects are based on incorporation of standard Best Management Practices (BMPs) related to minimizing impacts of construction on annual plant species. Because the seed bank for most of these species is long-lived and can persist for more than 100 years, impacts to reproduction during construction are scaled accordingly, such that construction occurring during a portion of the reproduction season would not necessarily be considered a major or substantial impact. In addition, the typical season of reproduction does vary from year to year due to environmental conditions such as the amount and timing of precipitation.



For project-related effects, the potential effect of the project on areal extent of habitat size and, to a lesser degree, population stability is considered. The proposed project also incorporates the potential for beneficial and adverse impacts to special status plant species. Plant species within the Project Area are largely annual plant species with a high interannual variability in numbers, with the range in numbers between consecutive years for some occurrences varying as widely as 250 to 6,000 plants. These annual plant species are also highly responsive to precipitation and disturbance patterns and able to persist through less optimal environmental conditions due to a long-lived seed bank. For these reasons, population stability was deemphasized under this impact indicator because of the inability to reliably interpret subtle trends in plant numbers. To some degree, context is used to assess intensity, because actions conducted as part of the proposed project will have to be considered in a larger context to accurately interpret the intensity of effects with respect to viability of regional subpopulations, extent of the species' range, or viability of the species as a whole. Analysis of changes in special status plant species habitat is based on knowledge of species' general habitat requirements, along with any microtopographic affinities (e.g., specific elevation zones, topographic features such as swales, or typical plant associates) within these broader habitat categories. Analysis of changes in cover or areal extent of special status plant species habitat is based on maps that predict long-term changes in vegetation communities in the Project Area once equilibrium, or, more accurately, dynamic equilibrium conditions have been reached.

TABLE 57. SPECIAL STATUS PLANT SPECIES

Source: Endangered Species Act (federal and California), Regional FWS Species of Concern, Park Service Management Policies, CCC/LCP, Marin CWP, CNPS Nature: Adverse Context: Project Area Duration: Construction	
No Impact	There would be no potential for impact to special status plant species associated with construction of the proposed project.
Negligible	Construction would adhere to BMPs such that construction would not occur in those areas during the typical season of reproduction for special status plant species documented in the Project Area, with typical season of reproduction identified by the timeframe listed by either CNPS (2001) or Seashore rare plant database. Any special status plant species areas affected by construction would have topsoils stockpiled and replaced correctly.
Minor	Construction would impact at least a portion of the typical season of reproduction (≤ 33 percent) for special status plant species documented in the Project Area, with typical season of reproduction identified by the timeframe listed by either CNPS (2001) or Seashore rare plant database. Construction would adhere to stockpiling BMPs such that any special status plant species areas affected by construction would have topsoils stockpiled and replaced correctly.
Moderate	Construction would impact at least a portion of the typical season of reproduction (> 33 percent and ≤ 66 percent) for special status plant species documented in the Project Area, with typical season of reproduction identified by the timeframe listed by either CNPS (2001) or Seashore rare plant database. Construction would largely adhere to stockpiling BMPs such that most (> 50 percent) of special status plant species areas affected by construction would have topsoils stockpiled and replaced correctly.
Major or Substantial	Construction would impact most of the typical season of reproduction (> 66 percent) for special status plant species documented in the Project Area, with typical season of reproduction identified by the timeframe listed by either CNPS (2001) or Seashore rare plant database. Construction would not or only partially adhere to stockpiling BMPs such that <50 percent of special status plant species areas affected by construction would have topsoils stockpiled and replaced correctly.
Source: Endangered Species Act (federal and California), Regional FWS Species of Concern, Park Service Management Policies, CCC/LCP, Marin CWP, CNPS Nature: Beneficial, Adverse Context: Project Area, Regional (Watershed/Park), Supra-Regional (Species Range) Duration: Long-Term	
No Impact	There would be no potential for change in the areal extent of special status plant species habitat associated with implementation of the proposed project.
Negligible	There would be a negligible change in areal extent of special status plant species habitat (≤ 1 percent) relative to the extent of areas currently supporting these species. Would be expected to have no measurable effect on populations in the Project Area or regional distribution of species.
Minor	There would be a minor change in the areal extent of special status habitat (>1 percent and ≤ 10 percent)

TABLE 57. SPECIAL STATUS PLANT SPECIES

	relative to the extent of areas currently supporting these species. Would be expected to have a measurable effect on Project Area distribution of species, but not on regional distribution.
Moderate	There would be a moderate change in the areal extent of special status habitat (> 10 percent and ≤ 25 percent) relative to the extent of areas currently supporting these species. Would be expected to have an appreciable effect on Project Area distribution of species and a measurable effect on regional distribution.
Major or Substantial	There would be a major or substantial change in the areal extent of special status habitat (> 25 percent) relative to the extent of areas currently supporting these species. Would be expected to have a major or substantial effect on Project Area distribution of species and an appreciable effect on regional distribution.

Changes in Extent of Invasive Plant Species: Impact thresholds focus on changes in non-native invasive plant species, specifically changes in the areal extent of non-native invasive plant species occurrences relative to baseline conditions (Table 58). For purposes of this analysis, evaluation focuses on non-native invasive plant species identified by the Seashore or the project planning team as high priority species for management or eradication (Seashore 1989), specifically cape ivy (*Delaria odorata*), pampas grass (*Cortaderia selloana*), English ivy (*Hedera helix*), Atlantic cordgrass and Atlantic cordgrass-Pacific cordgrass hybrids (*Spartina alterniflora* and *Spartina alterniflora* X *Spartina foliosa*), perennial pepperweed (*Lepidium latifolium*), and blackberry (*Rubus discolor*). Some of these species are currently in the Project Area, while others such as Atlantic cordgrass, Atlantic cordgrass-Pacific cordgrass hybrids, or perennial pepperweed occur in the watershed or region and have the potential for occurring in the Project Area in the future. Projects have the potential for affecting the extent of invasive plant species through 1) increasing disturbance, which can encourage expansion of species adapted to disturbance; 2) direct or indirect removal or eradication of invasive plant species occurrences; and 3) changing physical conditions such that viability of existing occurrences and potential for establishment or expansion is affected, either positively or negatively. Analysis of changes in physical or ecological conditions that could affect potential for establishment or viability and expansion potential of existing non-native invasive species is based on results from hydraulic and hydrodynamic modeling (KHE 2006a), as well as maps that predict long-term changes in vegetation communities in the Project Area once equilibrium or dynamic equilibrium conditions have been reached (~ > 10 years).

TABLE 58. INVASIVE PLANT SPECIES

Source: Park Service Management Policies, DOI Nature: Beneficial, Adverse Context: Project Area, Regional (Park) Duration: Short-Term/ Long-Term	
No Impact	There would be no potential for change in the areal extent of non-native invasive plant species associated with the proposed project.
Negligible	There would be a negligible change in areal extent of non-native invasive species (± 10 percent) associated with the proposed project.
Minor	There would be a minor change in areal extent of non-native invasive species (± 11 to 25 percent) associated with the proposed project.
Moderate	There would be a moderate change in areal extent of non-native invasive species (± 26 to 50 percent) associated with the proposed project.
Major or Substantial	There would be a substantial or major change in areal extent of non-native invasive species (> 50 percent) associated with the proposed project.

Impact Analysis

TABLE 59. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR VEGETATION RESOURCES.
All impacts would be considered Project Area and are separately analyzed for Construction, Short-Term, and Long-Term.

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Native Vegetation Communities Short-Term	Beneficial - Negligible	Beneficial - Negligible	Beneficial - Negligible	Adverse - Minor	Adverse - Minor

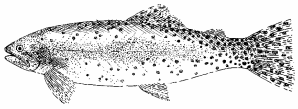


TABLE 59. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR VEGETATION RESOURCES.
All impacts would be considered Project Area and are separately analyzed for Construction, Short-Term, and Long-Term.

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Long-Term	Beneficial - Minor	Beneficial - Moderate	Beneficial - Major	Beneficial - Major	Beneficial - Major
Wetlands					
Construction/Temporary	Adverse - Negligible	Adverse - Moderate	Adverse - Moderate	Adverse - Moderate	Adverse - Moderate
Short-Term/Long-Term	Beneficial - Minor	Beneficial - Major	Beneficial - Major	Beneficial - Major	Beneficial - Major
Riparian and Bluff Habitat					
Construction/Temporary	No Impact	Adverse - Minor	Adverse - Minor	No Impact	No Impact
Short-Term/Long-Term	Beneficial - Negligible	Beneficial - Moderate	Beneficial - Major	Beneficial - Major	Beneficial - Major
Special Status Species					
Construction	Adverse-Minor	Adverse - Minor	Adverse - Minor	Adverse - Minor	Adverse - Minor
Long-Term	Beneficial - Minor	Beneficial - Major	Beneficial - Major	Beneficial - Major	Beneficial - Major
Invasive Plant Species					
Short-Term/Long-Term	Beneficial - Negligible	Beneficial - Minor	Beneficial - Moderate	Beneficial - Moderate	Beneficial - Moderate

No Action Alternative

Analysis: The effects of the No Action Alternative on vegetation and wetland resources in the Project Area would generally range from minor adverse to minor beneficial (Table 59). Under the No Action Alternative, levees, tidegates, and culverts in the Giacomini Ranch are not breached or removed, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. The Park Service is required under its existing agreement with CalTrans to restore wetlands as mitigation for impacts caused by CalTrans to aquatic habitat from a road repair on State Route 1 in Marin County in exchange for the Park Service receiving monies to purchase and restore the Giacomini Ranch. The remainder of the levee would not be deconstructed, although there would be no levee maintenance. Olema Marsh is also not restored, and there would no construction or expansion of public access facilities.

The No Action Alternative would have minor beneficial effects on vegetation resources in the Project Area, largely because of the elimination of intensive agricultural management practices. In Olema Marsh, where there is no agricultural use, conditions would be expected to remain fairly similar to baseline conditions. Under the existing purchase agreement with the Giacomini Trust, the Giacomini Ranch dairy had a 7-year Reservation of Use agreement that allowed the Giacomini family to continue dairying until the agreement expires in spring 2007. At that time, the dairy will close, and agricultural management practices associated with dairying will cease. These management practices include periodic removal of riparian vegetation associated with maintenance of levees and creek crossings; frequent removal of aquatic vegetation in drainage ditches; light and intensive spreading of manure; irrigation; and annual mowing. Most of these practices occur almost exclusively in the East Pasture, although there is some infrequent ditch maintenance and annual mowing in the West Pasture. In terms of management, the East Pasture represents the more intensively managed area that is characteristic of dairy operations, while the West Pasture more closely resembles the much less-intensively managed lands used for grazing of dairy heifers and beef cattle.

Under the No Action Alternative, there is a potential for leased grazing of dairy heifers or beef cattle on the Giacomini Ranch lands in the future, which would be in accordance with the parks' GMP. Leasing would

undergo a separate environmental review process, but it is likely that, if lease or leases were approved, that the Seashore would institute restrictions on resource setbacks or setbacks from creeks, riparian areas, and certain wetland areas, as well as the intensity, duration, and timing of grazing. In addition, certain creeks in the West Pasture would continue to be dredged to eliminate flood risks to adjacent private residences.

Vegetation Communities: Agricultural management practices have dramatically affected vegetation communities in the Project Area. Most of the Giacomini Ranch has been turned into pastureland that is dominated by non-native herbs and forbs or grasses (Wet and Dry Pasture) through exclusion of tidal influence, irrigation, and seeding of forage species (Parsons and Allen 2004b). Approximately 467 of the 613 acres in the Project Area are dominated or co-dominated by non-native plant species. Riparian habitat has been reduced considerably through grazing and direct removal during maintenance activities, with most of the Forested and Scrub Shrub Riparian habitat now restricted to the ranch perimeters.

Some other native vegetation communities – communities dominated or co-dominated by native species -- and/or pockets of native vegetation communities such as Diked Brackish Marsh, Freshwater Marsh, and Wet Meadow have encroached upon portions of the ranch that are less actively – or less successfully -- managed by grazing, irrigation, or other agricultural practices. A large extent of the northern portions of both the West and East Pastures have slowly reverted to communities dominated or co-dominated by salt marsh or brackish marsh plant species such as Diked Brackish Marsh and Salt Marsh Pasture. This reversion is due either to direct tidal influence through failing or malfunctioning tidegates or interactions between high groundwater tables and residual salts remaining in soils from tidal action prior to levee construction. The western and eastern perimeters of the Project Area often support considerable expanses of largely unmanaged Freshwater Marsh and Wet Meadow vegetation communities due to seasonal or permanent groundwater inflow from the Inverness Ridge. This groundwater emerges at the base of the ridge and sheetflows across the pastures in addition to elevating groundwater tables in the Project Area. The most notable of these features is the 7.2-acre freshwater marsh in the northern portion of the West Pasture adjacent to Sir Francis Drake Boulevard.

Discontinuation of management practices, combined with the potential for lower grazing intensity, would be expected to keep the Giacomini Ranch largely grassland, although, over time, the plant species composition would be expected to shift some in response to the lack of seeding, irrigation, and manure spreading. The absence of irrigation is expected to have the largest effect on the southern portion of the East Pasture, which would revert to a non-native grassland with more species characteristic of upland areas. Within the northern, lower-elevation portions of the East Pasture, the removal of irrigation would have little effect on hydrology, with the soils remaining inundated or saturated even without irrigation. However, in these areas, discontinuation of irrigation would still be expected to produce some of the shifts in vegetation communities and plant species that would be similar to that already observed in northern portions of the West Pasture, where residual salts in the soils have promoted establishment of halophytic or salt-tolerant communities (Salt Marsh Pasture, Diked Brackish Marsh) and species. These salt-tolerant communities have been expanding under existing conditions in the West Pasture because of changes in muted tidal flow with recent replacement of a tidegate. The extent of salt marsh and/or brackish marsh habitats would be expected to continue to increase not only in the portion of the pasture directly adjacent to the north levee, but in the northern portion of the freshwater marsh. Over the long-term, discontinuation of management practices would be expected to result in deterioration of the levees such that conditions may come to resemble those described under Alternative C. However, the trajectory of these changes is difficult to predict in light of the strong interaction between levee deterioration and wet years or series of large storms.

Some of the potential changes in vegetation communities would be determined to a large extent by whether or not leased grazing occurs. Without grazing, the pastures, and particularly the East Pasture, would be expected to respond dramatically to the removal of grazing pressures through substantial increases in overall plant biomass and rapid expansion of weedy, ruderal species such as thistles (e.g., milk thistle or *Silybum marinaum)* and non-native grasses (e.g., common velvet grass or *Holcus lanatus*) that appear well-adapted to exploiting nutrient-rich soils and reduced grazing pressure. This dynamic has been well-documented in vernal pool wetlands, where grazing is removed to protect endangered and threatened plant species only to result in a rapid increase in grassland height and biomass that either shades out or encroaches upon the rare plant species and threatens population viability. Within the Seashore, removal of grazing from one of the historic ranches near Drake's Beach – D Ranch – led to an explosion in cover and overall height of grasses and thistles, including common velvetgrass, poison hemlock (*Conium maculatum*), perennial ryegrass (*Lolium perenne*), and bull thistle (*Cirsium vulgare*; NPS unpub. data).

The potential for this phenomenon to occur – and the intensity if it does occur -- would be dictated by a number of factors, including presence and intensity of leased grazing, the nutrient content of soils, and the salt content of waters and soils. While lighter in intensity, leased grazing would be expected to maintain biomass and vegetation more characteristic of grazed lands depending upon grazing restrictions imposed by the Seashore for resource protection needs. Variability in nutrient loads would also affect vulnerability to invasion by weedy species. As discussed under Soil Resources in Chapters 3 and 4, nutrient concentrations within soils may differ between grazed and ungrazed areas, with some of the East Pasture areas having roughly double the nitrate and phosphate content of soils in the undiked marsh north of Giacomini Ranch (NPS, unpub. data). Nitrate concentrations are even higher in areas where manure was intensively spread, with levels 42 times higher than intensively grazed areas in other portions of the East Pasture (NPS, unpub. data). Some weedy or ruderal species are well-adapted to high nutrient conditions, expanding rapidly and either outcompeting or shading out other species, including native ones that may not be respond as rapidly to disturbance and changes in conditions because of low rates in seed production, clonal expansion, and recruitment. In terms of plant distribution, the effects of nutrient enrichment appear to be long-lived, with former agricultural lands believed to perhaps take decades for nutrients to decrease to levels characteristic of non-agricultural lands.

The pressures of lowering or eliminating grazing intensity and nutrient-enriched soils are countered to some degree in areas where there is either a direct source of salt from muted tidal inflow or from elevated groundwater tables interacting with residual salts in the soil. Some areas within the West Pasture had soil salinities as high as 60 ppt, which is almost double the salinity of seawater. Many non-native species cannot physiologically tolerate elevated soil salinities physiologically, which is one of the reasons why functioning, undisturbed salt marshes support largely native plant species and vegetation communities. Most of the invasion of non-native species takes place within higher elevation portions of salt marshes and upland ecotones, where salinities are lower and most of the development in terms of levees and roads occur. Even slight decreases in salinity can increase the number of non-native plant species, with a considerably larger number of non-native species occurring in brackish (salinities ~ 0.5 to 30) habitats, particularly diked brackish habitats or ones not regularly or exposed daily to tidal action.

Based on these factors, the most visible response to removal of grazing and agricultural management would probably occur in the East Pasture, where nutrient concentrations are higher due to higher historic levels of grazing intensity and manure spreading. Salinity patterns within the groundwater table would suggest that, within the East Pasture, the southern portions would probably be most affected, because of the reduced salinities in soils and groundwater. Grazing and management pressure is already considerably lower in the West Pasture, and, so, therefore, the response to closing of the dairy would not be expected to be as dramatic. At some point in the future, grasslands within the Project Area may undergo yet another change as nutrient pools within soils are reduced to levels more characteristic of non-agricultural lands. These communities are likely to be ones supporting a combination of both native and non-native species, as currently already occurs in the very northern portion of the East Pasture that is no longer actively managed and supports non-native forage species such as bentgrass (*Agrostis stolonifera*), as well as impressive numbers of the native grass species meadow barley (*Hordeum brachyantherum*). However, with the exception of perhaps the establishment of wildrye (*Leymus triticoides*) in more saline areas, native-dominated grasslands would be unlikely to establish naturally in wet conditions due to the overwhelming number of non-native hydrophytic grass species that dominate most grassy wetland areas in California.

Despite problems with reduced grazing and nutrient-enriched soils, a minor decrease in non-native vegetation communities would still be expected over the long-term under Alternative A, although issues associated with conversion from agricultural to non-agricultural conditions would mean that improvements over the short-term (~10-15 years) would be more negligible. The considerable proportion of non-native vegetation communities already present in the Giacomini Ranch under baseline conditions means that most of the potential spread in weedy, ruderal species would occur in areas already dominated or co-dominated by non-natives. Simultaneously, the small wetland restoration component, combined with discontinuation of agricultural management and lower intensity of grazing should grazing occur, would allow a small expansion of native vegetation communities, resulting in an approximately 11 percent decrease in the extent of non-native vegetation communities relative to baseline conditions.

<u>*Wetland and Riparian Resources*</u>: The wetland restoration component would expand Tidal Salt Marsh habitat by approximately 11.4 acres, with at least 11 acres of mid-marsh and 0.4 acres of high marsh proposed. Lower elevation Tidal Salt Marsh or low marsh, may establish in the very northern end of the East Pasture Old Slough, which would be re-opened to tidal action, and could potentially be colonized by species of local

concern such as Pacific cordgrass (*Spartina foliosa*). Riparian habitat would be expected to expand naturally with a reduction in grazing and levee and creek maintenance, particularly in areas where the Seashore established riparian setbacks if leased grazing was allowed. Within the West Pasture, riparian habitat would most likely increase along the upstream portions of Fish Hatchery Creek, as well as along the pasture's perimeter where groundwater flow from the Inverness Ridge creates optimal conditions for riparian growth. Other communities such as Wet Meadow and Freshwater Marsh would also potentially expand in the East Pasture, as well, with elimination of frequent ditching that act to drain many of the pastures and limit the extent of these communities. In northern portions of the Project Area, the slow, steady reversion to Diked Brackish Marsh communities would be expected to continue.

While the Giacomini Ranch is considered by most passers-by as primarily pastureland, most of the ranch is wetland subject to jurisdiction or oversight by the Corps, the CCC, and Park Service directives. Approximately 490 acres of Corps' jurisdictional wetlands and another approximately 47 of jurisdictional waters or unvegetated aquatic areas already exist within the 613-acre Project Area. Under the No Action Alternative, there would be approximately 0.46 acres of permanent impacts to wetlands from construction of the new levee separating the wetland restoration component from the rest of the East Pasture. However, removal of the East Pasture Lagunitas Creek levees would create 0.86 acres of wetlands, resulting in a minor net gain of 0.4 acres. As discussed earlier, further expansion of wetlands would be expected from more passive means of restoration related to discontinuation of ditching practices that have drained wetland areas on the perimeter of the Giacomini Ranch. If this alternative was selected, a Statement of Findings would need to be prepared in accordance with Park Service policy, because more than 0.25 acres of wetlands would be adversely impacted.

Elimination of levees and discontinuation of irrigation during the summer might have very negligible adverse impacts on the extent of wetlands, but, due to the already very wet conditions, irrigation appeared to primarily extend the length of time that good foraging conditions exist rather than increase the extent of wetlands. Levees also do not appear to have artificially increased the extent of wetlands relative to what would exist without levees through impoundment of waters. Negligible adverse effects on these communities may occur during construction from stockpiling of excavated sediments, but BMPs would be instituted to minimize construction impacts. These are discussed in more detail under Chapter 2. Overall, construction would be expected to have adverse negligible effects from temporary stockpiling, while short-term and long-term effects would be considered minor beneficial, because there would be a net gain of at least 0.4 acres. There would be no direct project impacts to riparian habitat, although, as alluded to earlier, riparian habitat may expand naturally under the No Action Alternative due to elimination of grazing under open space land uses or reduction in grazing intensity and riparian setbacks if leased grazing is permitted.

Long-Term Changes: The effect of sea level rise under the No Action Alternative is hard to predict. Recently published studies suggest that sea level may be rising at a much higher rate than originally, with water levels possibly rising as much as 3 feet by 2100 (Overpeck et al. 2006). Levees should preclude waters from inundating the East and West Pasture, but if there are breaches during storms or should tidal currents begin to further erode levees, these areas could become subject to tidal inundation. The projected rate of sea level rise could lead to regular inundation of large portions of the East and West Pastures below 4 feet NAVD88, converting lower elevation portions of the pasture to subtidal and intertidal unvegetated habitats and higher elevations portions to intertidal emergent wetland communities. The effects of sea-level rise could be compounded over the long-term by continued deterioration of the levees, which would not be maintained under this alternative.

Changes in the extent of riparian habitat would also potentially occur in Olema Marsh under the No Action Alternative. A large stand of Forested Riparian habitat borders Olema Marsh, a large Freshwater Marsh impoundment dominated by tall emergent marsh species such as cattails (*Typha* sp.) and tules (*Scirpus californicus* and *S.acutus*). Unlike the Giacomini Ranch, vegetation communities with Olema Marsh are exclusively native ones, which attest to the low "invasibility" potential of certain vegetation communities such as Freshwater Marsh (particularly areas dominated by medium- and tall emergent plant species) and established riparian communities. Conversely, the grassland that borders Olema Marsh to the east on the shutter ridge created by movement of the San Andreas Fault is dominated entirely by Non-Native Dry Grassland vegetation communities.

During recent years, water levels within Olema Marsh appear to be rising as a result of poor drainage from the marsh caused by a number of factors, including blockage of the western culvert by sedimentation, low capacity of the eastern culvert relative to the increased volume of flow now being directed to this culvert, and a small berm from a past fill event that acts as a funnel, limiting outflow, near the eastern culvert outlet (KHE

2006b). These drainage problems may have increased water surface levels as much as 6 feet since the early 1990s, and water surface levels are currently 4 feet above the eastern culvert invert (KHE 2006b). Increasing water levels appear to be expanding the extent of Freshwater Marsh at the expense of Forested and Scrub Shrub Riparian Habitat, with a ring of dead trees evident on the outer perimeter of the marsh adjacent to the riparian vegetation. Under the No Action Alternative, water surface levels would potentially continue to rise, thereby increasing threats to riparian vegetation on the marsh's edge. The implications of this for wildlife habitat and use are addressed under Fish and Wildlife Resources.

Special Status Plant Species: Most of the special status species that occur or have to potential to occur in the Project Area are wetland- or riparian-associated species. At least five special status species have been documented either in the Project Area or immediate vicinity, and all of these are Tidal Salt Marsh or Tidal Brackish Marsh associates, including Point Reyes bird's-beak (*Cordylanthus maritimus* ssp. *palustris*), Humboldt Bay owl's-clover (*Castilleja ambigua* ssp. *humboldtiensis*), salt marsh owl's-clover (*Castilleja ambigua* ssp. *ambigua*), Lyngbye's sedge (*Carex lyngbyei*), and Pacific cordgrass (*Spartina foliosa*). None of these species are listed as endangered, threatened or rare by either the USFWS or CDFG, but they have been designated as Species of State or Local Concern by the regional USFWS office or by CNPS. Three of these species are annual plant species from the same plant family (Scrophulariaceae) that occur between the mid- and high marsh intertidal marsh zones of undiked marshes. As with many annuals, these species respond positively to moderate or intermediate levels of disturbance from storm events or wrack deposition that create gaps in the vegetation canopy and often show wide fluctuations in numbers between years or groups of years such as a drought cycle in response to variable environmental conditions. Continued viability of these populations often relies on a long-lived seed bank, which has been shown for other species of bird's-beak to persist up to 100 years.

Two other species of concern, Lyngbye's sedge and Pacific cordgrass, are perennial grass or sedge species that occur in the lower elevations of Tidal Brackish Marsh and Tidal Salt Marsh, respectively. The Point Reyes region represents the southern extent of the known range for Lyngbye's sedge. Pacific cordgrass has become a plant of strong local concern, because of the accidental introduction and subsequent rapid invasion by and hybridization with its Atlantic and Gulf Coast counterpart, Atlantic cordgrass (*Spartina alterniflora*). Until 1993, the native cordgrass was not known to occur in Tomales Bay, however, since that sighting during the feasibility study for the proposed project, it has expanded rapidly throughout the Project Area and southern Tomales Bay.

These plants do not occur in the Project Area within diked marsh areas, although Humboldt Bay owl's-clover has established on the tidal marsh fringe or shelf on the outboard of both the West and East Pasture levees. Under the No Action Alternative, there would be only a minor expansion of undiked marsh habitat, with restoration of the 11-acre wetland as part of the Park Service's existing mitigation agreement with CalTrans. Ostensibly, this restoration component would increase potential habitat for all of these species, with the exception of perhaps Lyngbye's sedge, because low, mid-, and high marsh habitat would be restored. However, not all salt marsh habitat has the equivalent potential to support these special status species. Most salt marsh species are restricted to specific intertidal zones or even to microtopographic habitats within these zones. Within the Project Area, Humboldt Bay owl's-clover appears to occur at a slightly lower microtopographic intertidal zone than Point Reye's bird's-beak that differs only by an inch or two. However, in terms of absolute elevation, Humboldt Bay's owl's-clover appeared to occur within a broad range of elevations from 4 to 6 feet NAVD88 in the Project Area, suggesting that other factors influence establishment and persistence of this species such as frequency of tidal inundation, gaps in vegetation canopy, etc. Therefore, it is difficult to predict whether the restored wetland would be colonized by these species, but the proximity to established populations does considerably increases the potential for establishment to occur. Indeed, removal of levees either as part of construction or because of deterioration due to lack of maintenance has the potential to have a minor adverse effect on existing occurrences, because plants occur on the tidal marsh fringe on the outboard (or outside) of that levee. For potential losses associated with construction, appropriate BMPs would be employed to minimize impact to special status species as discussed in Chapter 2.

Invasive Plants: Under the No Action Alternative, the Seashore would implement some of the established invasive plant management programs within the Project Area, targeting some of the highest priority species. Invasive plant species represent a select subset of largely, although not exclusively, non-native species that are believed to represent some of the worst threats to viability and persistence of native vegetation communities and functions played by these communities for wildlife. For the proposed project, the list of invasive species was determined by consulting the list of high, medium, and low priority invasive species for eradication that is published by the California Invasive Plant Species Council (CalIPPC), as well as the Exotic

Plant Management Program already operating within the Seashore and north district of the GGNRA. Species proposed to be removed under the No Action Alternative include cape ivy (*Delairea odorata*) and pampas grass (*Cortaderia selloana*). The areal extent of these species within the Project Area is very low (~0.4 acres) and restricted to riparian habitat along Sir Francis Drake Boulevard and one small clump on the Tomasini Creek levee in the East Pasture. This alternative would completely eradicate occurrence of these species within the Project Area, but would have an overall minor effect on the total acreage of invasive plant species within the Project Area, reducing it by only 1.3 percent.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: The No Action Alternative would either have either no cumulative impact or very negligible cumulative impact with other projects proposed in the local community, Seashore, coastal Marin, or San Francisco Bay region.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The effects of the No Action Alternative on vegetation and wetland resources in the Project Area would generally range from minor adverse to minor beneficial (Table 59). The only active changes under this alternative would be an 11-acre wetland restoration component that is required under the Park Service's existing mitigation agreement with CalTrans, reduction in intensity or elimination of grazing, and the discontinuation of agricultural management practices that appear to have had negative effects on native vegetation communities, wetlands, riparian habitat, and special status species.

Under this alternative, the Giacomini Ranch would largely remain grassland, although it would change in nature due to the elimination of grazing or reduced grazing intensity and the elimination of intensive agricultural management practices. Depending upon a number of factors, including future grazing intensity, nutrient concentrations in soils, and influence of salts through surface waters or groundwater, this response would vary spatially. A large proportion of the pastures could respond to reduced grazing and management with a rapid increase in vegetation biomass and plant height, particularly of weedy, ruderal species such as common velvet grass and milk thistle that are well-adapted to nutrient-enriched soils and changes in environmental conditions. The extent and intensity of this response would be governed by nutrient and salt concentrations of soils, with the most visible changes occurring in areas with high nutrients and low salts such as the southern end of the East Pasture.

Despite this, there would be a minor decrease in non-native vegetation communities expected under this alternative, at least over the long-term, probably because most of the areas that would have a higher potential to support weedy species are already dominated by non-natives. Negligible to minor increases in native-dominated wetland and riparian vegetation communities would occur in the Giacomini Ranch, because of the 11-acre wetland restoration component, the reduced grazing pressure on riparian habitat, and the expansion of Wet Meadow and Freshwater Marsh communities with the elimination of frequent ditching to drain pastures. Negligible adverse effects on these communities may occur during construction from stockpiling of excavated sediments, but BMPs would be instituted to minimize construction impacts. Overall, construction would be expected to have adverse negligible effects from temporary stockpiling, while short-term and long-term effects would be considered minor beneficial, because there would be a net gain of at least 0.4 acres. In Olema Marsh, which would not be restored under the No Action Alternative, decreases in riparian habitat would continue to occur from what appears to be steadily increasing water levels over the last decade due to poor drainage through undersized culverts.

There would also be potentially minor beneficial effects on the salt marsh-associated special status plant species that already occur in the Project Area in close proximity to the restored wetland, as well as negligible beneficial effects on invasive plant species through eradication of some of the highest priority species within the Seashore (cape ivy and pampas grass). At some point in the future, grasslands within the Project Area may change yet again to communities dominated by both native and non-native species once nutrient pools within soils are reduced to levels more characteristic of non-agricultural lands. However, with the exception

of perhaps more saline areas, native grasslands would be unlikely to establish naturally in these types of wet conditions due to the overwhelming number of non-native hydrophytic grass species that dominate most grassy wetland areas in California.

Alternative A

Analysis: The effects of Alternative A on vegetation and wetland resources in the Project Area would generally range from minor adverse to major beneficial (Table 59). Under Alternative A, only the East Pasture would be restored, with new public access facilities limited to the eastern and southern perimeters of the East Pasture. There would be no restoration or construction of new public access facilities in the West Pasture or Olema Marsh, although there would the potential in the future for an extension of the southern perimeter trail to Inverness Park. The levees along and tidegate/culvert in the West Pasture and Tomasini Creek would be retained. In the East Pasture, restoration would involve breaching of levees in the East Pasture along Lagunitas Creek, and excavation of new tidal channels. The southwestern corner of the creek bank would be regraded to a more stabile profile and actively revegetated with riparian vegetation. Most of the actions under this alternative focus on removal or restoration of agricultural infrastructure such as filling of ditches, ripping of compacted roads, fence removal, and removal of pumps, pipelines, and concrete spillways.

Relative to the minor effects that discontinuation of agricultural management practices had on vegetation resources under the No Action Alternative, Alternative A would have moderate to major beneficial effects on native vegetation communities, wetlands, riparian habitat, and special status species in the Giacomini Ranch, largely because of the removal of agricultural infrastructure and reestablishment of hydrologic connectivity between the East Pasture and Lagunitas Creek and the southern portion of Tomales Bay. In Olema Marsh, where there is no agricultural use, conditions would be expected to remain fairly similar to the No Action Alternative, where negligible to minor losses or dieback of riparian habitat might occur due to increased water levels and expansion of the Freshwater Marsh.

Vegetation Communities: The largest single change under Alternative A comes from the substantial conversion of grasslands to brackish and salt marsh with reintroduction of tidal action through both breaching of levees and reconnection and expansion of the historic slough (East Pasture Old Slough) that had been ditched and straightened once the marsh was leveed. Approximately 100-150 acres of Tidal Salt Marsh would be expected to establish in the lowest elevation portions of the East Pasture at its northern end, with salt marsh distribution dictated to some degree by proximity to tidal channels or creeks such as Lagunitas Creek and the East Pasture Old Slough. Higher elevation areas, areas further from tidal channels or creeks, and areas receiving more freshwater influence from flooding of Lagunitas Creek during the winter or from seasonal to perennial emergent groundwater sources on the Point Reyes Mesa would remain brackish in nature.

Brackish communities, particularly low-growing ones that occur in diked areas, often closely resemble Tidal Salt Marsh, as they support many of the same suite of halophytic or salt-tolerant species such as saltgrass (*Distichlis spicata*), pickleweed (*Salicornia virginica*), jaumea (*Jaumea carnosa*), and alkali heath (*Frankenia salina*), along with species that are characteristic of primarily brackish areas such as fat-hen (*Atriplex triangularis*). However, low-growing, infrequently flooded brackish communities are usually more susceptible to invasion by non-native species such as brass buttons (*Cotula coronopifolia*), annual beard-grass (*Polypogon* spp.), birdfoot trefoil (*Lotus corniculatus*), loosestrife (*Lythrum hyssopifolia*), and curly dock (*Rumex crispus*). Within diked areas, these species can be persistent, but they also often occur as transitional species when tidal influence is reintroduced, because of their propensity to establish and expand rapidly under disturbance conditions and their tolerance of moderate salinities.

These non-native brackish species would be expected to move into much of the East Pasture that is influenced by tides for some period of time, as the salts in tidal waters slowly kill off the non-salt-tolerant – or at least less salt-tolerant – pasture grasses and convert grassland into marsh. This dynamic would minimize the conversion from non-native to native communities over the short-term, leading to only potentially a negligible beneficial effect during this timeframe. The rate at which more native salt marsh vegetation communities begin to establish within the East Pasture probably depends on a number of factors. Based on vegetation surveys in the West Pasture, conversion to salt marsh appears to take place more rapidly in areas adjacent to tidal channels. Repair of the tidegate on Fish Hatchery Creek in the West Pasture levee appears to have resulted in a minor increase in tidal inflow, which has some effect on the distribution of salt and/or brackish marsh habitats what was once ruderal marsh and grassland habitat in the portion of the West Pasture nearest the tidegate. Elongation of a remnant tidal marsh creek near the tidegate in response to increased tidal

influence has strongly dictated the pattern of salt marsh and/or brackish marsh establishment, with these habitats appearing to almost radiate outward from the creek. More distant, less frequently tidally inundated areas, conversely, support an abundance of non-native brackish marsh species such as brass buttons and annual beard grass amidst some native salt marsh species. Frequent tidal inundation likely increases the salt content of soils above that tolerated by some of the brackish species. The rate of establishment of native salt marsh vegetation communities will also depend on climatic cycles, with wet or high-precipitation years perhaps favoring persistence of brackish marsh non-natives. In 2006, which was characterized by a series of moderately sized to large floods, curly dock (*Rumex crispus*) suddenly appeared in the undiked salt marsh north of the Giacomini Ranch in much larger than normal numbers, probably in response to fresher or less saline surface water conditions.

Within 10-20 years, then, predominantly native vegetation communities would be expected to replace non-native vegetation communities characteristic of brackish conditions in those lowest elevation areas that are close to creeks and frequently inundated by tides. At higher elevations that are less frequently inundated by tides and more subject to freshwater influence from groundwater or run-off, communities that are more characteristic of disturbed conditions would be expected to persist for some time. These disturbance-adapted communities would be further promoted by the high nutrient concentrations present in the former dairy pastures due to high grazing intensities and practices such as manure spreading. Nutrient concentrations probably are highest in the southern portion of the East Pasture, where elevations are highest, tidal influence would be least, and disturbance from overbank flooding of Lagunitas Creek would be highest. A more complete description of this issue can be found under the No Action Alternative. Species within these brackish vegetation communities would probably consist of a diverse variety of species, including brass buttons, annual beard's grass, fat hen, curly dock, bent grass, ryegrass, and other moderately salt tolerant grasses and forbs.

Within the West Pasture, where no restoration would be performed, conditions would remain similar to those described for the No Action Alternative, with the exception that there would be no grazing. Vegetation communities in the southern portions of the West Pasture and the western perimeter would largely remain unchanged, however, in the northern portion, salt marsh and/or brackish communities would continue to expand into areas directly adjacent to the north levee and the northern portion of the freshwater marsh, as is already occurring under baseline conditions. Grazing removal would favor natural expansion of riparian habitat along Fish Hatchery Creek and the western perimeter where groundwater flow creates optimal conditions for riparian vegetation.

Wetland and Riparian Resources: Similar to the No Action Alternative, riparian habitat and, along certain portions of the ranch perimeter, freshwater wetland communities such as Wet Meadow and Freshwater Marsh would be expected to expand slightly in response to removal of grazing and the discontinuation of frequent ditching that was performed to drain pastures. These passive restoration components would combine with the more active restoration components of levee breaching, road removal, excavation of concentrated manure disposal, and removal of spoil piles to have a major beneficial effect on wetlands in the Project Area. Approximately 490 acres of Corps' jurisdictional wetlands and another approximately 47 of jurisdictional waters or unvegetated aquatic areas already exist within the 613-acre Project Area.

While Alternative A would involve at least 0.27 acres of wetland loss from construction of a culverted berm trail on the eastern perimeter of the East Pasture adjacent to Tomasini Creek and the Point Reyes Mesa bluff, the passive and active restoration components would result in an increase of approximately 9.2 acres for a net gain of 8.9 acres. Construction of the eastern perimeter trail would also require approximately another 0.2 acres of temporary impacts from removal of riparian vegetation, with these losses negatively affecting the ability of this habitat to function in water quality improvement and dissipation of flood flow energy of Tomasini Creek until vegetation can re-establish. If this alternative was selected, a Statement of Findings would need to be prepared in accordance with Park Service policy, because more than 0.25 acres of wetlands would be adversely impacted.

There may also be permanent fill of wetlands associated with the potential future extension of the southern perimeter trail to Inverness Park through possible widening of the Sir Francis Drake Boulevard road berm. The level of impact with berm widening would vary depending on final design, but impacts would be expected to minor to moderate unless the trail was placed instead on a boardwalk through the West Pasture. Within the East Pasture, there would be some major conversion of wetland types such that ditches would be filled to create emergent marsh, but at least 4.3 acres of new tidal channels with a planform or morphology more characteristic of natural marshes would be excavated to increase tidal influence into the interior of the pasture. Minor adverse effects on these communities may occur during construction from stockpiling of

excavated sediments, but BMPs would be instituted to minimize construction impacts. These are discussed in more detail under Chapter 2. Activities within wetlands would require permits from the Corps under Section 404 of the CWA, the CCC under the federal Coastal Act, and the RWQCB under Section 401 of the CWA (see Chapter 5 for more information). Overall, there would be moderate adverse effects during construction temporary impact to approximately 0.25 to 0.5 acres of wetlands from construction of the eastern perimeter trail and temporary stockpiling. However, over the short- and long-term, the permanent loss of 0.27 acres from construction of the eastern perimeter trail would be offset considerably, creating a net gain of 8.9 acres. This gain would represent a major beneficial effect.

Similar increases would occur for riparian habitat in the Giacomini Ranch through both passive and active restoration. Construction of the eastern perimeter trail would not only affect wetlands, but riparian habitat that is subject to oversight by both the CCC under the Streamside Conservation Act established under the LCP for Zone II and the Point Reyes Mesa bluff protection policies outlined in the Point Reyes Station Community Plan (see discussion earlier in this section). Approximately 0.54 acres of the riparian habitat would be permanently impacted by construction of the culverted berm, with another 0.34 acres temporarily impacted through removal of riparian vegetation for trail construction. In addition, riparian habitat in the West Pasture could possibly be impacted by the potential future extension of the southern perimeter trail, as berm widening would not only affect wetlands, but would require removal of riparian habitat. Placement of the trail on a boardwalk would eliminate these potential impacts. Under Alternative A, active riparian revegetation of the southwestern corner would be conducted on the East Pasture creek bank after being regraded to a more stabile profile. Passive riparian restoration would be expected to occur along the upper portions of Fish Hatchery Creek, where a stand of young arroyo willows (*Salix lasiolepis*) and red alders (*Alnus rubra*) are already beginning to establish. As a result of passive and active restoration, riparian habitat would increase by as much as 3.2 acres for a net gain of 2.5.

Long-Term Changes: Over the next 100 years, a net increase in wetlands and a subtle shift in wetland types could occur if sea levels rise as dramatically as has been recently projected. Recently published studies suggest that sea levels may be rising at a much higher rate than originally predicted, with water levels now predicted to rise as much as 3 feet by 2100 (Overpeck et al. 2006). This rate of sea level rise could lead to regular inundation of large portions of the East and West Pastures below 4 feet NAVD88, converting to intertidal emergent wetlands to subtidal and intertidal unvegetated habitats, and a shift upwards in the extent of areas subject to tidal inundation, thereby increasing wetland habitat and decreasing upland or grassland habitat within the Project Area.

Special Status Species: As discussed under the No Action Alternative, most of the special status species that occur or have to potential to occur in the Project Area are wetland- or riparian-associated species. At least five wetland species have been documented either in the Project Area or immediate vicinity, and all of these are Tidal Salt Marsh or Tidal Brackish Marsh associates, including Point Reyes bird's-beak, Humboldt Bay owl's-clover, salt marsh owl's-clover, Lyngbye's sedge, and Pacific cordgrass. These plants do not occur in the Project Area within diked marsh areas, although Humboldt Bay owl's-clover has established on the tidal marsh fringe or shelf on the outboard or outside of both the West and East Pasture levees. None of these species are listed as endangered, threatened or rare by either the USFWS or CDFG, but they have been designated as Species of State or Local Concern by the regional USFWS office or by CNPS.

Because this alternative would be expected to have major beneficial effects on Tidal Salt Marsh and Tidal Brackish Marsh, it would also be expected to have major beneficial effects on the potential for special status plant species to expand in areal extent and numbers. This alternative would create more than 300 acres of salt and brackish marsh habitat. As was noted under the No Action Alternative, not all salt marsh habitat has the same potential to support these special status species. For this reason, it is difficult to predict whether the restored wetland would be colonized by these species, but the proximity to established populations does considerably increases the potential for establishment to occur. As with the No Action Alternative, breaching of the East Pasture levees would have the potential to have a minor adverse effect on existing species status plant species occurrences, because Humboldt Bay owl's-clover occurs on the tidal marsh fringe on the outboard of that levee. Appropriate BMPs would be employed to minimize impact to special status species as discussed in Chapter 2.

Invasive Plants: Under Alternative A, the Seashore would expand invasive plant removal efforts to target approximately 5 acres of Himalayan blackberry in addition to cape ivy and pampas grass. Invasive plant species represent a select subset of largely, although not exclusively, non-native species that are believed to represent some of the worst threats to viability and persistence of native vegetation communities and

functions played by these communities for wildlife. For the proposed project, the list of invasive species was determined by consulting the list of high, medium, and low priority invasive species for eradication that is published by the California Invasive Plant Species Council (CalIPPC), as well as the Exotic Plant Management Program already operating within the Seashore and north district of the GGNRA. Himalayan blackberry would be removed from the southern portion of the East Pasture levee or creek bank, as well as from the small hillslope below the dairy facility on the mesa. This alternative would completely eradicate cape ivy and pampas grass within the Project Area and would remove approximately 31 percent of the Himalayan blackberry within the Project Area. Overall, it would have a minor effect on the total acreage of invasive plant species within the Project Area, reducing it by 16 percent.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

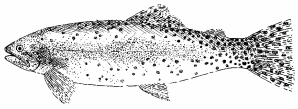
Cumulative Impacts: There are a number of projects that would have cumulative beneficial effects should Alternative A be implemented. The closest and most direct cumulative impact would come from the Bear Valley Creek Watershed Enhancement Project. The Bear Valley Creek proposes to replace failing or underperforming hydrologic infrastructure at a number of locations on Bear Valley Creek within the Seashore boundaries. There is no definitive timeframe for construction of this project, but it would be expected to benefit hydrologic and ecological processes on Bear Valley Creek and thereby have a cumulatively beneficial effect on Olema Marsh. Within the Tomales Bay watershed, the Tomales Bay Watershed Council with other local groups and agencies on a proposed restoration project at Chicken Ranch Beach on the western border of Tomales Bay that would potentially increase estuarine and riverine wetlands through removal of fill that is currently dominated by non-native upland vegetation communities.

The Seashore and the GGNRA are undertaking a number of wetland and watershed restoration projects, most of which have occurred or would occur in coastal portions of the parks that adjoin the Pacific Ocean. Most of the Seashore projects are in the Drakes Estero-Limantour Estero watershed. Similar to the proposed project, these projects focus on restoring hydrologic connectivity through removal of infrastructure that constrains natural hydrologic and ecological processes and functions. Most of these projects would result in a conversion in wetland type rather than an increase in total wetland acreage, but almost all would increase the extent of estuarine wetlands such as Tidal Salt Marsh that were lost when dams and roads were constructed. Cumulatively, the proposed project, in combination with these other projects, would be expected to have a minor to perhaps even moderate beneficial effect on estuarine wetlands and wetland functioning within the coastal Marin region and a negligible beneficial effect on native vegetation communities.

On a larger San Francisco Bay regional scale, the proposed project would benefit regional distribution of rare species, including Point Reyes bird's-beak and Pacific cordgrass. The proposed project, in combination with other regional marsh restoration projects, would be expected to increase the distribution and numbers of rare species such as Point Reyes bird's-beak, which occurs in Tomales and San Francisco Bays. In addition, the proposed project will also have a cumulatively beneficial effect on efforts to eradicate non-native cordgrass and reestablish native cordgrass in San Francisco Bay. A large percentage of the Pacific cordgrass occurrences in San Francisco Bay have been extirpated by invasion of Atlantic cordgrass or the Atlantic-Pacific cordgrass hybrid. The incredible resurgence and spread of Pacific cordgrass within Tomales Bay provides a source population of native cordgrass for possible recolonization within San Francisco Bay once extensive efforts to eradicate its invasive congeners have been successful. Therefore, over the long-term, the proposed project would be expected to have negligible to minor cumulative beneficial effects with non-native removal projects and the large number of ongoing wetland restoration projects in San Francisco Bay for species such as Pacific cordgrass and Point Reyes bird's-beak.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The effects of Alternative A on vegetation and wetland resources in the Project Area would generally range from minor adverse to major beneficial. The largest single change under this alternative relative to the No Action Alternative would come from the substantial conversion of grassland to salt and brackish marsh through breaching of the East Pasture levee, removal of agricultural infrastructure, and tidal



reconnection and expansion of the historic tidal slough. Through these actions, more than two-thirds of the East Pasture would be expected to shift from grassland to marsh. These actions would result in a moderate decrease in non-native vegetation communities of approximately 30 percent over the long-term. However, a transitional period would be expected over the short-term during which, as pasturelands slowly convert through exposure to saline conditions to marsh, restored areas would be dominated by a mix of non-native opportunistic, moderately salt-tolerant species characteristic of brackish conditions such as brass buttons, annual beard-grass, loosestrife, birdfoot trefoil, curly dock, and others. These species could persist in higher elevation portions of the East Pasture that are only infrequently inundated, subject to freshwater influence from run-off or emergent groundwater, and high in residual soil nutrients because of dairy cattle grazing and manure spreading. Native-dominated salt marsh communities would eventually move into those lower elevations that are close to tidal creeks and are more frequently inundated by tides.

No restoration would occur in either the West Pasture or Olema Marsh, but some changes would still be expected. As discussed under the No Action Alternative, increased tidal influence in the West Pasture would increase the extent of salt marsh and/or brackish marsh communities in the northern portion of the West Pasture, including in the existing freshwater marsh. Grazing removal would favor natural expansion of riparian habitat along Fish Hatchery Creek and the western perimeter where groundwater flow creates optimal conditions for riparian vegetation. Riparian habitat, on the other hand, would continue to potentially decrease in Olema Marsh in response to what appears to be increasing water levels caused by poor drainage from undersized culverts and other factors. Open water and Freshwater Marsh communities would increase as a result.

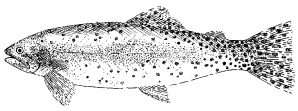
Moderate to major beneficial effects on wetland and riparian vegetation communities would occur, because of discontinuation of agricultural management practices, elimination of grazing, and removal of agricultural infrastructure such as levee breaching, removal of tidegates, and tidal reconnection and expansion of historic sloughs. Minor adverse effects on these communities may occur during construction from stockpiling of excavated sediments, but BMPs would be instituted to minimize construction impacts. These are discussed in more detail under Chapter 2. Overall, there would be moderate adverse effects during construction temporary impact to approximately 0.25 to 0.5 acres of wetlands from construction of the eastern perimeter trail and temporary stockpiling. However, over the short- and long-term, the permanent loss of 0.27 acres from construction of the eastern perimeter trail would be offset considerably, creating a net gain of 8.9 acres. There would be a minor 0.34-acre temporary impact to riparian habitat from construction of the eastern perimeter trail, and permanent losses of 0.54 acre from trail construction would be offset for a net gain of 2.5 acres.

There would also be major beneficial effects on the salt marsh-associated special status plant species that already occur in the Project Area in close proximity to the restored wetland, although minor adverse effects may occur during construction due to impacts to occurrences adjacent to removed levees. Minor beneficial effects would be expected on extent on invasive plant species through eradication of cape ivy, pampas grass, and Himalayan blackberry.

Alternative B

Analysis: The effects of Alternative B on vegetation and wetland resources in the Project Area would generally range from adverse minor to beneficial major (Table 59). Under Alternative B, the East and West Pastures would be restored, but not Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, although a viewing area would replace the informal existing trail on the West Pasture north levee, which would be removed. Restoration would involve complete removal of levees in the East Pasture along Lagunitas Creek and excavation of even more new tidal channels. Breaches would be created in the West Pasture levee. The whole southern East Pasture creek bank would be restored through removal of rip-rap bank stabilization and regraded.

Relative to the moderate effects that discontinuation of agricultural management practices, removal of agricultural infrastructure, and minor restoration actions have on vegetation resources under Alternative A, Alternative B would have major beneficial effects on native vegetation communities, wetlands, riparian habitat, and special status species in the Giacomini Ranch, largely because of the complete removal of the East Pasture and breaching of the West Pasture Levee. In Olema Marsh, where there is no agricultural use, conditions would be expected to remain fairly similar to the No Action Alternative, where negligible to minor



losses or dieback of riparian habitat might occur due to increased water levels and expansion of the Freshwater Marsh.

Vegetation Communities: Under Alternative B, the areal extent of salt marsh vegetation communities would expand dramatically in relation to the extent of grassland communities under baseline conditions and the No Action Alternative and brackish marsh and wet non-native grassland communities under Alternative A. Tidal Salt Marsh, including mid-, high, and high/upland ecotone communities, would be expected to cover more than 60 percent of the East Pasture, extending up to the maximum intertidal elevations with conversion from pasture to marsh promoted by an expanded tidal channel network. Within channels, intertidal and subtidal conditions would occur, with low marsh zones colonized either by Pacific cordgrass nearest the mouth and alkali bulrush (*Scirpus maritimus*) in the interior. Dry non-native grassland would establish at the highest elevations in the southern portion of the East Pasture, well above intertidal elevations but frequently disturbed by overbank flooding with flood frequency to increase to 2-year flood events. Brackish marsh communities consisting of sparsely vegetated mudflats would continue to persist in the northeastern portion of the East Pasture at the very lowest elevations, supported by continued muted tidal inflow from Tomasini Creek and ponding of surface freshwater run-off. The extent of Freshwater Marsh would increase in the East Pasture with excavation of a 5.4-acre feature, the Tomasini Triangle marsh, which is expected to be inundated through mid-summer with surface run-off and emergent groundwater from the adjacent Point Reyes Mesa. The duration of ponding would be enhanced by construction of a low berm at its western edge that would limit both outflow and inflow from extreme high events, maintaining fresh salinities.

The Tomasini Triangle marsh would help to offset the continuing conversion under baseline conditions of approximately half (4.5 acres) of the marsh in the West Pasture from freshwater to brackish conditions. The other half (3.9 acres) would remain freshwater marsh due to the slightly elevated topographic elevation relative to the northern portion, the distance from Fish Hatchery Creek, and proximity to large perennial sources of freshwater, the 1906 drainage and groundwater flow emerging from the base of the Inverness Ridge. Within the West Pasture, Tidal Salt Marsh would be concentrated in the northern and eastern portions in close proximity to tidal creeks such as Lagunitas and Fish Hatchery. A relatively limited amount of brackish marsh would develop around the perimeter of Tidal Salt Marsh near the upstream extent of tidal influence during the summer and fall. However, most of the western and southern portions of the West Pasture would remain similar to baseline conditions and conditions under the No Action Alternative, with Freshwater Marsh, Wet Meadow, Forested Riparian, Scrub-Shrub Riparian, and wet non-native grassland communities continuing to persist along the ranch's boundary with the Inverness Ridge due to the abundant groundwater supply. Riparian habitat would be expected to expand naturally with the removal of grazing and discontinuation of agricultural management practices, along with some limited revegetation efforts along the upper portion of Fish Hatchery Creek.

Over the long-term, these changes would result in a major beneficial effect on native vegetation communities, decreasing the extent of non-native vegetation communities by almost 70 percent relative to the 467 acres that exist under baseline conditions. As discussed under both the No Action Alternative and Alternative A, the response would not be as dramatic over the short-term in terms of reduction in non-native communities, with only a negligible beneficial effect expected. Non-native opportunistic species characteristic of brackish conditions such as brass buttons, annual beard grass, loosestrife, and curly dock would move into areas disturbed by levee removal and breaching for some period of time, as the salts in tidal waters slowly killed off the non-salt-tolerant – or at least less salt-tolerant – pasture grasses and convert grassland into marsh. The rate at which native salt marsh replaces these transitional communities probably depends on a number of factors, including proximity to tidal channels, frequency of tidal inundation, amount of freshwater inundation, climatic cycles such as a series of very wet or high-precipitation years, and soil nutrient and salt conditions. This dynamic would minimize the conversion from non-native to native communities over the short-term, leading to only potentially a negligible beneficial effect during this timeframe.

At higher elevations that are less frequently inundated by tides and perhaps more subject to freshwater influence from groundwater or run-off, communities more characteristic of disturbed conditions would be expected to persist for some time, if not indefinitely. These disturbance-adapted communities would be further promoted by the high nutrient concentrations present in the former dairy pastures due to high grazing intensities and practices such as manure spreading. Nutrient concentrations probably are highest in the southern portion of the East Pasture, where elevations are highest, tidal influence would be least, and disturbance from overbank flooding of Lagunitas Creek would be highest. A more complete description of this issue can be found under the No Action Alternative. These factors would lead the large grassland area within

the East Pasture to remain dominated by largely non-native species, although, with time, some native species may begin to be present.

Wetland and Riparian Resources: Similar to Alternative A, riparian habitat and, along certain portions of the ranch perimeter, freshwater wetland communities such as Wet Meadow and Freshwater Marsh would be expected to expand slightly in response to removal of grazing and the discontinuation of frequent ditching that was performed to drain pastures for improved grazing. These passive restoration components would combine with the more active restoration components of levee breaching and removal, tidal channel creation, freshwater marsh creation, road removal, excavation of concentrated manure disposal, and removal of spoil piles to have a major beneficial effect on wetlands in the Project Area. Approximately 490 acres of Corps' jurisdictional wetlands and another approximately 47 of jurisdictional waters or unvegetated aquatic areas already exist within the 613-acre Project Area.

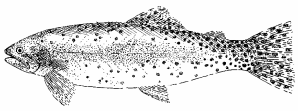
While Alternative B would still incorporate a trail on the eastern perimeter of the East Pasture, wetland losses in this area would be decreased by use of a boardwalk rather than a culverted berm trail. However, at least 1.74 acres of wetlands would be filled for creation of high tide refugia for a special status bird species in the West Pasture and a low refugia berm adjacent to the created Tomasini Triangle freshwater marsh in the East Pasture. If this alternative was selected, a Statement of Findings would need to be prepared in accordance with Park Service policy, because more than 0.25 acres of wetlands would be adversely impacted.

These losses would be offset by creation of approximately 15.8 acres of wetland through levee removal; restoration of the ranch roads; and excavation of spoil piles, berms, manure disposal areas, and upland areas, resulting in a net gain of 14.1 acres of wetlands. Construction of the eastern perimeter trail would still require approximately 0.2 acres of temporary impacts to riparian habitat from vegetation, with these losses expected to affect functionality until vegetation can re-establish, and there would be additional temporary impacts from stockpiling, with total temporary effects estimated to range from 0.25 to 0.5 acres. Overall, then, construction or temporary impacts would be moderate adverse, while over the short- and long-term, the net gain of 14.1 acres of wetlands would constitute a major beneficial effect. There may also be permanent fill of wetlands and removal of riparian habitat associated with the potential future extension of the southern perimeter trail to Inverness Park through possible widening of the Sir Francis Drake Boulevard road berm. The level of impact with berm widening would vary depending on final design, but impacts would be expected to minor to moderate unless the trail was placed instead on a boardwalk through the West Pasture.

Within the East Pasture, there would be some major conversion of wetland types such that ditches would be filled to create emergent marsh, but at least 4.6 acres of new tidal channels with a planform or morphology more characteristic of natural marshes would be excavated to increase tidal influence into the interior of the pasture. Minor adverse effects on these communities may occur during construction from stockpiling of excavated sediments, but BMPs would be instituted to minimize construction impacts.

Similar increases would occur for riparian habitat in the Giacomini Ranch through both passive and active restoration. Approximately 0.54 acres of the riparian habitat would be permanently impacted by construction of the boardwalk, with another 0.34 acres temporarily impacted through removal of riparian vegetation for trail construction. Under Alternative B, active riparian revegetation would be conducted along the entire southern portion of the East Pasture Lagunitas Creek bank after being regraded to a more stabile profile and removal of invasive Himalayan blackberry. Unlike Alternative A, active riparian restoration would also be conducted along the upper portions of Fish Hatchery Creek to speed up reestablishment of riparian vegetation, and passive restoration would be expected to increase riparian extent along the perimeter of both the East and West Pastures. As a result, riparian habitat would increase by as much as 11 acres for a net gain of almost 10 acres.

Long-Term Changes: Over the next 100 years, a net increase in wetlands and a subtle shift in wetland types may occur if sea levels are rising as dramatically as has been recently projected. Recently published studies suggest that sea level may be rising at a much higher rate than originally predicted, with water levels now predicted to increase as much as 3 feet by 2100 (Overpeck et al. 2006). This rate of sea level rise could lead to regular inundation of large portions of the East and West Pastures below 4 feet NAVD88, converting to intertidal emergent wetlands to subtidal and intertidal unvegetated habitats, and a shift upwards in the extent of areas subject to tidal inundation, thereby increasing wetland habitat and decreasing upland or grassland habitat within the Project Area.



Special Status Plant Species: Alternative B would have very similar effects to Alternative A on special status plant species, with the intensity of effects ranging from minor adverse during construction to major beneficial following implementation. As with Alternative A, this alternative would have major beneficial effects on Tidal Salt Marsh and Tidal Brackish Marsh. Therefore, it would also be expected to have major beneficial effects on the potential for the five Tidal Salt Marsh and Tidal Brackish Marsh special status plant species to expand in areal extent and numbers. This alternative would create more than 350 acres of salt and brackish marsh habitat. Under Alternative B, the West Pasture is breached, and the East Pasture, completely removed. These actions have the potential to result in a minor adverse effect on species such as Humboldt Bay owl's-clover and Lyngbye's sedge, both of which occur on the tidal marsh fringe on the outboard of Giacomini Ranch levees. Appropriate BMPs would be employed to minimize impact to special status species as discussed in Chapter 2.

Invasive Plants: Under Alternative B, the Seashore would expand invasive plant removal efforts to target approximately 9 acres of Himalayan blackberry in addition to the cape ivy and pampas grass removal efforts proposed under Alternative A. Himalayan blackberry would be removed from the entire southern portion of the East Pasture levee or creek bank, as well as from the small hillslope below the dairy facility on the mesa. This alternative would completely eradicate cape ivy and pampas grass within the Project Area and would remove approximately 60 percent of the Himalayan blackberry within the Project Area. Overall, it would have a moderate effect on the total acreage of invasive plant species within the Project Area, reducing it by 30 percent.

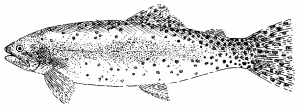
Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: As was discussed in detail under Alternative A, there are a number of projects that would have cumulative beneficial effects should Alternative B be implemented. These include the Bear Valley Creek Watershed and Fishery Enhancement Project; the Chicken Ranch Beach in Tomales Bay; and a number of wetland and watershed restoration projects in the park, Marin County, and San Francisco Bay. Most of these projects would result in a conversion in wetland type rather than an increase in total wetland acreage, but almost all would increase the extent of estuarine wetlands such as Tidal Salt Marsh that were lost when dams and roads were constructed. These projects would also increase distribution and long-term viability of certain rare species that occur in wetlands along the Marin Coast and in San Francisco Bay such as Pacific cordgrass and Point Reyes bird's-beak. Cumulatively, the proposed project, in combination with these other projects, would be expected to have major beneficial effects on estuarine wetlands and wetland functioning within Tomales Bay and the Point Reyes region and even a negligible to minor beneficial effect on native vegetation communities and rare plant species.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: Alternative B would result in negligible to major effects on vegetation and wetland resources in East and West Pastures of the Giacomini Ranch. Under this alternative, most of the grassland that exists under baseline and No Action Alternative conditions would be converted over the long-term to native salt marsh vegetation communities. Restoration would result in a decrease in non-native vegetation communities of approximately 70 percent over the long-term. However, over the short-term, changes in non-native vegetation communities would be expected to more negligible due to rapid establishment of non-native opportunistic, moderately salt-tolerant species characteristic of brackish conditions such as brass buttons, annual beard-grass, loosestrife, curly dock, birdfoot trefoil, and others during the transitional period as pasturelands slowly convert through exposure to tidal action and increased salts in water and soils. These species could persist in higher elevation portions of the pastures that are only infrequently inundated, subject to freshwater influence from run-off or emergent groundwater, and/or high in residual soil nutrients because of dairy cattle grazing and manure spreading. No restoration would occur in Olema Marsh, but the extent of riparian habitat may continue to shrink in response to what appears to be steadily increasing water levels caused by poor drainage.



Major beneficial effects on wetland and riparian vegetation communities would occur, because of discontinuation of agricultural management practices, elimination of grazing, and removal of agricultural infrastructure such as levee breaching and removal, removal of tidegates, tidal reconnection and expansion of historic sloughs, and freshwater marsh creation. Minor adverse effects on these communities may occur during construction from stockpiling of excavated sediments, but BMPs would be instituted to minimize construction impacts. These are discussed in more detail under Chapter 2. Overall, there would be moderate construction-related temporary impacts of 0.25 to 0.5 acres of wetlands from construction of the eastern perimeter trail and temporary stockpiling. However, permanent loss of 1.74 acres of wetland from construction of high tide refugia berms would be offset by passive and active restoration, resulting in a net gain of 8.9 acres. There would be a minor 0.34-acre temporary impact to riparian habitat from construction of the eastern perimeter trail, and permanent losses of 0.54 acre from trail construction would be offset for a net gain of 10.0 acres.

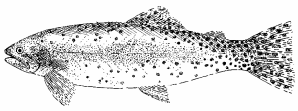
There would also be major beneficial effects on the salt marsh-associated special status plant species that already occur in the Project Area in close proximity to the restored wetland, although minor adverse effects may occur during construction due to impacts to occurrences adjacent to removed levees. Moderate beneficial effects would be expected on extent on invasive plant species through expansion of eradication efforts on cape ivy, pampas grass, and Himalayan blackberry.

Alternative C

Analysis: The effects of Alternative C on vegetation and wetland resources in the Project Area would be very similar to those of Alternative B, ranging in intensity from minor adverse to major beneficial (Table 59). As with Alternative B, Alternative C would have major beneficial effects on native vegetation communities, wetlands, riparian habitat, and special status species in the Giacomini Ranch, largely because of the complete removal of both the East Pasture and West Pasture levees in addition to discontinuation of intensive agricultural management practices, elimination of grazing, removal of agricultural infrastructure, and other restoration actions. In the East Pasture, the effects of this alternative would be enhanced relative to Alternative B through other restoration actions, as well, including expanded tidal channel creation, realignment of more than 60 percent of Tomasini Creek in the Project Area into one of its historic channel alignments, and scraping of weed-dominated surface soils from approximately 40 acres in the southern portion of the East Pasture. Native vegetation communities already dominate Olema Marsh, however, a minor to moderate adverse effect on these communities may occur over the short-term following construction during the process of lowering water surface levels and reestablishing new equilibrium conditions. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, although access along the eastern perimeter would be scaled back relative to Alternative B through conversion of the through-trail component into two spur trails. There would also still be the potential for extension of the southern perimeter trail to Inverness Park through a separate project conducted jointly with the county

Vegetation Communities – Giacomini Ranch: Under Alternative C, the areal extent of salt marsh vegetation communities remains fairly similar to Alternative B, although it represents 24 times the amount of acreage present under baseline conditions. Similar to Alternative B, Tidal Salt Marsh, including mid-, high, and high/upland ecotone communities, would be expected to cover more than 60 percent of the East Pasture, extending up to the maximum intertidal elevations with conversion from pasture to marsh promoted by an expanded tidal channel network. Under this alternative, excavated channels convert from primarily being dominated by tidal influence to being dominated by both tidal and creek influences with realignment of Tomasini Creek into the East Pasture Old Slough, one of its historic channel alignments. Realignment may expand the influence of brackish conditions within and along the channel, creating a larger, localized zone of Tidal Brackish Marsh communities with distribution of low intertidal zone species such as alkali bulrush (*Scirpus maritimus*) extending even further northward along the creek toward its mouth. Brackish marsh communities consisting of sparsely vegetated mudflats would continue to persist in the northeastern portion of the East Pasture at the very lowest elevations, supported by continued muted tidal inflow from Tomasini Creek and ponding of surface freshwater run-off.

As with Alternative B, the extent of Freshwater Marsh would increase in the East Pasture through excavation of a 5.4-acre feature, the Tomasini Triangle marsh, which is expected to be inundated through mid-summer with surface run-off and emergent groundwater from the adjacent Point Reyes Mesa. The duration of ponding would be enhanced by construction of a low berm at its western edge that would limit both freshwater outflow



and tidal inflow during extreme high tide events, thereby maintaining fresh salinities. The largest single change in the East Pasture under Alternative C would occur in the grassland areas in the southern portion of the pasture. These areas, which are above intertidal elevations, would be scraped to eliminate the existing surficial weed (and nutrient) layer, and some limited revegetation would be performed to try and promote some establishment by native grasses and herbs. The difficulty in establishing native-dominated grassland without extensive maintenance would result in non-native species continuing to be present in revegetated areas, although total cover would drop relative to Alternatives A and B. Over the long-term, this grassland would remain a combination of non-native and native species, partly due to the regular disturbance expected from more frequent (2-year flood event versus 3.5-year) overbank flooding by Lagunitas Creek that sometimes favors establishment by non-native, disturbance-adapted species.

While under Alternative C, there would be changes in hydrologic processes related to higher volumes of floodwater flowing through during overbank flooding by Lagunitas Creek during storm events, the extent of tidal inundation would remain similar to that under Alternative B, leading to few, if any changes, in expected distribution of vegetation communities relative to that alternative. As noted under Alternative B, the Tomasini Triangle marsh in the East Pasture would be created to help offset the continuing conversion under baseline conditions of approximately half (4.5 acres) of the freshwater marsh in the West Pasture from fresh to brackish conditions. The other half (3.9 acres) would remain fresh due to its slightly higher elevation; the distance from Fish Hatchery Creek; and proximity to large perennial sources of freshwater such as the 1906 drainage and groundwater flow from the Inverness Ridge. Within the West Pasture, Tidal Salt Marsh would be concentrated in the northern and eastern portions in close proximity to tidal creeks such as Lagunitas and Fish Hatchery Creeks. A relatively limited amount of brackish marsh would develop around the perimeter of Tidal Salt Marsh near the upstream extent of tidal influence during the summer and fall. However, most of the western and southern portions of the West Pasture would remain similar to baseline conditions and to conditions described for the No Action Alternative, with Freshwater Marsh, Wet Meadow, Forested Riparian, Scrub-Shrub Riparian, and wet non-native grassland communities continuing to persist along the ranch's boundary due to the abundant groundwater supply from the Inverness Ridge. Riparian habitat would expand naturally from with the removal of grazing and discontinuation of agricultural management practices, as well as from some limited revegetation efforts along the upper portion of Fish Hatchery Creek.

Vegetation Communities – Olema Marsh: Perhaps, the largest change relative to vegetation resources under Alternative C comes from restoration of Olema Marsh. Under the adaptive restoration approach, a small berm that acts as a funnel would be removed. This berm limits outflow from the marsh through its only available remaining, the eastern culvert, to Lagunitas Creek. Shallow excavation would also be performed along the flow path of Bear Valley Creek, which runs currently along the marsh's eastern perimeter, directly adjacent to the shutter ridge. Water surface levels within the marsh appear to have possibly increased as much as 6 feet since the early 1990s due to a number of factors, including elimination of drainage from the once-dominant western culvert under Levee Road due to a massive influx of sediment during the 1998 flood event (KHE 2006b). Currently, water surface levels within the marsh are consistently perched approximately 4 feet above the eastern culvert invert. These hydrologic conditions have promoted extensive establishment by Freshwater Marsh vegetation, making the Bear Valley Creek channel vegetation-choked and indistinct from the rest of the marsh. In addition, increasing water surface levels appear to be expanding Freshwater Marsh at the expense of the Forested and Scrub Shrub Riparian vegetation communities at the marsh's perimeter, with a ring of dead or dying trees evident along the marsh-riparian interface.

With implementation of the initial adaptive restoration actions, water surface levels would be expected to drop as much as 1- to 4 feet (KHE 2006b). Implementation at a later time of some of the other adaptive restoration actions could lower water surface levels another 2 feet (KHE 2006b). As waters drain down, the upper 1- to 2 feet of the marsh surface, which appear to be largely peat or undecomposed organic matter, would be dewatered and exposed to air. Through oxidation, the surface layer of these peat soils would begin to break down and decompose, causing a lowering of the marsh surface through subsidence or compaction. Subsidence rates are difficult to predict, but based on general elevations of the marsh soil surface from topographic surveys conducted, Olema Marsh could subside by as much 1-2 feet. This subsidence or compaction of soils or peat would be expected to be accompanied by an extensive die-back in tall emergent Freshwater Marsh vegetation such as cattails (*Typha* spp.), California bulrush (*Scirpus californicus*), and other bulrush (*Scirpus acutus*), with conditions largely becoming drier although some spatial variability would be expected in the degree of drawdown and vegetation die-back. During interim conditions, as the marsh begins to adjust to new water levels, there may be some invasion of non-native species in response to disturbance and a pulse in concentrations of soil and water nutrients from rapid decomposition of peat and organic-rich

mineral soils and release of bound nutrients such as ammonium (Delaune and Smith 1985, Anisfeld and Benoit 1997, Portnoy 1999, Sommer and Horwitz 2001, Parsons and Martini-Lamb 2003).

The extent of die-back by native vegetation and invasion by non-native species would also be governed by the degree of lowering in soil pH because of the production of humic acids and other types of acids during oxidation of soils. Production of these acids even under natural conditions under summer or low tide-driven oxidation of soils often leads to a die-back of vegetation in salt marshes, creating gaps in the vegetation canopy (Cooper 1974; Mitsch and Gosselink 2000). The severity of this reduction in pH depends on the soil substrate and the degree of current or historic tidal influence. The pH in overlying waters often drops lower in saline or tidally influenced soils (pH ~2-4 with pH 7 considered normal or neutral) than in freshwater wetland or peat soils (pH ~5.0), because oxidation of pyrite and other iron-sulfur compounds in tidally influenced soils leads to extensive production of additional acidic compounds (e.g., sulfuric acid and ferrous iron; Delaune and Smith 1985). In freshwater wetlands, acidity is primarily produced by breakdown of peat into humic acids.

The peat underlying Olema Marsh is expected to be relatively fresh or low salinity in nature, at least within surface layers, because tidal influences have been largely precluded or at least limited since construction of Levee Road in the late 1800s. However, estuarine-derived muds and peat probably underlie the peat at some unknown depth. Therefore, pHs generated by breakdown of organic matter would be expected to be closer to 5 than 2-4. The persistence of acidic conditions within overlying waters depends to a large degree on the influx rate of waters high in carbonates such as seawater, groundwater, or streams, with acids typically quickly buffered in wetlands with some consistent source of water. Low pHs typically persist for longer periods of time in systems with no to very low sources of inflowing water, because acid concentrations greatly exceed that of available carbonates. Permanent Bear Valley Creek inflow, combined with persistent subsurface groundwater inflow from the Inverness Ridge, would be expected to buffer acids within a short time of being produced, although there could be some spatial variability within the marsh where lower pHs would persist.

The reintroduction of tidal influence into Olema Marsh after many decades of absence may have other effects on vegetation. An influx of sulfates, which are naturally high in ocean waters, would occur during daily tidal flows, and these sulfates would typically be reduced in the low or no oxygen environment of wetland soils to its reduced form, sulfides. Abundant sulfides in the root zone can be extremely toxic to plants and is responsible for the poor performance of inland or high marsh plants (Hollis 1967; Mendelssohn et al. 1982) *in* Mitsch and Gosselink 2000; (DeLaune et al. 1987); Portnoy 1999). In most natural marshes, this toxicity is avoided through binding of sulfides with iron, which neutralizes its effect on plants. Tidally influenced marshes with low iron content and/or stagnant water conditions are likely to have higher sulfide concentrations within soils. Extensive die-back or poor plant colonization rates have been observed to occur in diked marshes undergoing tidal restoration that have been historically waterlogged with freshwater, because of the low levels of iron available to bind the new influx of sulfides produced from reduced sulfate (DeLaune et al. 1987; Portnoy 1999). While iron concentrations can be lower in San Francisco Bay region brackish and freshwater marshes (Goman 2005), analyses of metals within Project Area sediments showed extremely high concentrations of iron in all sediment samples high despite that some of the areas had been diked for decades and isolated from tidal influence (Parsons and Allen 2004a). Iron is naturally high in the Tomales Bay and other San Francisco Bay watershed and is detected regularly in creek and groundwater (NMWD, unpub. data). The permanent flow present in Bear Valley Creek, as well as subsurface groundwater inflow from the Inverness Ridge, would be expected to have maintained high iron concentrations in the peat despite the relative lack of tidal influence (Syrovetnik and Neretnieks 2002). These iron stores would be expected to buffer Olema Marsh against any negative effects of seawater reintroduction.

Over time, subsidence and vegetation die-back would be expected to reach some kind of equilibrium with water surface levels, but while subsidence can occur relatively rapidly, the long-term effects of drainage on sediment, water quality, and vegetation can persist for some time, with effects noted in some marshes even 10 years after marshes had been drained (Portnoy 1999). The implications for soils and water quality are discussed under the Soil Resources and Water Resources –Water Quality sections. Within the short-term, assumed to be at least 10- to 15 years for vegetation, a large degree of variability in vegetation communities would be expected in degree of die-back, extent of invasion by non-native species, and rate of recolonization by marsh species some kind of equilibrium is reached. Some of this variability would be driven by localized microtopography; the extent of tidal influence within the marsh following drainage; and the volumes and distribution of freshwater flow from Bear Valley Creek and small drainages and emergent groundwater from the Inverness Ridge on the western side of the marsh.

In the long-term, brackish communities, probably dominated by tall emergent species, would be expected to establish in approximately 10- to 20 acres in the northwestern portion of the marsh influenced by tides (KHE 2006a). Freshwater Marsh would reestablish throughout most of the rest of the marsh, with the extent dependent on the degree of drawdown in water surface levels. A larger degree of drawdown in water surface levels would promote encroachment upon the existing Freshwater Marsh boundaries by riparian habitat, thereby countering current trends and perhaps ultimately increasing acreage of riparian habitat substantially relative to its current extent. In addition, some indirect changes in riparian and marsh habitat upstream of Bear Valley Road might occur as a result of the decrease in water impoundment in Olema Marsh. Lowering of water surface levels and improvement in hydrologic connectivity within Olema Marsh would be expected to reduce backwater flooding upstream on Bear Valley Creek upstream of Bear Valley Road and potentially decrease the areal extent of marsh and/or riparian habitat. However, based on the mapped extent of marsh conditions in prior USGS topographic maps, the width of the marsh in this portion of Bear Valley Creek appears to have been relatively constant over time and has not measurably expanded latitudinally or longitudinally due to backwater flooding.

While short-term effects of restoration would have potentially moderate to major impacts on vegetation communities in Olema Marsh, over the long-term, this alternative would be expected to have minor to moderate beneficial effects on vegetation resources. While the composition of vegetation communities would perhaps not change dramatically, the sustainability of this system would be far greater than under non-restored conditions. The degree of restoration possible is ultimately constrained by the inability to effectively relink this once tidal marsh with the Giacomini Ranch because of the inordinate amount of fill present in Levee Road and White House Pool County Park, which now separates the marsh from Lagunitas Creek and the Giacomini Ranch. However, relative to current conditions, the trend in riparian habitat die-back would be stopped and even reversed, which would have important implications for wildlife that are discussed further under the Fish and Wildlife Resources section.

Another negligible change in vegetation communities adjacent to Olema Marsh would come from conversion of approximately 2 acres of upland grassland in the Olema Creek watershed to Open Water and Freshwater Marsh through excavation of several small depressional features as mitigation for impacts to California red-legged frog habitat.

Vegetation Communities - Project Area Summary: From an overall project perspective, changes under Alternative C would result in a major beneficial effect on native vegetation communities, decreasing the extent of non-native vegetation communities by almost 70- 90 percent relative to the 467 acres that exist under baseline conditions. The major change under Alternative C in terms of the extent of non-natives would come from complete removal of the West Pasture levee and restoration and revegetation efforts in the grasslands in the southern portion of the East Pasture. As discussed under all of the other alternatives, the response would not be as dramatic over the short-term in the Giacomini Ranch in terms of reduction in non-native communities. Non-native opportunistic species characteristic of brackish conditions such as brass buttons, annual beard grass, loosestrife, birdfoot trefoil, and curly dock would move into areas disturbed by levee removal and breaching for some period of time, as the salts in tidal waters slowly killed off the less salt-tolerant pasture grasses and convert grassland into marsh. The rate at which native salt marsh replaces these transitional communities probably depends on a number of factors, including proximity to tidal channels, frequency of tidal inundation, amount of freshwater inundation, climatic cycles such as a series of very wet years, and soil nutrient and salt conditions. This dynamic would minimize the conversion from non-native to native communities over the short-term, leading to only potentially a negligible beneficial effect during this timeframe. In combination with the moderate to major short-term adverse effects expected in Olema Marsh, the overall short-term effects for this alternative would be characterized as minor and adverse.

At higher elevations in the Giacomini Ranch that are less frequently inundated by tides and perhaps more subject to freshwater influence from groundwater or run-off, communities more characteristic of disturbed conditions would be expected to persist for some time, if not indefinitely. These disturbance-adapted communities would be further promoted by the high nutrient concentrations present in the former dairy pastures due to high grazing intensities and practices such as manure spreading. Nutrient concentrations probably are highest in the southern portion of the East Pasture, where elevations are highest, tidal influence would be least, and disturbance from overbank flooding of Lagunitas Creek would be highest. A more complete description of this issue can be found under the No Action Alternative. Under Alternative C, a considerable amount of this nutrient load is removed through scraping of surficial soils in approximately 40 acres, however, nutrient concentrations may be high in some of the lower soil strata, as well. Scraping is

intended primarily to remove seeds and a large proportion of the existing non-native species present. As discussed earlier, these soil and flood disturbance factors would lead the large grassland area within the East Pasture to remain dominated by largely non-native species, although restoration efforts, including scraping and limited revegetation, should increase cover of native species at least moderately relative to what would be expected with no restoration.

Wetland and Riparian Resources: Similar to Alternatives A and B, riparian habitat and, along certain portions of the ranch perimeter, freshwater wetland communities such as Wet Meadow and Freshwater Marsh would be expected to expand slightly in response to removal of grazing and the discontinuation of frequent ditching that was performed to drain pastures for improved grazing. These passive restoration components would combine with the more active restoration components of levee breaching and removal, tidal channel creation, freshwater marsh creation, road removal, excavation of concentrated manure disposal, and removal of spoil piles to have a major beneficial effect on wetlands in the Project Area. Approximately 490 acres of Corps' jurisdictional wetlands and another approximately 47 of jurisdictional waters or unvegetated aquatic areas already exist within the 613-acre Project Area.

Under Alternative C, the eastern perimeter trail would be converted into two spur trails, eliminating the wetland fill and riparian/bluff vegetation removal required to construct either a culverted berm or boardwalk through-trail. Alternative C would still result in approximately 1.74 acres of wetland loss from fill used to create a high tide refugia for special status species in the West Pasture and a low refugia berm adjacent to the created Tomasini Triangle freshwater marsh in the East Pasture. If this alternative was selected, a Statement of Findings would need to be prepared in accordance with Park Service policy, because more than 0.25 acres of wetlands would be adversely impacted. As this is the Preferred Alternative, a draft Statement of Findings can be found in Appendix C. There would also be some potential permanent fill of wetlands and removal of riparian habitat associated with the potential future extension of the southern perimeter trail to Inverness Park through possible widening of the Sir Francis Drake Boulevard road berm. The level of impact with berm widening would vary depending on final design, but impacts would be expected to minor to moderate unless the trail was placed instead on a boardwalk through the West Pasture.

These losses would be offset, however, by creation of approximately 18.8 acres of wetland in the Giacomini Ranch through complete levee removal; restoration of the ranch roads; and excavation of spoil piles, berms, manure disposal areas, and upland areas, resulting in a net gain of 17.0 acres of wetlands. Restoration actions in Olema Marsh would not be expected to decrease the extent of wetlands, but rather to change the type of wetland (e.g., forested versus emergent). It may also temporarily decrease functionality of this wetland, but these effects are addressed under other sections of this chapter, including Soil Resources, Water Resources-Water Quality, and Fish and Wildlife Resources. A small increase in wetland acreage would also result from excavation of approximately 2 acres of upland grassland in the Olema Creek watershed to create emergent wetland and open water aquatic habitat as mitigation for impacts to California red-legged frog habitat. Overall, then, moderate adverse impacts to wetlands would be expected during construction from temporary stockpiling. However, permanent loss of 1.74 acres of wetland from construction of high-tide refugia would be offset by passive and active restoration, resulting in a net gain of more than 19 acres.

Within the East Pasture, there would be some major conversion of wetland types such that ditches would be filled to create emergent marsh, but at least 4.9 acres of new tidal channels with a planform or morphology more characteristic of natural marshes would be excavated to increase tidal influence into the interior of the pasture. Moderate adverse effects on wetlands may occur during construction from stockpiling of excavated sediments, use of coffer dams to temporarily dewater construction areas, and excavation of a more defined flow path in Bear Valley Creek, but BMPs would be instituted to minimize construction impacts. Activities within wetlands would require permits from the Corps under Section 404 of the CWA, the CCC under the federal Coastal Act, and the RWQCB under Section 401 of the CWA.

Under Alternative C, there would be no direct adverse impacts to riparian habitat, unless the southern perimeter trail is extended to Inverness Park by widening of the Sir Francis Drake Road berm. Over the short-term, some indirect changes may occur in riparian habitats upstream of Bear Valley Road as a result of replacement of culverts that are undersized and cause backwater flooding upstream of the culvert. Improvement in hydrologic connectivity and a decrease in ponding upstream of the culverts would be expected to potentially reduce the width of the wetland and/or riparian habitat corridor for some distance upstream. Based on hydrology and the size of the wetland-riparian corridors in both areas, only a very negligible reduction in the extent of wetland and riparian habitat would probably occur.

Similar to Alternative B, a net gain of riparian habitat would occur over the long term from both passive and active restoration efforts, with active restoration efforts resulting in a net increase of approximately 11.6 acres. Similar to Alternative B, active riparian revegetation would be conducted along the entire southern portion of the East Pasture Lagunitas Creek bank and along the upper portions of Fish Hatchery Creek to accelerate reestablishment of riparian vegetation. In addition, under Alternative C, riparian revegetation would occur on the north bank of Tomasini Creek between Mesa Road and the Giacomini Hunt Lodge, which would be the terminus for one of the spur trails proposed. As noted earlier, riparian habitat would also expand naturally in many portions of the Project Area, including the upland perimeters of the East and West Pastures and Olema Marsh, with the degree of expansion in the latter ultimately dependent on which adaptive restoration actions would be taken and the subsequent degree of drawdown in water surface levels.

Long-Term Changes: Over the next 100 years, a net increase in wetlands and a subtle shift in wetland types could occur if sea levels rise as dramatically as has been recently projected. Recently published studies suggest that sea level may be rising as at much higher rates than originally predicted, with water levels potentially rising as much as 3 feet by 2100 (Overpeck et al. 2006). This rate of sea level rise could lead to regular inundation of large portions of the East and West Pastures below 4 feet NAVD88, converting to intertidal emergent wetlands to subtidal and intertidal unvegetated habitats, and a shift upwards in the extent of areas subject to tidal inundation, thereby increasing wetland habitat and decreasing upland or grassland habitat within the Project Area. Within Olema Marsh, a sea level rise of 3 feet would be expected to increase the extent of tidal influence within the marsh considerably, causing a large-scale conversion to brackish marsh.

Special Status Plant Species: As discussed under the other alternatives, most of the special status species that occur or have to potential to occur in the Project Area are wetland- or riparian-associated species. At least five Tidal Salt Marsh or Tidal Brackish Marsh species have been documented either in the Project Area or immediate vicinity, including Point Reyes bird's-beak, Humboldt Bay owl's-clover, salt marsh owl's-clover, Lyngbye's sedge, and Pacific cordgrass. These plants do not occur in the Project Area within diked marsh areas, although Humboldt Bay owl's-clover has established on the tidal marsh fringe or shelf on the outboard of both the West and East Pasture levees. None of these species are listed as endangered, threatened or rare by either the USFWS or CDFG, but they have been designated as Species of State or Local Concern by the regional USFWS office or by CNPS.

Because this alternative would be expected to have major beneficial effects on Tidal Salt Marsh and Tidal Brackish Marsh, it would also be expected to have major beneficial effects on the potential for special status plant species to expand in areal extent and numbers. Similar to Alternative B, this alternative would be expected to create more than 350 acres of salt and brackish marsh habitat. It is difficult to predict whether the restored wetland would be colonized by these species, but the proximity to established populations does considerably increases the potential for establishment to occur. As with the other alternatives, complete removal of the East and West Pasture levees would have the potential to have a minor adverse effect on existing species status plant species occurrences, because Humboldt Bay owl's-clover occurs on the tidal marsh fringe on the outboard or outside of both levees. Appropriate BMPs would be employed to minimize impact to special status species as discussed in Chapter 2.

Invasive Plants: Under Alternative C, the Seashore would expand invasive plant to remove approximately 10.5 acres of Himalayan blackberry in addition to the cape ivy, pampas grass, and Himalayan blackberry occurrences proposed for eradication under Alternative B. As was discussed under Alternative A, invasive plant species represent a select subset of largely, although not exclusively, non-native species that are believed to represent some of the worst threats to viability and persistence of native vegetation communities and functions played by these communities for wildlife. Under this alternative, Himalayan blackberry would be removed from the entire southern portion of the East Pasture levee or creek bank, as well as from the small hillslope below the dairy facility on the mesa. In addition, under this alternative, blackberry would be removed from the Tomasini Creek riparian zone between Mesa Road and the Giacomini Hunt Lodge. This alternative would completely eradicate cape ivy and pampas grass within the Project Area and would remove approximately 70 percent of the Himalayan blackberry within the Project Area. Overall, it would have a moderate effect on the total acreage of invasive plant species within the Project Area, reducing it by approximately 35 percent.

Possible Additional Mitigation Measures: Possible additional mitigation measures to reduce short-term impacts to vegetation communities in Olema Marsh could include actions that would result in a more gradual

change in water surface levels in Olema Marsh. Through a gradual reduction in water surface levels, changes to soil nutrient -- and potentially soil contaminant -- conditions would occur over a longer time period to ensure that impacts to vegetation and other resources are minimized to the extent possible. Possible mitigation measures include installation of a temporary culvert in the berm or excavation of a small lowered section or breach. With use of a breach measure, the marsh would drain over the summer, and high flows during the winter would blow out the remainder of the berm. Installation of a culvert may require construction of a temporary coffer dam to dewater conditions sufficiently to allow for proper placement.

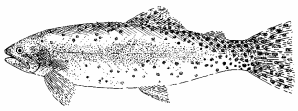
Effectiveness of Possible Additional Mitigation Measures: By instituting a more gradual reduction in water surface levels, some of the adverse effects associated with pulses in nutrients and acids that would further impact vegetation communities in Olema Marsh might be lessened or tempered to some degree. This could reduce the amount of invasion by non-native species adapted to nutrient-rich conditions. However, ultimately, the degree of die-back would be similar with or without this mitigation measure, and this approach might prolong the length of time it takes the marsh to reach new equilibrium conditions, actually increasing impacts.

Cumulative Impacts: As was discussed in detail under Alternative A, there are a number of projects that would have cumulative beneficial effects should Alternative C be implemented. These include the Bear Valley Creek Watershed and Fishery Enhancement Project; the Chicken Ranch Beach project in Tomales Bay; and a number of wetland and watershed restoration projects along coastal Marin and in San Francisco Bay. Most of these projects would result in a conversion in wetland type rather than an increase in total wetland acreage, and some would increase the extent of estuarine wetlands such as Tidal Salt Marsh that were lost when dams and roads were constructed. These projects would also increase distribution and long-term viability of certain rare species that occur in wetlands along the Marin Coast and in San Francisco Bay such as Pacific cordgrass and Point Reyes bird's-beak. Cumulatively, the proposed project, in combination with these other projects, would be expected to have a major beneficial effect on estuarine and freshwater wetlands and wetland functionality within Tomales Bay and the Point Reyes region and even a negligible to minor beneficial effect on native vegetation communities and rare plant species.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The effects of Alternative C on vegetation and wetland resources in the Project Area would be very similar to Alternative B, with the intensity of effects ranging from minor adverse to major beneficial. Under this alternative, the areal extent of salt marsh and other vegetation communities within the Giacomini Ranch would remain almost identical to that of Alternative B, but restoration would improve vegetation conditions in the grassland in the southern portion of the East Pasture by scraping off the surficial soil layer, thereby decreasing cover of non-native species and nutrient concentrations resulting from grazing and manure spreading. Native grasses and forbs would then be planted in an attempt to expand the amount of native vegetation in what would otherwise be largely a non-native dominated-grassland. Adaptive restoration efforts in Olema Marsh would be expected to halt the current downward trend in extent of riparian vegetation by dramatically lowering surface water levels within the impounded marsh. Over the long-term, these restoration efforts, including grassland restoration and revegetation and complete removal of the West Pasture levee, would result in a decrease in vegetation communities completely dominated by non-natives as much as 70-90 percent, with Olema Marsh already dominated by native vegetation communities.

Over the short-term, however, adverse effects on vegetation resources would be expected, because of moderate to major adverse changes in Olema Marsh as the marsh subsides anywhere from 1- to 4-feet initially in response to lowering of water surface levels. These adverse changes include establishment by non-native opportunistic species and a decrease in the extent of Freshwater Marsh relative to baseline conditions because of lowered water surface levels and subsequent encroachment by riparian vegetation. In the Giacomini Ranch, only a negligible beneficial effect on native vegetation communities would potentially occur over the short-term due to rapid establishment of non-native opportunistic, moderately salt-tolerant species such as brass buttons, annual beard-grass, loosestrife, birdfoot trefoil, and curly dock as pasturelands slowly convert to marsh through exposure to tidal action and increased salts in water and soils. From an overall project perspective, taking into account changes in both the Olema Marsh and the Giacomini Ranch, effects over the short-term would be characterized as adverse and minor in intensity.



As with Alternative B, major beneficial effects on wetland and riparian vegetation communities would occur with discontinuation of agricultural management practices, elimination of grazing, complete removal of all levees, removal of agricultural infrastructure such as tidegates, tidal reconnection and expansion of historic sloughs, and freshwater marsh creation. The extent of wetlands would not be expected to change with implementation of adaptive restoration, although riparian habitat would probably increase. Minor adverse effects on the areal extent of these communities may occur during construction from stockpiling of excavated sediments, but BMPs would be instituted to minimize construction impacts. These are discussed in more detail under Chapter 2. Overall, moderate adverse impacts to wetlands would be expected during construction from temporary stockpiling. However, permanent loss of 1.74 acres of wetland from construction of high-tide refugia would be offset by passive and active restoration, resulting in a net gain of more than 19 acres. This would have a major beneficial effect on wetlands. There would be no temporary impacts to riparian habitat, and losses of less than 0.1 acres from public access-related clearing activities would be offset for a net gain of 11.6 acres.

There would also be major beneficial effects on the salt marsh-associated special status plant species that already occur in the Project Area in close proximity to the restored wetland, although minor adverse effects may occur during construction due to impacts to occurrences adjacent to removed levees. Moderate beneficial effects would be expected on extent on invasive plant species through expansion of eradication efforts on cape ivy, pampas grass, and Himalayan blackberry.

Alternative D

Analysis: The effects of Alternative D on vegetation and wetland resources in the Project Area would be largely identical to Alternative C, with the intensity of effects ranging from minor adverse to major beneficial (Table 59). As with Alternative C, Alternative D would have major beneficial effects on native vegetation communities, wetlands, riparian habitat, and special status species in the Giacomini Ranch, largely because of the complete removal of both the East Pasture and West Pasture levees in addition to discontinuation of intensive agricultural management practices, elimination of grazing, removal of agricultural infrastructure, and other restoration actions.

Vegetation Communities: The largest single change under Alternative D relative to Alternative C comes from excavation of the southwestern portion of the East Pasture to intertidal or to lower intertidal elevations. Approximately 8.4 acres of grassland and upland ecotone vegetation communities would be excavated and lowered to mid- and high-Tidal Salt Marsh intertidal elevations. This restoration action would be expected to have a negligible to minor beneficial effect on native vegetation communities relative to Alternative C, although the overall effect would still be major. Another change under Alternative D is the realignment of the entire Tomasini Creek channel in the Project Area into one of its former historic alignments. This alignment would run through the created Tomasini Triangle freshwater marsh, which would be scaled back slightly from 5.4 acres under Alternative C to 5.2 acres. A small berm would be constructed on both sides of the realigned channel to discourage drainage of the marsh into the creek, and it would be actively revegetated with riparian plant species. In addition to the indirect effects on wetlands and riparian habitat upstream of Bear Valley Road, some indirect changes may occur in riparian habitats upstream of Mesa Road as a result of replacement of culverts that are undersized and cause backwater flooding upstream of the culvert. Improvement in hydrologic connectivity and a decrease in ponding upstream of the culverts would be expected to potentially reduce the width of the wetland and/or riparian habitat corridor for some distance upstream and potentially displace some obligate wetland plant species. Based on hydrology and the size of the wetland-riparian corridors in both areas, only a very minor reduction in width would probably occur.

As with Alternative C, changes under Alternative D would result in a major beneficial effect on native vegetation communities, decreasing the extent of non-native vegetation communities by almost 70- 90 percent relative to the 467 acres that exist under baseline conditions. As discussed under all of the other alternatives, the response would not be as dramatic over the short-term in the Giacomini Ranch in terms of reduction in non-native communities. In combination with the moderate to major short-term adverse effects expected in Olema Marsh, the overall short-term effects for this alternative would be characterized as minor and adverse. Under Alternative D, the extent of grassland is reduced from 40 acres to 26 acres through lowering of the southwestern portion of the East Pasture to intertidal elevations. As discussed under other alternatives, high nutrient concentrations and frequent flooding would lead the large grassland area within the East Pasture to remain dominated by largely non-native species, although restoration efforts, including

scraping and limited revegetation, should increase cover of native species somewhat relative to what would be expected with no restoration.

Wetland and Riparian Resources: Alternative D would result in approximately 1.82 acres of wetland loss from fill used to create a high tide refugia for special status species in the West Pasture and the berms in the created Tomasini Triangle freshwater marsh in the East Pasture. If this alternative was selected, a Statement of Findings would need to be prepared in accordance with Park Service policy, because more than 0.25 acres of wetlands would be adversely impacted.

However, these losses would be offset by creation of approximately 27.8 acres of wetland through excavation to intertidal elevations; complete levee removal; restoration of the ranch roads; excavation of spoil piles, berms, manure disposal areas, and upland areas, resulting in a net gain of 26.0 acres of wetlands. Overall, moderate adverse impacts to wetlands would be expected during construction from temporary stockpiling. However, permanent loss of 1.82 acres of wetland from construction of high-tide refugias would be offset by passive and active restoration, resulting in a net gain of more than 26.0 acres. This would have a major beneficial effect on wetlands.

As with Alternative C, restoration actions in Olema Marsh would not be expected to decrease the extent of wetlands, but rather to change the type of wetland (e.g., forested versus emergent) and temporarily decrease functionality. Approximately 2 acres of wetlands would be created within existing grassland in the Olema Creek watershed adjacent to Olema Marsh as mitigation for impacts to California red-legged frog breeding habitat. Within the East Pasture, wetland conversion would also occur with ditches being filled to create emergent marsh, but at least 5.6 acres of new tidal channels would be excavated to increase tidal influence into the interior of the pasture.

Under Alternative D, there would be no adverse impacts to riparian habitat. Similar to Alternative C, a net gain of riparian habitat would occur from both passive and active restoration efforts, with active restoration efforts resulting in a net increase of approximately 11.8 acres relative to 11.6 acres under Alternative C. Under Alternative D, new riparian revegetation efforts would be limited to planting of the berm created in the Tomasini Triangle freshwater marsh.

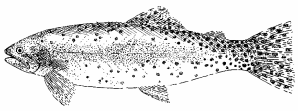
Special Status Plant Species: As discussed under the other alternatives, at least five wetland species have been documented either in the Project Area or immediate vicinity, and all of these are Tidal Salt Marsh or Tidal Brackish Marsh associates. Because this alternative would be expected to have major beneficial effects on Tidal Salt Marsh and Tidal Brackish Marsh, it would also be expected to have major beneficial effects on the potential for special status plant species to expand in areal extent and numbers. Similar to Alternative C, this alternative would be expected to create more than 350 acres of salt and brackish marsh habitat. As with the other alternatives, complete removal of the East and West Pasture levees would have the potential to have a minor adverse effect on existing species status plant species occurrences, because Humboldt Bay owl's-clover and Lyngbye's sedge occurs on the tidal marsh fringe on the outboard of both levees. Appropriate BMPs would be employed to minimize impact to special status species as discussed in Chapter 2.

Invasive Plants: Under Alternative D, the Seashore would expand invasive plant species removal efforts by increasing the amount of Himalayan blackberry removal up to approximately 11.4 acres. This alternative would remove blackberry from the Tomasini Creek riparian zone between Mesa Road and the Giacomini Hunt Lodge, as well as the entire southern portion of the East Pasture levee or creek bank and the small hillslope below the dairy facility on the mesa. This alternative would completely eradicate cape ivy and pampas grass within the Project Area and would remove approximately 75 percent of the Himalayan blackberry within the Project Area. Overall, it would have a moderate effect on the total acreage of invasive plant species within the Project Area, reducing it by approximately 38 percent.

Possible Additional Mitigation Measures: Possible additional mitigation measures would be the same as proposed under Alternative C.

Effectiveness of Possible Additional Mitigation Measures: The effectiveness of the possible additional mitigation measures would be the same as discussed under Alternative C.

Cumulative Impacts: Cumulative impacts would be the same as described as under Alternative C.



Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The effects of Alternative D on vegetation and wetland resources in the Project Area would be largely identical to Alternative C, with the intensity of effects ranging from minor adverse to major beneficial (Table 59). As with Alternative C, Alternative D would have major beneficial effects on native vegetation communities, wetlands, riparian habitat, and special status species in the Giacomini Ranch, largely because of the complete removal of both the East Pasture and West Pasture levees in addition to discontinuation of intensive agricultural management practices, elimination of grazing, removal of agricultural infrastructure, and other restoration actions.

Under this alternative, the areal extent of salt marsh and other vegetation communities within the Giacomini Ranch would remain very similar to that of Alternative C, with the exception that 8.4 acres of upland grassland would be converted to intertidal mid- and high-Tidal Salt Marsh wetlands. The extent of grasslands would be reduced from 40 acres under Alternative C to 31 acres under Alternative D through expansion of intertidal habitat. In addition, the size of the Tomasini Triangle freshwater marsh would be scaled back slightly from 5.4 under Alternative C to 5.2 acres, and a berm would be constructed along the channel to prevent drainage of waters within the marsh into the creek. Adaptive restoration efforts in Olema Marsh would be expected to reverse the downward trend in extent of riparian habitat by dramatically lowering surface water levels within the impounded marsh. Over the long-term, these restoration efforts would result in a decrease in vegetation communities completely dominated by non-natives as much as 70-90 percent, with Olema Marsh already dominated by native vegetation communities. As discussed under Alternative C, over the short-term, moderate to major adverse changes in vegetation and wetland communities would probably occur in Olema Marsh as it adjusts to almost 1- to 4 feet or more of lowering in water surface levels. From an overall project perspective, short-term effects would then be characterized as minor adverse.

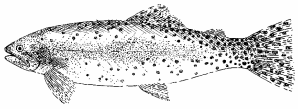
Ultimately, major beneficial effects on wetland and riparian vegetation communities would occur, because of discontinuation of agricultural management practices, elimination of grazing, complete removal of all levees, removal of agricultural infrastructure such as tidegates, tidal reconnection and expansion of historic sloughs, and freshwater marsh creation. Overall, moderate adverse impacts to wetlands would be expected during construction from temporary stockpiling. However, permanent loss of 1.82 acres of wetland from construction of high-tide refugias would be offset by passive and active restoration, resulting in a net gain of more than 26.0 acres. This would have a major beneficial effect on wetlands. Under Alternative D, there would be no temporary impacts or permanent losses to riparian habitat, and, overall, there would be a gain of 11.8 acres. There would also be major beneficial effects on the salt marsh-associated special status plant species that already occur in the Project Area in close proximity to the restored wetland, although minor adverse effects may occur during construction due to impacts to occurrences adjacent to removed levees. Moderate beneficial effects would be expected on extent on invasive plant species through expansion of eradication efforts on cape ivy, pampas grass, and Himalayan blackberry.

Fish and Wildlife Resources

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

Many wildlife species within the United States have been adversely impacted by increasing urbanization, resource extraction, contamination from pesticides, metals, and other pollutants, and introduction of non-native wildlife species. A number of regulations and policies have attempted to protect wildlife from these negative impacts, with most of these focused either on preservation of key or critical habitat or protection and recovery of the species itself.

Some of the habitat protection is accomplished directly through establishment of Critical Habitat and Essential Fish Habitat or California's Lake and Streambed Alteration Agreement (Section 1600) and LCP Zone II's policies on Environmentally Sensitive Habitats. Marin's draft CWP (2005) proposes to establish policies for protection of essential habitat for special status species, wildlife nursery areas, movement corridors, and ecotones, because of their importance to wildlife. Policies in the Point Reyes Station Community Plan (Marin County Community Development Agency 2001) specifically identify "protection of Lagunitas Creek, specifically its water quality, coho salmon and steelhead populations, and other aquatic life." In addition to direct habitat



conservation through these laws and policies, habitat protection comes indirectly from other legislation aimed at improving water quality through protection of wetlands and riparian habitat under Section 404 of the Clean Water Act, and LCP Zone II's policies regarding Streamside Conservation Areas and upland buffer areas around wetlands.

Federal and state agencies have moved to protect individual species under federal and state Endangered Species Acts (ESA). The federal ESA protects threatened and endangered species from unauthorized "take", and directs federal agencies to ensure that their actions do not jeopardize the continued existence of listed species. Even bird species that are not necessarily protected under federal or state ESA receive some protection under the Migratory Bird Treaty Act of 1918 (16 U.S.C. §703-712), which protects almost all migratory wild birds from "taking," which is defined as disturbance that causes nest abandonment and/or loss of reproductive effort (e.g., killing or abandonment of eggs or young). Park Service Management Policies (2006) require parks to preserve and restore the natural abundances, diversities, dynamics, and habitats of native animal populations and the communities and ecosystems in which they occur (NPS 2006; Section 4.4.1). The Park Service is also specifically urged to not only avoid impacts to threatened or endangered species, but to look for opportunities to restore and to strive to recover these species (NPS 2006; Section 4.4 and 4.4.2.3). A more detailed description of laws, regulations, and policies related to protection of species and wildlife habitats can be found under Fish and Wildlife Resources in Chapter 3.

Under DOI's NEPA significance criteria, actions that would considered significant and require preparation of an EIS include potentially significant impacts on species listed or proposed for listing as threatened or endangered; Critical Habitat; or migratory birds; or actions that would contribute to the introduction, continued existence, spread, or range expansion of non-native species known to occur in the area. The County's CEQA significance criteria focus on the potential for reduction in the number or a substantial alteration of habitats of endangered and threatened fish, insect, and animal species and birds listed as special status by federal and state agencies. Specifically, under CEQA, mandatory findings of significance are required for actions that would cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate an animal community, or reduce the number or range of an endangered animal. Also, these criteria identify substantial changes in the diversity, number, or habitat of any species of animals currently present or likely to occur at any time throughout the year, as well as introduction of new animals into an area or alterations that would result in a barrier to migration, dispersal, or movement of animals.

General Assumptions and Methodologies:

- The purpose of the proposed project is to restore natural hydrologic and ecological processes and functions and processes, which includes habitat for and support of wildlife species within the Project Area and the larger watershed.
- Changes in wildlife habitat are evaluated using maps prepared that predict long-term vegetation community establishment based on changes in tidal hydrologic processes and the extent of tidal influence, as well as qualitative interpretation of the extent and strength of freshwater influences such as overbank flooding from creeks and surface flow from groundwater sources along the perimeter of the Project Area.
- For most of this document, the duration category, "Short-Term," refers to a short period post-project of two to three years that was created to represent dynamic, highly variable conditions expected to occur for a short period after construction that would not be representative of long-term conditions. However, for vegetation and wildlife habitat, which evolve over a longer time period, it is appropriate to lengthen this short-term post-project period to 10 years to reflect the longer timeframe over which vegetation changes would occur, particularly as most of the Project Area would not be bareground, but vegetated, and thereby require a longer transition period.

Described below are methodologies for impact indicators related to fish and wildlife resources, including specific assumptions or details on methodologies.

Changes in High Value Wildlife Habitat: Impact thresholds focus on change in high value wildlife habitat, specifically areal extent of habitats characterized as being of high value to wildlife species currently using the Project Area, as well as those expected to use the Project Area should the proposed project be implemented. High value wildlife habitats are defined as those wetland and non-wetland habitats utilized by a high diversity and/or high number of wildlife species, including aquatic organisms such as benthic, planktonic, and macro-invertebrates and fish; amphibians; reptiles; mammals; and bird groups or guilds such as waterfowl, waterbirds, shorebirds, passerines, and raptors. High Value wildlife habitats include 1) Tidal Waters –

Subtidal/Intertidal, 2) Non-Tidal Waters-Ponds; 3) Freshwater Marsh; 4) Tidal Salt Marsh (including High/Upland Ecotone), 5) Tidal Brackish Marsh; 6) Mesic Coastal Scrub; 7) Forested and Scrub Shrub Riparian; and 8) Seasonally Flooded-Ponded Pastures/Grasslands and Meadows. A list of high value habitats and some of the associated wildlife species can be found in Table 16 in Chapter 3. Evaluation of changes in cover or areal extent of wildlife habitat is based on maps that predict long-term changes in vegetation communities in the Project Area once equilibrium or dynamic equilibrium conditions have been reached. For certain alternatives, a relatively short-term (≤10 years) post-construction period would be expected during which wildlife habitats would be in a transitional state prior to reaching to equilibrium conditions. Other types of high value wildlife habitat that have received regulatory designation such as Critical Habitat for steelhead and Essential Fish Habitat for coho salmon are discussed under the Changes in Special Status Wildlife Species section. Changes in overall extent of wetland and riparian habitats, which are very important for wildlife species, are addressed under Vegetation Resources.

TABLE 60. HIGH VALUE WILDLIFE HABITATS IN THE PROJECT AREA

Source: Endangered Species Act (federal and California), Migratory Bird Treaty Act, CDFG Lake and Streambed Alteration Agreement (1600), Park Service Management Policies, CCC/LCP Zone II, Marin CWP Nature: Beneficial, Adverse Context: Project Area Duration: Construction, Short-Term, Long-Term	
No Impact	There would be no potential for impact to wildlife habitats in the Project Area associated with the proposed project.
Negligible	There would be a negligible change (≤ 5 percent) in the areal extent of high value wildlife habitats in the Project Area.
Minor	There would be a minor change (> 5 – ≤10 percent) in the areal extent of high value wildlife habitats in the Project Area.
Moderate	There would be a moderate change (> 10 – ≤25 percent) in the areal extent of high value wildlife habitats in the Project Area.
Major or Substantial	There would be a substantial or major change (> 25 percent) in the areal extent of high value wildlife habitats in the Project Area.

Changes in Wildlife Use: Impact thresholds focus on potential changes in use of the Project Area by wildlife with implementation of the proposed project. Changes are analyzed by evaluating whether use by specific orders, guilds, or individual species or taxa would increase, decrease, or remain equivalent to use under existing or baseline conditions. The analysis targets not only species that currently use the Project Area, but those that occur in adjacent areas and might use the Project Area if the proposed project is implemented. Wildlife includes common, as well as special status species that are or are not already addressed by individual criteria. A list of orders, guilds, and individual species or taxa to be evaluated can be found in Table 17 in Chapter 3.

For each of the alternatives, the relative change in abundance of each order, guild, species, or taxa in Table 17 is evaluated relative to baseline conditions. Some weighting was incorporated such that entire guilds and orders or special status species received a higher score than common wildlife species. To some extent, this analysis also evaluated the relative ecological integrity of the wildlife community by giving non-native -- and particularly non-native, highly invasive species – negative scores: highly invasive non-native species were scored lower or more negatively than those not considered to be highly invasive. This analysis also took into account whether the change would represent a new occurrence or simply an increase or decrease of an order, guild, species, or taxa that is already present under baseline conditions. For analysis purposes, the Project Area was split into Giacomini Ranch-East Pasture, Giacomini Ranch-West Pasture, Tomasini Creek, Lagunitas Creek, and Olema Marsh and then summed for each alternative. In general, this impact indicator focuses on the intensity of change without characterizing losses or gains of particular native orders, guilds, and taxa as beneficial or adverse. However, this indicator does assume the following: (1) the Project Area does not support the number of native wildlife species that it could under unmanaged conditions; (2) increases in the number or abundance of native wildlife species would be beneficial and enhance species diversity or richness; and (3) increases in the number of non-native species would not be beneficial, even if species diversity or richness was increased.

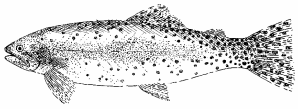


TABLE 61. GENERAL WILDLIFE USE OF THE PROJECT AREA

Source: Endangered Species Act (federal and California), Migratory Bird Treaty Act, Marine Mammal Protection Act, CDFG Lake and Streambed Alteration Agreement (1600), Park Service Management Policies, CCC/LCP Zone II, Marin CWP Nature: Beneficial, Adverse Context: Project Area Duration: Construction, Short-Term, Long-Term	
No Impact	There would be no potential for impact to wildlife use of the Project Area associated with the proposed project.
Negligible	There would be a negligible change (≤ 5 percent) in wildlife use of the Project Area.
Minor	There would be a minor change (> 5 – ≤10 percent) in wildlife use of the Project Area.
Moderate	There would be a moderate change (>10 – ≤25 percent) in wildlife use of the Project Area.
Major or Substantial	There would be a substantial or major change (>25 percent) in wildlife use of the Project Area.

Invasive Wildlife Species: Impact thresholds focus on change in non-native invasive wildlife species, specifically potential changes in the extent of area occupied or the number of occurrences. For purposes of this analysis, evaluation focuses on non-native invasive wildlife species identified by the Seashore, project planning team, or watershed groups as high priority species for management or eradication. The species of highest concern for the Project Area, watershed, or park are the green crab (*Carcinus maenas*; undiked marsh north of Giacomini Ranch), bullfrog (East Pasture, Tomasini Creek, Olema Marsh), and the red fox (*Vulpes vulpes*; Giacomini Ranch-East Pasture and dairy facility). Other non-native species of concern include the yellowfin goby (*Acanthogobius flavimanus*; in Lagunitas Creek), turkeys (*Meleagris gallopavo*; in the West Pasture), brackish water or Korean shrimp (*Palaemon macrodactylus*; in Lagunitas and Tomasini Creeks), mosquitofish (*Gambusia affinis*; in Giacomini Ranch East and West Pastures), and crayfish (Giacomini Ranch East and West Pastures).

Projects have the potential for affecting the extent of invasive wildlife species through 1) changes in habitat; 2) increasing disturbance, which can encourage expansion of species adapted to disturbance; 3) increasing hydraulic connectivity; and 4) changing physical conditions such that viability of existing occurrences and potential for establishment or expansion is affected, either positively or negatively. The analysis of the potential for an increase or decrease in invasive species takes into account, then, information on predicted changes in physical conditions and habitats obtained from hydraulic and hydrodynamic modeling (KHE 2006a) and future vegetation communities maps. Because the Project Area is already moderately to highly invaded, and because it is difficult even with the most well-designed wetland restoration project to avoid invasions by non-native aquatic species in the extremely highly invaded San Francisco Bay region, the impact thresholds for this threshold have been broadened to allow for the eventuality that restoration may not be able to be accomplished without invasion by at least some non-native aquatic organisms.

TABLE 62. INVASIVE WILDLIFE SPECIES

Source: Park Service Management Policies, DOI Nature: Beneficial, Adverse Context: Project Area, Watershed, Regional (San Francisco Bay area) Duration: *Short-Term, Long-Term*	
No Impact	There would be no potential for change in the area occupied or the abundance of non-native invasive wildlife species associated with the proposed project.
Negligible	There would be a negligible change (≤10 percent) in the area occupied or abundance of non-native invasive species in the Watershed.
Minor	There would be a minor change (>10 percent and ≤ 25 percent) in the area occupied or abundance of non-native invasive species in the Watershed.
Moderate	There would be a moderate change (>25 percent and ≤ 50 percent) in the area occupied or abundance of non-native invasive species in the Watershed.
Major or Substantial	There would be a major and substantial change (> 50 percent) in the area occupied or abundance of non-native invasive species in the Watershed.

Potential for Wildlife in Watershed to be Affected by Proposed Project: While the proposed project has the potential to affect wildlife habitat and use within the Project Area, one of the most important functions of

wetlands is the ability to support the larger wildlife community within a watershed or region. Wetlands provide a source of food through export of dissolved or particulate organic carbon, detritus, seeds, invertebrates, fish, and higher order animals that can to downstream water bodies for consumption by marine and estuarine wildlife species. In addition, wetlands provide alternate foraging and refugia habitat for marine and estuarine organisms that normally spend most of their time in the open waters of Tomales Bay or the Pacific Ocean. Many of these species represent occasional, incidental, or vagrant visitors to southern Tomales Bay that move higher into the estuary in search of food. Should contributions to the larger wildlife community be high enough, wetlands can actually influence the types or assemblages of species that frequent downstream habitats. The proposed project has the potential to affect both the opportunity and capacity of the Project Area to support the larger wildlife community within the watershed. Because of the difficulty in quantifying changes in wildlife conditions within the watershed from the proposed project, *impact thresholds qualitatively assess the potential for change under the various alternatives.* Certain components related to opportunity (e.g., need for hydrologic connectivity to move food resources out and allow marine and estuarine organisms into wetlands) or capacity (e.g., potential for increase in prey items such as fish within wetlands) have already been addressed to some degree under Water Resources and Wildlife Resources – High Value Wildlife Habitats, respectively.

TABLE 63. POTENTIAL FOR WILDLIFE CONDITIONS IN WATERSHED TO BE AFFECTED BY PROPOSED PROJECT

Source: Park Service Management Policies, CCC/LCP Zone II, Marin CWP, Community Plan Nature: Beneficial, Adverse Context: Project Area Duration: Construction, Short-Term, Long-Term	
No Impact	There would be no potential for impact to wildlife and aquatic organisms in the Tomales Bay watershed associated with the proposed project.
Negligible	A barely detectable change in conditions for wildlife would be expected downstream of the Project Area based on changes in conditions in the Project Area, including changes in the rates of production and transport of food (i.e., carbon, prey items, etc) and availability of alternate foraging and refugia habitat for marine and estuarine organisms. Changes would be in the range of natural variability for conditions in natural wetlands in Tomales Bay and surrounding watersheds and would not result in any detectable effect on food resource conditions or species assemblages in southern Tomales Bay.
Minor	A measurable change in conditions for wildlife would be expected downstream of the Project Area based on changes in conditions in the Project Area, including changes in the rates of production and transport of food (i.e., carbon, prey items, etc) and availability of alternate foraging and refugia habitat for marine and estuarine organisms. Change might be expected to result in a barely detectable effect on food resource conditions in southern Tomales Bay, but no effect on species assemblages.
Moderate	An apparent and measurable change in conditions for aquatic organisms and wildlife would be expected downstream of the Project Area based on changes in conditions in the Project Area, including changes in the rates of production and transport of food (i.e., carbon, prey items, etc) and availability of alternate foraging and refugia habitat for marine and estuarine organisms. Change might be expected to result in a measurable effect on food resources conditions in southern Tomales Bay and a barely detectable effect on species assemblages.
Major or Substantial	A substantial and major change in conditions for aquatic organisms and wildlife would be expected downstream of the Project Area based on changes in conditions in the Project Area, including changes in the rates of production and transport of food (i.e., carbon, prey items, etc) and availability of alternate foraging and refugia habitat for marine and estuarine organisms. Change might be expected to result in an appreciable effect on food resources conditions in southern Tomales Bay and a measurable effect on species assemblages.

Effect on Special Status Wildlife Species: Impact thresholds focus on effects of the proposed project on key special status wildlife species, specifically potential changes in areal extent of habitat relative to existing conditions. The proposed project could affect these species through both construction- and project-related actions. For purposes of this analysis, separate quantitative impact indicators were developed for each key special status species, but construction-related effects are evaluated for each species using the a single set of impact thresholds shown in Table 64. Construction-related effects take into account the extent to which standard Best Management Practices (BMPs) have been incorporated into the proposed project to minimize impacts of construction on wildlife. Most of these standard BMPs are discussed in Chapter 2; any other measures proposed to mitigate construction impacts are discussed in this section.

For project-related effects, the potential effect of the project on the extent and quality of habitat is considered. The analysis takes into account both impacts to existing habitat, as well as the potential for creation of new habitat. However, it errs on the conservative or cautious side by placing a higher value on

maintenance of existing habitat than on creation of new habitat, which inherently poses more risk to viability of special status species population. Impact indicators deemphasize interpretation of impacts from changes in population size or number of individuals, because many species show wide interannual variability in numbers, use the Project Area for only a limited portion of their lifecycle, or are only sporadically present within the Project Area and vicinity (e.g., California clapper rail). Most of these impact indicators use another, broader context in addition to the Project Area one to help evaluate the intensity of impacts. This is because the proposed project's effect on distribution of regional subpopulations, extent of the species' range, or distribution or viability of the species as a whole may need to be considered to accurately assess its impact on a listed species. Analysis of changes in cover or areal extent of habitat for special status wildlife species is based on maps that predict long-term changes in vegetation communities in the Project Area once equilibrium or dynamic equilibrium conditions have been reached.

Assumptions used in evaluating the effects of the proposed project for key special status wildlife species are outlined below:

TABLE 64. SPECIAL STATUS WILDLIFE SPECIES – CONSTRUCTION-RELATED EFFECTS

Source: Endangered Species Act (federal and California), Migratory Bird Treaty Act, CDFG Policy, Park Service Management Policies, CCC/LCP, Marin CWP Nature: Adverse Context: Project Area, Watershed (southern portion of Tomales Bay) Duration: Construction	
No Impact	There would be no potential for impact to special status species associated with construction of the proposed project.
Negligible	Construction would have barely detectable effects on special status species. Construction would not impact breeding or non-breeding individuals or young. Construction activities would not directly impact habitats for the species. Indirect effects would be barely detectable.
Minor	Construction would have measurable effects on special status species. Construction would have no more than measurable effects on non-breeding individuals and no effects on breeding individuals or young. Construction activities would have a barely detectable direct effect on breeding habitats, although they might have a measurable effect on non-breeding habitats. Indirect effects may be measurable.
Moderate	Construction would have appreciable effects on special status species. Construction would have appreciable effects on non-breeding individuals and barely detectable effects on breeding individuals or young. Construction activities would have a measurable direct effect on breeding habitats and/or an appreciable effect on non-breeding habitats. Indirect effects may be appreciable.
Major or Substantial	Construction would have major or substantial effects on special status species. Construction would have major or substantial effects on non-breeding individuals and measurable to major or substantial effects on breeding individuals or young. Construction activities would have at least an appreciable direct effect on breeding habitats and/or a major or substantial effect on non-breeding habitats. Indirect effects may be major or substantial.

California red-legged frog (federally threatened)

- California red-legged frog (*Rana aurora draytonii*) is identified as a Critical Resource objective for the proposed project, although objectives emphasize preserving the total extent or amount of habitat rather than focusing on maintaining the existing habitat *in situ* or in place.
- The Project Area does not fall within Critical Habitat areas identified by the USFWS, however, the Seashore and adjoining West Marin lands are designated as the Point Reyes Peninsula Core Area. Core Areas represent areas where USFWS will concentrate their recovery actions, because the amount of protected area will allow for long-term viability of existing populations.
- Evaluation of potential impacts to California red-legged frog under the various alternatives focuses on two elements. One of these elements assesses change in appropriate breeding habitat units in the Seashore-owned and managed portions of the Point Reyes Peninsula Core Area, with "appropriate" breeding habitat defined as meeting the following structural and non-structural criteria based on constituent elements identified as important in the USFWS Critical Habitat designation and information from Dr. Gary Fellers, Research Biologist, USGS:

- *Breeding Habitat*: Seasonally flooded areas that are inundated through at July or August of most years, except during extreme drought, with a minimum deep water depth of 20 inches and within 660 to 3,300 feet of a permanent non-breeding water source (G. Fellers, USGS, *pers. comm.*); OR
- Riparian and/or upland habitat surrounding or bordering seasonally flooded areas up to 300 feet from the water's edge (USFWS);
- *Water Salinity*: Breeding habitat should have waters with maximum salinities less than 4.5 ppt
- *Predators*: While bullfrogs are predators of red-legged frog and are considered to be a deterrent to stable red-legged frog populations, the presence of bullfrog is not necessarily an indication that red-legged frog populations are in jeopardy (G. Fellers, USGS, *pers. comm.*). Seasonally flooded areas that draw down completely in the fall do tend to preclude bullfrogs, because bullfrog tadpoles require year-round inundation (S. Granholm, wildlife biologist, LSA Associates, *pers. comm.*).
- *Documented Habitat in Recovery Unit*: Based on surveys conducted by the USGS, there are approximately 76 documented breeding habitat units in the Pastoral Zone of the Seashore (NPS 2004). The Pastoral Zone represents approximately one-third of the Seashore land area. A unit is defined as a discrete pond or other type of wetland or water feature in which frogs are known to breed or have been consistently observed and are believed to breed.

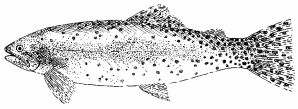
- The second element used for evaluation of changes to California red-legged frog under the various alternatives involves expected changes in distribution of the species within the Project Area and/or in the Seashore-owned or managed portions of the Point Reyes Peninsula Core Area.
- Under some alternatives, there is a potential for short-term impacts relating to the length of time that would be required for vegetation communities to undergo the transition from pasturelands to more unmanaged habitats, including establishment and development of any new freshwater marsh areas.

TABLE 65. SPECIAL STATUS WILDLIFE SPECIES - CALIFORNIA RED-LEGGED FROG

Source: Endangered Species Act (federal and California), Park Service Management Policies, CCC/LCP Zone II, Marin CWP Nature: Beneficial, Adverse Context: Project Area, Regional (Point Reyes Recovery Unit), Supra-Regional (Species Range) Duration: Short-Term(Temporary), Long-Term (Permanent)	
No Impact	There would be no potential for impact to California red-legged frog associated with implementation of the proposed project.
Negligible	There would be a barely detectable effect (≤ 1 percent) expected on appropriate breeding habitat units in the Point Reyes Peninsula Core Area. Would be expected to have a barely detectable effect on Project Area distribution of species and no effect on distribution in the Point Reyes Peninsula Core Area.
Minor	There would be a measurable effect (> 1 percent and ≤ 2 percent) expected on appropriate breeding habitat units in the Point Reyes Peninsula Core Area. Would be expected to have a measurable effect on Project Area distribution of species, but no effect to a barely detectable effect on distribution in the Point Reyes Peninsula Core Area.
Moderate	There would be an appreciable effect (> 2 percent and ≤ 5 percent) expected on appropriate breeding habitat units in the Point Reyes Peninsula Core Area. Would be expected to have an appreciable effect on Project Area distribution of species and either a barely detectable or measurable effect on distribution in the Point Reyes Peninsula Core Area.
Major or Substantial	Would have a major or substantial effect on breeding habitat (> 5 percent) expected on appropriate breeding habitat units in the Point Reyes Peninsula Core Area. Would be expected to have a striking effect on Project Area distribution of species and a measurable or appreciable effect on distribution in the Point Reyes Peninsula Core Area.

Tidewater goby (federally endangered)

- Tidewater goby (*Eucylogobius newberryi)* is identified as a Critical Resource objective for the proposed project, although objectives emphasize preserving the total extent or amount of habitat rather than focusing on maintaining the existing habitat *in situ* or in place.
- The proposed project has the potential to affect tidewater goby through restoration of tidal and freshwater hydrologic processes.
- Restoration of freshwater hydrologic processes would also have the potential to affect gobies should actions increase flood scour or sedimentation that eliminates the preferred sandy substrates or eliminate sheltered, backwater habitat areas.
- The population in the Project Area represents a genetically distinct unit from the other nearest populations at Salmon Creek Marsh and Rodeo Lagoon, which are located outside the Tomales Bay watershed. Therefore, impacts to the Project Area population would have impacts on regional distribution.



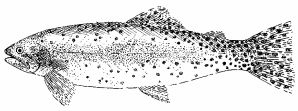
- Analysis of potential impacts to tidewater goby habitat under the various alternatives focuses on changes in acreage of habitat, with "appropriate" habitat defined as meeting the following criteria based on information published in the Recovery Plan and discussed in other documents (Swift 2003):
  - Critical habitat has only been established for the southern California portion of the range.
  - Brackish water portions of creeks or open water impoundments (e.g., lagoons) that maintain salinities in or below the 20 ppt range during the summer and fall;
  - Reduced flood scour OR backwater or sheltered areas along creeks subject to high flood scour that offer refugia during flood events;
  - Maintenance of some areas with permanent subtidal conditions in creeks or open water impoundments;
  - Presence of sandy substrate in some portion of creek or open water impoundment for burrows.
  - *Presence of predators*: Some of the documented freshwater and brackish water predators on goby include largemouth bass, green sunfish (*Lepomis cyanellus*), striped bass (*Morone saxatilis*), yellowfin goby, and shimofuri goby (*Tridentiger bifasciatus*; Swift 2003). Crayfish may disrupt nesting sites while digging for the eggs in the sand (Swift 2003). The native rainbow trout or steelhead, starry flounder, Pacific staghorn sculpin, and prickly sculpin have also been documented to feed on tidewater gobies in the lower Santa Ynez River and elsewhere (Swift 2003).
- Under some alternatives, there is a potential for short-term impacts relating to the length of time that would be required for the appropriate habitat to develop, including establishment and development of any new brackish water channels.

TABLE 66. SPECIAL STATUS WILDLIFE SPECIES – TIDEWATER GOBY

Source: Endangered Species Act (federal and California), Park Service Management Policies, CCC/LCP Zone II, Marin CWP Nature: Beneficial, Adverse Context: Project Area, Supra-Regional (central/northern California portion of population range) Duration: Short-Term(Temporary), Long-Term (Permanent)	
No Impact	There would be no potential for impact to tidewater goby associated with implementation of the proposed project.
Negligible	There would be a barely detectable effect (≤ 1 percent) on the areal extent of appropriate habitat relative to the extent of areas currently supporting this species. Would have no detectable effect on Project Area distribution of species.
Minor	There would be a measurable effect (> 1 percent and ≤ 10 percent) on the areal extent of appropriate habitat relative to the extent of areas currently supporting this species. Would have a barely detectable effect on Project Area distribution of species.
Moderate	There would be an appreciable effect (> 10 percent and ≤ 25 percent) on the areal extent of appropriate habitat relative to the extent of areas currently supporting this species. Would have a measurable effect on Project Area distribution of species.
Major or Substantial	There would be a major or substantial effect (> 25 percent) on the areal extent of appropriate habitat relative to the extent of areas currently supporting this species. Would have an appreciable effect on Project Area distribution of species.

Central California coast steelhead Designated Population Segment (DPS), (federally threatened), coastal California Evolutionarily Significant Unit (ESU) Chinook salmon (federally threatened), and central California coast coho ESU salmon (State/federally endangered)

- Three federally protected salmonids occur within the Lagunitas Creek watershed: coast steelhead (*Oncorhynchus mykiss*), Chinook salmon (*O. tshawytscha*), and coho salmon (*O. kisutch*). Salmonids are identified as a Critical Resource objective for the proposed project
- The Lagunitas Creek watershed, including Olema Creek, has been documented to support 10 percent of the CCCESU coho population (Brown et al. 1994). It represents one of the southernmost, stable populations of coho salmon within the CCCESU.
- The Project Area does not represent a potential breeding or spawning area for steelhead, coho or Chinook salmon. These types of salmonids typically breed in the upper portions of the watershed in medium- to high-gradient tributaries.
- The proposed Project Area represents important feeding habitat for salmonids as they migrate to the ocean. Smolts may spend days to weeks in estuarine habitat feeding in nutrient-rich areas and growing prior to heading to the open ocean. While this is a relatively short period of time, this transitional life stage may have direct implications on the ocean survival of smolts, as there is direct correlation between



increased smolt weight lead to higher adult survivorship (Naiman et al. 2002), but improved water quality and stream access should improve spawning success.

- The proposed project has the potential to affect salmonids through restoration of tidal and freshwater hydrologic processes.
  - Migration of salmonids is inhibited by hydrologic infrastructure such as barriers (e.g., dams or tidegates); culvert installations that are poorly designed or in poor condition; creeks with poor hydraulic connectivity due to backwater effects; and lack of instream refugia (e.g., pools, large woody debris, overhanging or instream vegetation, etc.).
  - Rearing of salmonids in estuaries -- where that occurs -- can be limited by levees that eliminate tidal marshes and creeks where rearing can occur or eliminate access to marshes, as well as a lack of appropriate foraging and refugia habitat, a lack of appropriate prey such as mysid shrimp, and lack of access to marshplains at high tides. In addition, temperatures can be a prohibitive factor, although less so in the case of fish that move quickly through estuarine reaches.
- Because of the lack of information on salmonid use of estuarine areas in Tomales Bay, analysis of impacts to salmonid passage and estuarine rearing habitat under the various alternatives focuses on changes in opportunity -- specifically the amount of impediments or obstacles to passage and the amount of potential "appropriate" rearing habitat -- and capacity or quality of the available habitat. The analysis uses the following methodologies and assumptions:
  - *Salmonid Passage/Refugia Opportunity and Capacity – Project-Related Effects*: The analysis of effects on salmonid passage and rearing potential uses a "checklist" approach, with hypothesized or known barriers to salmonid migration and/or rearing within the Project Area totaled for each subwatershed.
  - *Salmonid Rearing and Refugia Habitat Capacity– Project-Related Effects*: Analysis of salmonid rearing and foraging/refugia capacity is based on the total aquatic edge or linear perimeter of tidally connected creek available during daily high tides, which is an indicator or metric for salmonids used in functional assessment methodologies for wetlands (Simenstad et al. 2000). Total aquatic edge measures the outer perimeter of all tidal creeks influenced by daily high tides, with the assumption that juvenile salmonids spend much of their time adjacent to tidal creeks banks because of the refugia and foraging opportunities available in these edge habitats.
- While these impact indicators do not specifically address capacity issues such as water temperature and actual refugia habitat available from overhanging banks and vegetation and large woody debris, they do provide a semi-quantitative tool for assessing potential effects of the proposed project. Based on continuous water quality monitoring, water temperature does not appear to be an issue for salmonids in Lagunitas Creek during the typical outmigration period for salmonid smolts.
- Under some alternatives, there is a potential for short-term impacts relating to either development of new tidal creeks or disturbance conditions following creation of new tidal channels.

TABLE 67. SPECIAL STATUS WILDLIFE SPECIES - SALMONIDS

Criteria: Effects on Opportunity for Salmonid Passage and Rearing Source: Endangered Species Act (federal and California), Magnuson-Stevens Fishery Conservation and Management Act, Park Service Management Policies, CCC/LCP Zone II, Marin CWP Nature: Beneficial, Adverse Context: Project Area, Watershed Duration: Long-Term	
No Impact	There would be no potential for impact to salmonid passage and rearing opportunity associated with implementation of the proposed project.
Negligible	There would be a negligible change (±10 percent) in the number of infrastructure facilities and management practices affecting opportunity for salmonid passage and rearing.
Minor	There would be a minor change (±11 - 25 percent) in the number of infrastructure facilities and management practices affecting opportunity for salmonid passage and rearing.
Moderate	There would be a moderate change (± 26 - 50 percent) in the number of infrastructure facilities and management practices affecting opportunity for salmonid passage and rearing.
Major or Substantial	There would be a major or substantial change (> 50 percent) in the number of infrastructure facilities and management practices affecting opportunity for salmonid passage and rearing.
Criteria: Areal Extent of Potential Rearing Habitat in Project Area Source: Endangered Species Act (federal and California), Magnuson-Stevens Fishery Conservation and Management Act, Park Service Management Policies, CCC/LCP Zone II, Marin CWP	

TABLE 67. SPECIAL STATUS WILDLIFE SPECIES - SALMONIDS

Nature: Beneficial, Adverse Context: Watershed, Supra-Regional (central Coast ESU) Duration: Short-Term, Long-Term	
No Impact	There would be no potential for impact to salmonid estuarine rearing habitat associated with implementation of the proposed project.
Negligible	There would be a barely detectable change (≤ 10 percent) expected in areal extent and connectivity of appropriate edge microhabitat in potential estuarine rearing areas relative to the extent of edge microhabitat currently existing. Would have no detectable effect on watershed population dynamics.
Minor	There would be a measurable change (> 10 percent and ≤ 25 percent) expected in the areal extent and connectivity of appropriate edge microhabitat in potential estuarine rearing areas relative to the extent currently existing. May have a detectable effect on watershed population dynamics.
Moderate	There would be an appreciable change (> 25 percent and ≤ 50 percent) expected in the areal extent and connectivity of appropriate edge microhabitat in potential estuarine rearing areas relative to the extent currently existing. May have a measurable effect on watershed population dynamics.
Major or Substantial	There would be a major or substantial change (> 50 percent) expected in the areal extent and connectivity of appropriate edge microhabitat in potential estuarine rearing areas relative to the extent currently existing. May have an appreciable effect on watershed population dynamics.

California black rail (state threatened) and California clapper rail (federally and state-listed endangered)

- Marsh and upland ecotone habitats are identified as Critical Resource objectives for the proposed project, in part because of their importance to these federally and state-listed bird species.
- The proposed project has the potential to affect rails, because of their affinity for tidal marsh habitat.
- Analysis of potential impacts during construction focuses on avoiding construction during the breeding period (February 1 through August 15) in areas with clapper rails or observing setbacks when there are no seasonal restrictions. Setback requirements developed by CDFG for black rails are 250 feet from occupied habitat.
- Because California clapper rails (*Rallus longirostris obsoletus*) have not been sighted in the Project Area since 2001 and did not appear to breed there even when present, this portion of the analysis focuses on California black rails (*Laterallus jamaicensis coturniculus*).
- Analysis of potential impacts to rail habitat under the various alternatives focuses on changes in acreage of habitat, with "appropriate" habitat defined as meeting the following criteria based on information in ARA et al. (2003). Acreage of areas that meet these criteria are calculated and summed under the various alternatives to semi-quantitatively assess potential habitat changes that would occur as part of the proposed project.
  - *Breeding Habitat*: California black rails breed in Tidal Salt Marsh-High or high marsh habitat. They prefer fully tidal Mid- and High Tidal Salt Marsh "patches" with dense vegetation cover that are preferably larger in size, contiguous, and broader in configuration (Evens et al. 1989, Flores and Eddleman 1993, Evens et al. 1991, Evens and Nur 2002)
  - *Foraging Habitat*: Black rails forage in the high marsh plain (J. Evens, ARA, *pers. comm*.)
  - *High Tide Refugia*: During extreme high tides, these birds, which are relatively poor flyers, seek refuge in Upland Ecotone or higher elevation areas such as levees that are not submerged during some of the highest high tides (>7 feet MLLW). The risk of predation increases when vegetation cover is sparse or of short height.
  - *Protection from Predators*: Refugia needs to have little to no potential for access by predators such as red fox (*Vulpes vulpes*), feral cats, dogs, and other predatory mammals. The best areas have no levees, riprap, or upland areas bordering urban or rural residential areas that could allow egress of predatory mammals such as red fox, feral cats, and dogs or have buffers that protect rails from mammals and avian predators.
- Under some alternatives, there is a potential for short-term impacts relating to the length of time that would be required for vegetation communities to undergo the transition from pasturelands to more unmanaged habitats, including establishment and development of any new tidal marsh areas.

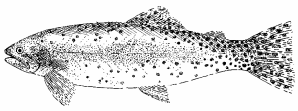


TABLE 68. SPECIAL STATUS WILDLIFE SPECIES - RAILS

Source: Endangered Species Act (federal and California), Park Service Management Policies, CCC/LCP Zone II, Marin CWP Nature: Beneficial, Adverse Context: Project Area, Watershed (southern portion of Tomales Bay), Regional (San Francisco Bay region) Duration: Short-Term, Long-Term	
No Impact	There would be no potential for impact to rails associated with implementation of the proposed project.
Negligible	There would be a negligible change (≤ 1 percent) expected in the areal extent of appropriate habitat. Would have no detectable effect on Project Area, watershed, or regional distribution of species.
Minor	There would be a minor change (> 1 percent and ≤ 10 percent) expected in the areal extent of appropriate habitat. Would have a detectable effect on Project Area/watershed distribution of species, but not on regional distribution.
Moderate	There would be a moderate change (> 10 percent and ≤ 25 percent) expected in the areal extent of appropriate habitat. Would have a measurable effect on Project Area/watershed distribution of species and possibly a detectable effect on regional distribution.
Major or Substantial	There would be a major or substantial change (> 25 percent) expected in the areal extent of appropriate habitat. Would have a major or substantial effect on Project Area/watershed distribution of species and possibly a measurable effect on regional distribution.

Other Special Status Species

Most of the other federally and state-listed endangered and threatened species are only occasional visitors or vagrants to the Project Area, with the exception of peregrine falcon, a state endangered species and federally delisted species that has been regularly observed foraging over the Project Area. Analysis for these species focuses on how the proposed project would affect incidental use. These species include California freshwater shrimp (*Syncaris pacifica,* FE; common upstream in freshwater portions of Lagunitas Creek, rare in Project Area); California brown pelican (*Pelicanus occidentalis californicus*, FE; foraging on Lagunitas Creek shoreline); Least Bell's vireo (*Vireo bellii pusillus*, FE, SE; extremely rare vagrant in riparian habitat); green sturgeon (*Acipenser medirostris*, FT; forages rarely in Lagunitas Creek); peregrine falcon (*Falco peregrinus*, SE, FD; regularly observed foraging over the Giacomini Ranch and undiked marsh); sandhill crane (*Grus canadensis*, ST; very rare visitor to wet pastures in Giacomini Ranch); and bank swallow (*Riparia riparia*, ST; rare transient over Giacomini Ranch in fall). In addition, analysis also includes species that are not federally or state-listed as endangered or threatened, but that have some listing status and are known to occur in the Project Area. These species include: northwestern pond turtle (*Clemmys marmorata marmorata*, FWS SacSC), southwestern river otter (*Lontra canadensis sonorae*, FWSSacSC), and saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*, FWSSacSC). Impact thresholds are based on qualitative evaluation of the potential for impact to use of the Project Area during both construction and post-construction phases under the various alternatives.

TABLE 69. SPECIAL STATUS WILDLIFE SPECIES – OTHER SPECIES

Source: Endangered Species Act (federal and California), Migratory Bird Treaty Act, Park Service Management Policies, CCC/LCP Zone II, Marin CWP Nature: Beneficial, Adverse Context: Project Area, Watershed, Regional Duration: Short-Term, Long-Term	
No Impact	There would be no potential for impacts to use of the Project Area by other federally and state-listed special status species associated with construction or implementation of the proposed project.
Negligible	There would be a negligible potential for impacts to use of the Project Area by other federally and state-listed special status species associated with construction or implementation of the proposed project. Would have no measurable effect on use of Project Area or watershed.
Minor	There would be a minor potential for impacts to use of the Project Area by other federally and state-listed special status species associated with construction or implementation of the proposed project. Would have a measurable effect on use of Project Area, but not on watershed use.
Moderate	There would be a moderate potential for impacts to use of the Project Area by other federally and state-listed special status species associated with construction or implementation of the proposed project. Would have an appreciable effect on use of Project Area and a detectable effect on use of the watershed.
Major or Substantial	There would be a substantial or major potential for impacts to use of the Project Area by other federally and state-listed special status species associated with construction or implementation of the proposed project. Would have a substantial effect on use of Project Area and a measurable effect on use of the watershed.

Impact Analysis

TABLE 70. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR FISH AND WILDLIFE RESOURCES

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
High Value Wildlife Habitats					
Construction	Negligible Adverse	Negligible Adverse	Minor Adverse	Minor Adverse	Minor Adverse
Short-Term	Negligible Adverse	Negligible Adverse	Negligible Adverse	Moderate Adverse	Moderate Adverse
Long-Term	Minor Beneficial	Moderate Beneficial	Major Beneficial	Major Beneficial	Major Beneficial
Changes in Wildlife Use					
Construction	Negligible Adverse	Negligible Adverse	Minor Adverse	Minor Adverse	Minor Adverse
Short-Term	Negligible Beneficial	Negligible Beneficial	Negligible Beneficial	Minor Adverse	Minor Adverse
Long-Term	Negligible Beneficial	Minor Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
Invasive Wildlife Species					
Short-Term/Long-Term	Negligible Adverse	Minor Adverse	Minor Adverse	Minor Adverse	Minor Adverse
Wildlife Conditions in the Watershed					
Short-Term	Negligible Beneficial	Negligible Beneficial	Negligible Beneficial	Negligible Beneficial	Negligible Beneficial
Long-Term	Negligible Beneficial	Minor Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
Special Status Species					
California Red-legged Frog					
Construction	Negligible Adverse	Negligible Adverse	Minor Adverse	Minor Adverse	Minor Adverse
Short-Term	Negligible/ Minor Adverse	Negligible/ Minor Adverse	Minor Adverse	Moderate Adverse	Moderate Adverse
Long-Term	Minor Adverse	Minor Adverse	Negligible/ Minor Adverse	Minor/ Moderate Adverse	Minor/ Moderate Adverse
Tidewater Goby					
Construction	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse
Short-Term	Negligible Beneficial	Minor Beneficial	Moderate Beneficial	Moderate Adverse	Moderate Adverse
Long-Term	Moderate Beneficial	Moderate Beneficial	Major Beneficial	Major Beneficial	Major Beneficial
Salmonids					
Construction	Negligible Adverse	Negligible Adverse	Negligible Adverse	Negligible Adverse	Negligible Adverse
Passage and Rearing Conditions	Negligible Beneficial	Minor Beneficial	Moderate Beneficial	Major Beneficial	Major Beneficial
Rearing Habitat Extent: Short-Term	Negligible Beneficial	Minor Beneficial	Minor Beneficial	Moderate Beneficial	Moderate Beneficial
Rearing Habitat Extent: Long-Term	Minor Beneficial	Moderate Beneficial	Moderate Beneficial	Major Beneficial	Major Beneficial

TABLE 70. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR FISH AND WILDLIFE RESOURCES

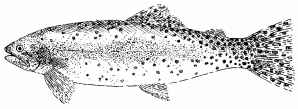
	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Black and Clapper Rail					
Construction	Negligible Adverse	Negligible Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse
Short-Term	Negligible Beneficial	Negligible Beneficial	Negligible Beneficial	Negligible Beneficial	Negligible Beneficial
Long-Term	Minor Beneficial	Major Beneficial	Major Beneficial	Major Beneficial	Major Beneficial
Other Special Status Species					
Construction	Negligible Adverse/ No Impact	Negligible Beneficial/ Moderate Adverse	Negligible Beneficial/ Moderate Adverse	Negligible Beneficial/ Moderate Adverse	Negligible Beneficial/ Moderate Adverse
Short-Term/Long-Term	Negligible Beneficial / Moderate Adverse	Minor Beneficial/ Moderate Adverse	Minor Beneficial/ Moderate Adverse	Minor Beneficial/ Moderate Adverse	Minor Beneficial/ Moderate Adverse

No Action Alternative

Analysis: The effects of the No Action Alternative on wildlife habitat and use in the Project Area and support of wildlife species in the watershed would generally range from moderate adverse to minor beneficial (Table 70). Under the No Action Alternative, levees, tidegates, and culverts in the Giacomini Ranch are not breached or removed, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. The Park Service is required under its existing agreement with CalTrans to restore wetlands as mitigation for impacts caused by CalTrans to aquatic habitat from a road repair on State Route 1 in Marin County in exchange for the Park Service receiving monies to purchase and restore the Giacomini Ranch. The remainder of the levee would not be deconstructed, although there would be no levee maintenance. Olema Marsh is also not restored, and there would be no new public access facilities. Agricultural infrastructure would largely remain, although most agricultural management practices such as mowing, ditch dredging, and irrigation would be discontinued. There is a potential for leased grazing through a separate environmental review process. However, if such management were to be instituted the Seashore would impose setbacks from creeks, riparian areas, and certain wetland areas, as well as restrict the intensity, duration, and timing of grazing as to limit natural resource degradation.

Wildlife Habitats and General Wildlife Use – Project Implementation: Over the long-term, the No Action would be expected to have minor beneficial effects on High Value Wildlife Habitats in the Project Area, although there may be some very negligible adverse impacts during construction of the 11-acre wetland restoration/mitigation component. Under this alternative, the Giacomini Ranch would largely remain grassland, although it would change in nature due to the elimination of grazing or reduced grazing intensity and the elimination of intensive agricultural management practices. Depending upon a number of factors that would probably vary spatially (e.g., future grazing intensity, nutrient concentrations in soils, and influence of salts through surface waters or groundwater), a large proportion of the pastures could respond to reduced grazing and management with a rapid increase in vegetation biomass and plant height, particularly of weedy, ruderal species such as common velvet grass (*Holcus lanatus*) and milk thistle (*Silybum marianum*). This same phenomenon has been documented in other grazed areas where grazing has been removed, such as vernal pool areas and a Seashore-owned ranch near Drake's Beach. At some point in the future, grasslands within the Project Area may change yet again to communities dominated by both native and non-native species once nutrient pools within soils are reduced to levels more characteristic of non-agricultural lands. However, with the exception of perhaps more saline areas, native grasslands would be unlikely to establish naturally in these types of wet conditions due to the overwhelming number of non-native grass species that dominate most grassy wetland areas in California.

The acreage of wetland and riparian habitats would increase in the Giacomini Ranch, because of the 11-acre wetland restoration component, the reduced grazing pressure on riparian habitat, and the expansion of Freshwater Marsh habitats with the elimination of frequent ditching to drain pastures. These factors would



potentially cause a minor increase of approximately 6 percent in High Value Wildlife Habitats such as Tidal Waters, Forested and Scrub Shrub Riparian, Tidal Brackish Marsh, Tidal Salt Marsh, and Tidal Salt Marsh-High/Upland Ecotone relative to baseline conditions, despite the fact that most of the Giacomini Ranch would remain grassland and potentially convert into a less managed type of grassland that would offer less value to at least certain wildlife species. While, in general, discontinuation of agricultural management may benefit most High Value Wildlife Habitats, ultimately, the discontinuation of dredging could reduce Freshwater Marsh habitat in the East Pasture, because ditches might begin to fill in with sediments deposited during overbank flooding.

In Olema Marsh, where there is no agricultural use, conditions would be expected to remain fairly similar to baseline conditions. Currently, Open Water and Freshwater Marsh habitats appear to be expanding at the expense of Forested and Scrub Shrub Riparian habitats, because of steadily increasing water levels in the marsh that has resulted from poor drainage through the Levee Road culvert.

The small increase in High Value Wildlife Habitats would have a negligible beneficial effect over the long-term on use of the Project Area, with use by common and special status wildlife species potentially negligibly increasing. The largest beneficial effects in wildlife use under this alternative would be expected to come from increased use of expanded Forested and Scrub Shrub Riparian habitat by resident and Neotropical migrant passerines or riparian bird species.

Discontinuation or reduction of grazing under the No Action Alternative would increase the areal extent and structural complexity of riparian habitat along the edges of the Project Area. As riparian habitat expands following elimination of trimming and grazing, an increase in foraging and breeding habitat for riparian associates (residents and Neotropical migrants) would be expected. Riparian habitat provides structural refuge critical to passerine birds, including salt marsh common yellowthroat; mammals (southwestern river otter, dusky-footed woodrat, and black-tailed deer), and amphibians (California red-legged and Pacific tree frog). Many vertebrate species utilize tidal salt marsh and freshwater marsh habitats for foraging, but also require nearby high-quality riparian forest or scrub shrub habitat for resting and refuge.

In terms of acreage, the largest gain in High Value Wildlife Habitat under the No Action Alternative would occur as a result of the wetland mitigation/restoration component, which would restore 11.4 acres of Tidal Salt Marsh and Tidal Salt Marsh-High/Upland Ecotone, as well as Tidal Brackish Marsh and Tidal Open Water. These habitats primarily benefit salt marsh dependent bird species, such as California black rail, California clapper rail, and saltmarsh common yellowthroat, but would also benefit generalist waterbirds such as great egret, and generalist shorebirds such as willet, godwit, and greater yellowlegs. Salt marsh also provides foraging habitat for raptors species - such as short-eared owl, white-tailed kite, northern harrier, and peregrine falcon - drawn to the site by small vertebrates such as California voles, shrews, and garter snakes. However, the small size of this restoration component may limit its ability to attract new species or increase numbers of existing ones. Some species such as California clapper rail require larger expanses of unfragmented marsh habitat before they will colonize. Certain special status fish species such as tidewater goby and salmonids may use the tidally reconnected portion of the East Pasture Old Slough at times for refugia, but the size of this off-stream channel again minimizes its usefulness for many wildlife species.

Changes in management would also benefit avian and mammalian species associated with aquatic habitats. Foraging habitat for some waterfowl and marsh-associated passerines would increase as additional Freshwater Marsh and Wet Meadow habitats developed on the fringe where frequent ditching has precluded their presence. The seasonal abundance of migratory waterfowl in ditches, sloughs, and northeast corner of East Pasture would be expected to continue under the No Action Alternative, although discontinuation of dredging could affect attractiveness of this habitat over the long-term. The Muted Tidal Brackish Marsh - Mudflat/Panne in the southeastern portion of the East Pasture would continue to attract moderately high numbers of shorebirds and waterfowl during the winter and provide alternate habitat for these species during high tide conditions within Tomales Bay. Southwestern river otter, which reappeared in the vicinity of the Project Area during the past several decades, would continue to expand its presence in the Project Area, moving between Lagunitas Creek, Giacomini Ranch, and Olema Marsh.

In the West Pasture freshwater marsh, the current conversion of the northern portion of the marsh from Freshwater Marsh to Muted Tidal Brackish Marsh would continue. In 2003, the culverts on Fish Hatchery Creek at the West Pasture north levee collapsed, allowing a greater range of tidal flows into the pasture Following replacement of the culverts and installation of modified one-way tidegates, the tidal range within the West Pasture compressed, but still appears to be higher than prior to the culvert/tidegate failure. During

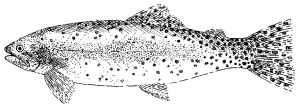
higher high tides, particularly during the winter, saltwater can flow into the marsh, where it appears to pond for several months due to the poor drainage conditions. Since 2003, then, maximum and average salinities within the marsh have increased and have started to convert at least the lower elevation northern portions of the marsh to Muted Tidal Brackish Marsh. This conversion may have possibly already caused impacts to the California red-legged frog, as annual surveys since 2003 have yet to document the same high numbers as were observed during the baseline study year in 2001 (G. Fellers, USGS, unpub. data). Numbers of these frogs would be expected to continue to remain low under the No Action Alternative, because of the habitat conversion already occurring. This issue is discussed further under the Special Status Species portion of this section. While negatively affecting frogs, the conversion of this habitat would benefit passerine bird species, such as salt marsh common yellowthroat and red-winged blackbird, which use tall vegetation for nesting and resting habitat while maintaining close proximity to more open foraging habitat.

In general, amphibians and reptiles would be the most adversely affected by the No Action Alternative. These species are predominantly freshwater species that would be negatively affected by conversion of Freshwater Marsh to brackish or tidal habitats in the West Pasture and the discontinuation of agricultural management practices such as levee maintenance, dredging and irrigation that maintained Open Water areas in ditches in the East Pasture. In addition to the red-legged frog, another special status species, the Northwestern pond turtle, would be adversely affected by these changes, with barely detectable to measurable changes in habitat and numbers expected. These same factors would also, however, have a beneficial effect on the amphibian and reptile community by decreasing the extent of appropriate habitat for a non-native predator of the red-legged frog, the bullfrog, which occurs in the East Pasture, Tomasini Creek, and the West Pasture. Over the long-term, deterioration of levees would potentially increase tidal influence in the East and West Pastures and thereby increase impacts to the red-legged frog, pond turtle, and bullfrog populations.

Increasing water levels in Olema Marsh and the associated decline in riparian habitat would result in a decline in riparian-associated avian species (e.g. warbling vireo, Swainson's thrush, and Wilson's warbler) at the marsh, although there may be an increase in species (e.g. swallows) that nest in cavities in snags and forage over the expanding Freshwater Marsh. The increasing water levels and predicted subsequent expansion of Freshwater Marsh would continue to support marsh wrens, song sparrows, salt marsh common yellowthroat, and Virginia rails, as well as migratory waterfowl. The expansion of freshwater marsh may increase breeding potential for waterfowl species such as mallard, gadwall, and Canada goose in Olema Marsh. In addition, it could increase habitat for California red-legged frog and bullfrog, both of which currently occur in the marsh.

Overall, the elimination of intensive agricultural management may benefit avian species by resulting in increased grass heights and introduction of additional food resources. Higher grass heights would increase potential nesting habitat for certain ground nesting species, especially near water in ditches. Species that may benefit include waterfowl (e.g. mallard, gadwall) and passerines (e.g. song sparrows, marsh wrens). Other passerines, which are considered short-grass specialists such as savannah sparrows and western meadowlarks, would probably decrease in abundance with discontinuation of mowing and a reduction in grazing. Raptors such as northern harrier may have increased foraging opportunities with greater grass heights as small mammal populations respond to more cover. A change in vegetative species composition to non-native species, i.e. thistles, may also increase foraging opportunities for avian species such as American and lesser goldfinch. The increase in vegetative cover resulting from eliminating intensive agricultural management practices may also benefit California black rail by increasing upland refugia and providing cover from predators during high tides.

Wildlife Habitats and General Wildlife Use – Long-Term Changes: As discussed earlier, over the long-term, the weedy, more ruderal grassland that would develop either under reduced or no grazing conditions would be expected to convert into a less densely vegetated grassland that supports both native and non-native species. This conversion may be stymied by the steady deterioration or abrupt breaching of the levees on the East and West Pastures, which would not be maintained. With loss of the levees, grasslands would begin converting to brackish and tidal marsh habitats, thereby attracting a different assemblage of wildlife species that might more closely resemble those expected for Alternatives A through D. These brackish and tidal marsh habitats would possibly continue to evolve in the future in response to sea level rise, which may be increasing at a much greater rate than was originally predicted (Overpeck et al. 2006). The projected rate of 3 feet of sea level rise by 2100 could lead to regular inundation of large portions of the East and West Pastures below 4 ft NAVD88, converting lower elevation portions of the pasture to subtidal and intertidal unvegetated habitats and higher elevations portions to intertidal emergent wetland habitats. This shift would attract specific avian species such as diving ducks, dabbling ducks, marsh-associated passerines, and other aquatic species.



Wildlife Habitats and General Wildlife Use – Construction: Construction of the No Action Alternative would have only very negligible adverse effects, if any, on High Value Wildlife Habitats and use by common wildlife species, however, there could be minor to moderate adverse impacts on special status species such as tidewater goby. The area where the wetland mitigation/restoration component would be constructed currently has Non-Tidal Brackish Marsh and Pasture/Grassland habitats. Wildlife use of this area is generally low, although the East Pasture Old Slough pond that would be tidally reconnected supports low to moderate numbers of waterfowl, high numbers of estuarine fish species such as threespine stickleback, and, as of 2006, very low numbers of tidewater goby. Because of its proximity to the undiked marsh where California black rail occur, construction would not be implemented until after August 31. Potential mitigation measures are discussed in a separate sub-section below.

Invasive Wildlife Species: The No Action Alternative would have a negligible adverse effect on the number of non-native invasive wildlife species that would be present as a result of changes in conditions. Under this alternative, most of the invasive species already present in the Project Area would be expected to remain, with a possible expansion into new areas by some of the species. The continued dominance of the Giacomini Ranch by grassland habitats would result in the No Action Alternative having little to no effect on terrestrial invasive species, such as red fox and wild turkey. These species would continue to access East and West Pasture for foraging, resting, and other purposes.

Most of the increase in numbers or number of invasive species would come from estuarine-dependent invasive species that would benefit from the very small increase in tidal and muted tidal habitats. Most of the Giacomini Ranch would remain leveed under this alternative, but approximately 11.4 acres would be converted to tidal habitats through a small wetland restoration/mitigation component. Species with potential to invade the restored habitat include animals already present within the Project Area and Tomales Bay watershed, as well as potentially animals not yet found in the watershed but that are likely to invade this estuary in the future because of their rapid spread within other regional estuaries such as San Francisco Bay. Estuarine-dependent invasive species currently in the Project Area and watershed that could increase negligibly in numbers or areal extent from the No Action Alternative include: European green crab, present in large numbers just north of the Project Area and observed in Fish Hatchery Creek in the West Pasture; yellow-fin goby, currently inhabiting Lagunitas Creeks at low densities; and Korean shrimp, documented from both Lagunitas and Tomasini Creeks. The New Zealand burrowing isopod (*Sphaeroma quoyanum*) may also occur in intertidal creeks in the undiked marsh north of Giacomini Ranch, but it has not been positively identified.

The No Action Alternative would have some effect on freshwater and terrestrial invasive species, as well. Under the No Action Alternative, the northern half of the freshwater marsh in the West Pasture would continue to convert to Muted Tidal Brackish Marsh habitat. In addition to California red-legged frog and Pacific tree frog, this marsh also supports an unknown number of bullfrogs, which were sighted for the first time in 2006 (P. Kleeman, *USGS, pers. comm*.). Degradation of the levees over the long-term could increase saltwater intrusion into freshwater habitats and decrease the potential habitat available for this freshwater species. Other invasive freshwater aquatic species include mosquitofish and crayfish, both of which are currently found within the Project Area. Mosquitofish have also been found in the more saline waters of Lagunitas Creek and the undiked marsh north of Giacomini Ranch (NPS, unpub. data), suggesting that this species can tolerate at least brackish conditions. While changes in some portions of the Giacomini Ranch might be detrimental to freshwater species, the current trend in Olema Marsh of conversion of riparian habitat to Freshwater Marsh and permanently flooded Open Water would be expected to continue, thereby maintaining or even increasing numbers of bullfrogs. Mosquitofish and crayfish have not been observed in this system, but the marsh is difficult to survey, so it is possible that at least mosquitofish occur there.

Wildlife Conditions in the Watershed: Only a very negligible beneficial effect would be expected in terms of support of wildlife species in southern portion of the Tomales Bay watershed, with most of the benefits over the short-term coming from discontinuation of agricultural management practices in the Project Area that affect conditions in Lagunitas and, ultimately, the bay. Retention of the levees would minimize potential export of sources of carbon to downstream water, as well as access by marine and estuarine organisms into the Giacomini Ranch interior. Watershed habitat quality would be improved by discontinuation of levee maintenance, withdrawal of water for irrigation, infrequent pumping of waters from the ranch into Lagunitas Creek, and crossing of Lagunitas Creek by cattle.

California red-legged frog: The No Action Alternative would have a negligible adverse effect on California red-legged frog breeding habitat units and distribution of the species in the Point Reyes Peninsula Core Area, but a minor adverse effect on distribution of red-legged frogs in the Project Area. Over the long-term, impacts

could possibly increase to minor, because degradation of the levees and sea level rise could cause a measurable effect on breeding habitat units and regional distribution. Impacts during construction of the wetland mitigation/restoration component in the northern portion of the East Pasture where no breeding has been documented would be expected to be non-existent or very negligible.

Baseline studies documented two areas that provide breeding habitat for red-legged frog. The West Pasture freshwater marsh is approximately 7.25 acres in area and has supported reproduction in 4 of the last 5 years (no reproduction observed in winter 2002-03). Breeding also has sporadically occurred in Fish Hatchery Creek, creating another 1.0 acre of breeding habitat in the West Pasture. The Olema Marsh provides a complex and dense habitat known to support red-legged frog breeding habitat. The vegetation density and site complexity have made it impossible to conduct a survey to estimate use. Bullfrogs are also known to occur in large numbers within the pond. Breeding habitat within the Olema Marsh is assumed to comprise all of the areas with Freshwater Marsh and Open Water, which total 39 acres. There is no documented breeding habitat in the East Pasture, although a few adult frogs were observed during baseline surveys (Fellers and Guscio 2002).

Numbers of individuals within the West Pasture freshwater marsh has fluctuated sharply during the limited years of monitoring, potentially in response to the failure of the tidegate and the apparent increase in tidal influence even after the tidegate was repaired. This issue is discussed in more detail under Water Quality in Chapter 3. During 2001-2002, the year prior to the tidegate failure, egg masses totaled 45, and number of estimated adults totaled 90 (Fellers and Guscio 2002). Only a few adults and no egg masses or tadpoles were observed in the West Pasture freshwater marsh and Fish Hatchery Creek during the 2003-2004 season after the tidegate was repaired (G. Fellers, USGS, *pers. comm.*). Since then, frog numbers have rebounded slightly, but not to 2001-2002 levels (Table 18). In 2004-2005, approximately 10 adult red legged frogs were detected, but no egg masses were observed (G. Fellers and P. Kleeman, USGS, unpub. data). In January 2006, a survey following extensive flooding, including multiple breaches of the West Pasture levees found 12 adult frogs and 15 egg masses (G. Fellers and P. Kleeman, USGS, *pers. comm.*).

Under stable environmental conditions, numbers of individuals as measured by egg masses within established habitats such as Cemetery Pond have remained fairly stable from year to year, varying only by 25 percent during the years of monitoring, which suggests that, under optimal conditions, the range of natural variability might be fairly low (G. Fellers and P. Kleeman, USGS, wildlife biologists, *pers. comm.*). The amount of monitoring in the West Pasture freshwater marsh prior to the tidegate failure is limited (one year), so the ability to interpret the stability of the population prior to this event is reduced. No frogs were observed in this marsh during baseline studies conducted in 1993 as part of the feasibility study, when red-legged frog was first documented to be on the Giacomini Ranch (PWA et al. 1993). Certainly, the potential for red-legged frog was much lower prior to construction of the levees in the 1940s, with aerial photographs depicting this area as intertidal emergent marsh. Construction of the levees has created an artificial freshwater regime in what was historically a tidal marsh complex, although pockets of freshwater marsh have probably always existed on the perimeter where abundant surface water and groundwater flow from the Inverness Ridge and Point Reyes Mesa have been present.

While 2001-2002 cannot be necessarily interpreted as baseline population numbers for this marsh due to the lack of consecutive years of survey, it is likely that the greater influx of saltwater into Fish Hatchery Creek and the freshwater marsh in the West Pasture that has occurred after the tidegate repair has had some effect on this population. Interestingly, saltwater intrusion into the West Pasture currently appears to be controlled by extreme high tide events and long residence time during winter months, not by evapotranspiration during the summer months, as might be expected. Based on continuous salinity monitoring within the marsh, most of this tidal influence appears to be during the winter when the extreme tides are highest, with salinities actually dropping during the spring and summer. Extreme high tides in Tomales Bay exceeding approximately 6.2 ft NAVD88 cause water levels within the muted tidal West Pasture to increase to 5.25 ft NAVD88, the uppermost part of the tidal range in the pasture, which then allows tidal waters to overbank flood and flow into the central and lowest elevations portions of the freshwater marsh. While salinities have not reached the levels recorded during the period that the tidegate had failed since its repair, red-legged frogs actually continue to breed in some of the highest salinity areas, which are the deepest portions of the depressional basin in which the freshwater marsh is located (P. Kleeman, USGS, *pers. comm.*). It is possible that frogs are taking advantage of stratification of freshwater over denser, saltier waters.

This pattern of saltwater intrusion is causing the northern half of the marsh to convert from Freshwater Marsh to Muted Tidal Brackish Marsh. The southern half does not appear to be affected by salinity intrusion, perhaps

because elevations are slightly higher, which reduce the reach of tides, and because of high perennial freshwater inflow from the 1906 Drainage and groundwater flow from the Inverness Ridge. The Park Service is conducting a habitat enhancement project in 2006 that would slightly expand higher elevation Freshwater Marsh habitat in this area by excavating fill that has been placed directly adjacent to the Lucchesi residence. This project would expand Freshwater Marsh by approximately 0.4 acres. In addition, continued increases in water levels in Olema Marsh due to poor drainage would continue to convert Forested and Scrub Shrub Riparian habitat to Freshwater Marsh and Open Water habitat, perhaps providing a very negligible increase in breeding habitat for red-legged frog. Over the short-term, this alternative would be expected to have slightly beneficial effects on non-breeding habitat through maintenance of non-tidal grasslands and expansion of riparian habitat along the perimeter.

While the levees and infrastructure would remain under the No Action Alternative, discontinuation of levee maintenance would result in slow decay of levee and tidegate facilities. The slow decay or sudden breach during large storm events of these facilities would allow for greater tidal flooding and thereby further reduce viable red-legged frog breeding habitat in the West Pasture. Under full tidal conditions, an additional 1.5 acres of breeding habitat would be lost through conversion to brackish or saline habitats. This impact could be increased over the long-term by sea level rise, which may be rising at a much higher rate than originally predicted. If the levees decayed or abruptly breached, impacts on red-legged frog would be expected to be minor, with the exact effect dependent on a number of factors, including annual variability in rainfall and runoff conditions and possible passive creation of Freshwater Marsh in other areas through discontinuation of agricultural management.

Effects on red-legged frog during construction of the wetland restoration/mitigation component would be expected to be non-existent or very negligible. There is no breeding habitat in the northwestern corner of the East Pasture, and this area does not represent key non-breeding habitat, although adult frogs have been sighted in the East Pasture Old Slough Pond on occasion. Mitigation measures are discussed in a separate sub-section below.

Tidewater goby: The No Action Alternative would have very negligible beneficial effects on tidewater goby in the Project Area through a potential increase in quality of existing habitat, although, over the long term, slow decay or sudden breaching of levees could increase the benefits to tidewater goby by considerably increasing the amount of available habitat. Impacts during construction would be expected minor to moderate at most, with implementation of mitigation measures designed to reduce the potential or amount of incidental take of this federally listed species.

Within the Project Area, Acreage of existing tidewater goby habitat in the Giacomini Ranch totals 11.3 acres. This species occurs primarily in a section of Tomasini Creek that has been bermed to run against the base of Point Reyes Mesa until it drains into Tomales Bay. The creek supports both open water and vegetated sections. Most of the creek bottom is muddy or a combination of clay and silt (G. Kamman, KHE, *pers. comm*.). The flashboard dam and culvert structure is malfunctioning and allows modified two-way flow, such that the creek is influenced by the full upper range of high tides, but does not drain completely during low tides. This maintains permanent ponding or subtidal conditions within the creek, which may have become intertidal mudflat during low tides if it had been allowed to drain completely. The tidegate, along with natural gravel bar features create residual brackish pool habitat that provides habitat for the tidewater goby, despite the fact that the substrate and flow conditions are probably not optimal.

In addition, tidewater goby has been documented in a diked slough in the West Pasture. This slough is not a fluvial or creek system such as Tomasini Creek, but rather appears to drain freshwater surface run-off from a seasonally flowing seep present on the Gradjanski property, as well as surface run-off from overbank flooding of the pasture by Fish Hatchery Creek. It receives tidal influence from Fish Hatchery Creek, which has muted tidal flows with lower amplitude than Tomasini Creek. As with Tomasini, substrate conditions are suboptimal, with the surface substrate being muddy or a combination of clay and silt.

In 2006, tidewater goby were also found in non-tidal portions of the East Pasture. During the December 2005 storm, these fish may have been washed into the East Pasture Old Slough from Tomasini Creek when the Tomasini Creek levee breached, or they may have entered the slough from the bay. During the storm, the entire northern portion of the East Pasture was flooded and connected through elevated surface waters with Lagunitas Creek and Tomales Bay. Tidewater goby have been found outside the mouth of Tomasini Creek. Lastly, these fish may have entered the East Pasture Old Slough Pond through the one-way tidegates if the tidegates were malfunctioning and allowing water in as well as out. During surveys, dead marine fish species

were discovered in the pond, suggesting that gobies probably entered from the Lagunitas Creek side of the pond. The pond is bermed off from the rest of the East Pasture Old Slough, because the Giacominis once reputedly used this area for hunting. This pond consistently has brackish water salinities, probably because the tidegates leak. As with Tomasini Creek and the West Pasture Old Slough, substrate conditions are suboptimal, with the surface substrate being muddy or a combination of clay and silt.

Numbers of tidewater goby in the Project Area have also been relatively low within each of these sites, ranging from five to 22 at most. These sites represent the only known occurrence of this species in the Tomales Bay watershed, as, prior to 2002, the species had last been sighted in the bay in 1953. Genetic analyses indicate that this population is genetically distinct from the nearest existing occurrences of tidewater goby at Salmon Creek Marsh and Rodeo Lagoon (Jacobs and Earl 2005).

Following project implementation, the No Action Alternative would result in negligible beneficial effects in the Project Area on tidewater goby by slightly improving the quality of existing habitats. Tidal reconnection would improve water quality within the East Pasture Old Slough Pond, which, based on observations of dead marine fish during the 2006 sampling, probably has at least periods of sub-optimal water quality. A reduction or removal of grazing would increase water quality within the West Pasture Old Slough, improving the quality of existing habitat for the group of fish first observed in 2005. This alternative would be expected to have only a very negligible to no effect on Tomasini Creek other than the discontinuation of any levee maintenance practices, although this levee has not been actively maintained for many decades.

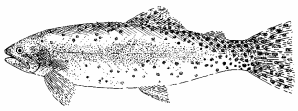
Over the long-term, slow decay or abrupt breaching of the Giacomini Ranch levees would have the potential to increase habitat for tidewater goby through creation of more tidal channels and side channels in the East and West Pastures. This trend would be intensified by sea level rise, which may be increasing at a much higher rate than originally predicted. The projected rate of 3 feet of sea level rise by 2100 (Overpeck et al. 2006) could lead to regular inundation of large portions of the East and West Pastures below 4 ft NAVD88, converting lower elevation portions of the pasture to subtidal and intertidal unvegetated habitats and higher elevations portions to intertidal emergent wetland habitats.

Additional benefits from tidewater goby are expected to come from implementation of the captive propagation program in which tidewater goby would be caught, bred in captivity, and reestablished in new habitats within the southern portion of the Tomales Bay watershed. This program is described more in Chapter 2. Over the long-term, the likely reconnection of creeks with their floodplains through levee decay and breaching, combined with the captive propagation program, would increase benefits to a moderate level.

The tidal wetland restoration/mitigation component includes tidal reconnection of the East Pasture Old Slough Pond with Lagunitas Creek and Tomales Bay. As noted above, tidewater goby have recently been found in the East Pasture Old Slough Pond. Mitigation measures are discussed in a separate sub-section below.

Central California coast steelhead, coastal California Evolutionarily Significant Unit (ESU) Chinook salmon, and central California coast coho ESU salmon: The No Action Alternative would have a very negligible beneficial effect on salmonid rearing and passage habitat in the Project Area. No impacts to at the very most very negligible adverse effects to salmonid habitat or salmonids would be expected to occur during construction of the wetland restoration/mitigation component.

As discussed under Chapter 3 and the assumptions portion of this section, salmonids have been detected in several Project Area creeks despite the presence of levees, tidegates, and other hydrologic infrastructure and intensive agricultural management. The Project Area does not represent a potential breeding or spawning area for steelhead, coho or Chinook salmon. These types of salmonids typically breed in the upper portions of the watershed in medium- to high-gradient tributaries. The proposed Project Area represents important feeding habitat for salmonids as they migrate to the ocean. Previous investigations have shown that the Project Area is a primary production zone for neomysid shrimp (Bratovich and Kelly 1988, Pearson 2000) known to be an important food source for the outmigrating smolts in this watershed (Bratovich and Kelly 1988). Smolts may spend days to weeks in estuarine habitat feeding in nutrient-rich areas and growing prior to heading to the open ocean (Reimers 1973, Simenstad et al. 1982, Levy and Northcote 1982). While this is a relatively short period of time, this transitional life stage may have direct implications on the ocean survival of smolts, as there is direct correlation between increased smolt weight lead to higher adult survivorship (Naiman et al. 2002). The importance of estuarine habitats varies between salmonid species, with Chinook typically spending the most time in wetlands before outmigrating to the ocean (Simenstad et al. 1982, Aitkin 1998). The importance for coho salmon appears to be more geographically and temporally variable



(Magnusson and Hilborn 2003; Miller and Sadro 2003). Park Service staff has documented the presence of steelhead and coho within the estuarine portions of Lagunitas and Tomasini Creek more than one month after the peak of smolt outmigration.

Steelhead has been documented several times in Fish Hatchery Creek, though no determination of anadromy could be conducted. Steelhead and coho have also been observed several times in Tomasini Creek within the leveed section of the creek. Information on anadromous species runs in Bear Valley Creek is poor, but smolt trapping by the Seashore upstream of Olema Marsh in 1999 netted 21 steelhead – five of which were classified as pre-smolts (Ketcham, *in prep.*). Coho salmon have not been observed, at least in recent times, in the Bear Valley Creek watershed (B. Ketcham, Seashore, *pers. comm*.). Fisheries surveys on the section of Lagunitas Creek

Salmonid presence in these watersheds indicates that, while impediments, the levees and tidegate facilities are still allowing some degree of fish passage.

Current conditions limit salmonid habitat to Fish Hatchery Creek (accessed via modified one-way tide gate in West Pasture levee), Tomasini Creek (accessed via malfunctioning tidegates and flashboard dam structure on East Pasture levee), and Bear Valley Creek (accessed via undersized culverts in Levee Road). Fisheries monitoring within the Project Area, as well as within the Lagunitas/Olema Creek watershed, indicate that infrastructure in the Giacomini Ranch and Olema Marsh do not eliminate the potential for passage to the main spawning grounds in the upper watersheds, but likely limit the duration and timing of access to Fish Hatchery and Tomasini Creek. These same levees also eliminate most of the potential for off-channel rearing habitat on Tomasini Creek and Lagunitas Creek. Fish Hatchery Creek is not actually leveed within the West Pasture, although it is infrequently dredged. On Bear Valley Creek, Levee Road, Bear Valley Roads, and their culverts limit both passage and rearing potential, along with the indistinct flow path in Olema Marsh created by excessive impoundment of waters.

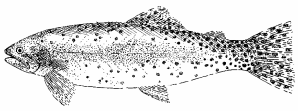
Under the No Action Alternative, all levees and hydrologic infrastructure would remain, although they would not be maintained. The largest benefit to salmonids under this alternative would come from improvements in habitat conditions through discontinuation of agricultural management practices such as levee maintenance, dredging, cattle crossing of Lagunitas Creek, pumping of creek water for irrigation, and other factors. This would have a negligible beneficial effect on passage and rearing conditions in the Project Area. The only change in areal extent of refugia habitat would be the tidal reconnection of the East Pasture Old Slough Pond to Lagunitas Creek and Tomales Bay, which would provide a negligible beneficial increase in refugia habitat or Total Aquatic Edge of approximately 3 percent relative to existing conditions over the short-term. There would be no change in Olema Marsh, other than water levels would be expected to continue their rise, which may further affect the ability of salmonids to reach upstream portions of the watershed.

Over the long-term, slow decay or abrupt breaching of the Giacomini Ranch levees would have the potential to increase habitat for salmonids through creation of more tidal channels and side channels in the East and West Pastures and thereby increase benefits for salmonids. While these channels could provide more refugia and foraging habitat for salmonids, levee failure could also create an ecological sink such that water could flood in, but not flow out, causing extensive stranding of aquatic species. The potential for this scenario is greater in the West Pasture than the East Pasture. This trend toward tidal reconnection with levee failure would be intensified by sea level rise, which may be increasing at a much higher rate than originally predicted. The projected rate of 3 feet of sea level rise by 2100 (Overpeck et al. 2006) could lead to regular inundation of large portions of the East and West Pastures below 4 ft NAVD88, converting lower elevation portions of the pasture to subtidal and intertidal unvegetated habitats and higher elevations portions to intertidal emergent wetland habitats.

Construction would have either no impact or very negligible adverse effects on salmonids.

California black rail and California clapper rail: The No Action Alternative would have a minor beneficial effect on California black rail by causing a barely detectable increase in appropriate breeding, foraging, and refugia habitat with restoration of 11.4 acres of mid- and high Tidal Salt Marsh and the continued conversion of northern portions of the West Pasture to more brackish conditions. Impacts during construction would either be non-existent or very negligible, at most.

As of 1994, the undiked marsh north of the Giacomini Ranch appeared to support a breeding population of at least seven pairs of California black rails (Evens and Page 1986; Evens and Nur 2002). Breeding individuals



have also been detected in intermittent years at Olema and Bear Valley Marshes, immediately south of the Giacomini Ranch (ARA 2002). During baseline surveys, black rails were detected in the Giacomini Ranch and in Olema Marsh (ARA 2002). Territorial black rails were calling on territories in May-June 2002 and were assumed breeding in the West Pasture freshwater marsh (ARA 2002). Small numbers (1-2 individuals) also occurred within the Project Area in brackish and freshwater marsh (ARA 2002). There is no recent information since 2001-2002 on the number of breeding pairs, although it is possible that numbers have decreased (J. Evens, ARA, *pers. comm.).*

In the early 1900s, when tidal marshes were more extensive, clapper rails were reported as occurring in Tomales Bay (Grinnell and Miller 1944). In 1980, one bird was heard in the portion of the East Pasture adjacent to Tomasini Creek (J. Evens, unpub. field notes). Since then, the species has been largely absent, although individuals were sighted for years in the undiked marsh north of the Giacomini Ranch during fall and winter between 1995 and 2001 (J. Evens, R. Stallcup, unpub. field notes). There are no recent breeding records, however. Except for the "intermittent presence of wandering or wintering birds," the population of clapper rails in Tomales Bay appears to be extirpated (ARA 2002).

Black rails both forage and nest in the mid- to high marsh plain, well above the low marsh and intertidal mudflats favored by clapper rails. During higher high tides, black rails move to higher elevations in marshes or adjacent upland areas to escape floodwaters, because rails are poor fliers and unable to fly long distances. Optimal high tide refugia habitat is not inundated, even during higher high tide water levels, and is well-vegetated with at least medium-sized plants to provide cover from predators that use high tides as an opportunity to prey on rails (J. Evens, ARA, *pers. comm*.). Unlike black rails, clapper rails prefer to forage in low marsh areas with sparse vegetation, mudflats, and tidal sloughs (ARA 2002). Higher marsh areas with dense vegetation are used for nesting and high-tide refugia (Albertson and Evens 2000).

Black rail habitat in the Project Area and adjacent undiked marsh to the north of the Giacomini Ranch currently totals 120 acres, with approximately 39 acres of refugia habitat, some of which is the Giacomini Ranch levees. Within the immediate Project Area, black rail habitat totals approximately 59.3 acres with 32.4 acres of high tide refugia. Clapper rail habitat occurs in the northern portion of the Project Area and the adjacent undiked marsh, totaling at least 116.8 acres of foraging and nesting habitat, in addition to the 39 acres of high tide refugia.

Under the No Action Alternative, approximately 11.0 acres of mid-marsh Tidal Salt Marsh habitat would be created, along with 0.4 acres of high marsh/upland ecotone. The restoration would provide benefits primarily to black rail, although clapper rail could receive negligible benefits from the lower elevation marsh portions, too. While rails do not currently use the East Pasture, the proximity of the restoration area to the undiked marsh makes it more likely that rails might expand into the East Pasture. In addition to the 0.4 acres of high marsh/upland ecotone habitat that would be created, rails could also avail themselves of the nearby Tomasini Creek levee or the newly created high tide refugia in the northeastern portion of the West Pasture during high tide conditions. The Park Service is currently planning a habitat enhancement project that would include approximately 1.0 acres of high tide refugia. This project involves widening and revegetation of the existing north levee of the West Pasture to enhance refugia conditions.

Another change that would benefit California black rail is the continued conversion of the northern portions of the West Pasture, including the freshwater marsh, to Muted Tidal Brackish Marsh. The conversion is discussed in more detail under General Wildlife and California red-legged frog.

In other areas, decreases in rail numbers might be expected from continuation of existing conditions. Potential occurrence of a non-native isopod in the undiked marsh north of Giacomini Ranch could threaten valuable high marsh habitat for black rails adjacent to tidal creeks, because of accelerated rates of bank slumping and creek widening. Also, under this alternative, the West Pasture north levee would not be removed. Rails often use these levees during storms and extreme high tide events. While the levees are well above most of the higher high tides, they are often poorly vegetated due to trampling from cattle and people and are subject to disturbance pressures from people using the existing informal trail to view the rails who may inadvertently flush them into the open where they are vulnerable to predation. In addition, steadily increasing water levels in Olema Marsh, which is causing conversion of riparian to Freshwater Marsh and Open Water habitat, would potentially decrease suitability of this habitat for black rail.

Over the long-term, slow decay or abrupt breaching of the Giacomini Ranch levees would have the potential to increase nesting, foraging, and roosting habitat for rails through creation of more low- and mid-marsh

intertidal emergent marsh. This trend toward tidal reconnection with levee failure would be intensified by sea level rise, which may be increasing at a much higher rate than originally predicted. The projected rate of 3 feet of sea level rise by 2100 (Overpeck et al. 2006) could lead to regular inundation of large portions of the East and West Pastures below 4 ft NAVD88, converting lower elevation portions of the pasture to subtidal and intertidal unvegetated habitats and higher elevations portions to intertidal emergent wetland habitats. While this trend could increase available rail habitat in the Giacomini Ranch, it would potentially decrease habitat and numbers of black rails in Olema Marsh, because of a continued rise in water levels.

Loss of levees from decay or breaching would reduce the amount of high-tide refugia available. Other than the created high tide refugia in the northwestern and northeastern corners of the East and West Pastures, respectively, and possibly portions of the Tomasini Creek levee, most of the remaining refugia during high tides would come from riparian and upland habitat along Sir Francis Drake Boulevard, which might have more problems with disturbance due to the presence of peoples, pets, and other more urban factors. Depending upon the southernmost extent of intertidal marsh formed following levee failure, rails may begin using some of the higher elevation areas in the southern portions of the pastures that would generally be above higher high tides. These areas are also physically linked to road and trail corridors, which increase the potential for disturbance and predation by birds and mammals. However, the quality of high tide refugia under this alternative may not differ substantially from that under existing conditions, which, as noted earlier, consists of poorly vegetated and often highly trampled levees and muted tidal portions of ruderal pastures. Taking these factors into consideration, over the long term, the No Action Alternative would be expected to have at least a moderate beneficial effect on rail habitat and populations.

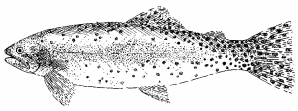
Creation of the 11-acre marsh at the northeastern corner of the property would require use of equipment within the vicinity of existing rail habitat in the undiked marsh across the Lagunitas Creek channel from the East Pasture. Mitigation measures are discussed in a separate sub-section below.

Other Special Status Species: The effects of the No Action Alternative would generally range from negligible beneficial effects to negligible to moderate adverse effects depending on the species. Impacts to these species during construction of the 11-acre wetland restoration/mitigation component would be non-existent to negligible adverse.

Species included in this category are federally or state-listed threatened and endangered species that are only occasional visitors or vagrants to the Project Area or are listed as a Species of Concern by the Sacramento office of the USFWS. The discontinuation of agricultural management practices such as levee maintenance, ditching, and withdrawal of water for the purposes of irrigation would have negligible beneficial effects on species such as **California freshwater shrimp**, California brown pelican, green sturgeon, **southwestern river otter**, and **northwestern pond turtle**, because of the reduction in potential for impacts associated with these practices. Saltmarsh common yellowthroat would benefit at least negligibly from the reestablishment of riparian vegetation following removal of grazing pressure. The American peregrine falcon would also benefit negligibly under this alternative from an increase in the vole and mouse population with discontinuation of mowing and manure spreading and the reduction or elimination of grazing. Sandhill crane, which is a very rare visitor to wet pastures, would not be affected under the No Action Alternative.

Over the long-term, the slow decay or abrupt breaching of the levees anticipated under this alternative could change the nature of impacts for at least two of the species. With levee failure, grassland would be converted into tidal and brackish marsh. This shift could decrease the number of rodents in the Giacomini Ranch relative to baseline conditions and potentially have a negligible adverse effect on peregrine falcon numbers and use.

This change could have a moderate adverse impact on **northwestern pond turtle**. The increase in salinities, coupled with the loss of levees possibly used for aestivation, would have an appreciable effect on the use of the ranch by this species and would lead to a decrease in its numbers. In addition, the turtle may be adversely affected by reconnection of the East Pasture Old Slough Pond, although turtles have not been sighted in this area (Fellers and Guscio 2002): Mitigation measures for this portion of the proposed project are discussed in a separate sub-section below. The turtle may possibly move into Olema Marsh, which would actually have a small net increase in Freshwater Marsh habitat. It has not been documented currently in the marsh, although it occurs in nearby reaches of Lagunitas Creek, so it is possible that habitat conditions are not appropriate for this species (e.g., not enough basking or aestivation sites).



Possible Additional Mitigation Measures: Standard BMPs would be implemented to reduce impacts to special status species and wildlife habitats are discussed under Chapter 2. All construction and staging/stockpiling areas would be cleared by biologists prior to use to ensure that there are no nesting or breeding species within the vicinity of the Project Area or staging/stockpile areas prior to implementation. Measures specific to certain species are described below:

California red-legged frog: Construction activities would include removal of roads, fences, and ditches within the Project Area, and excavation of certain portions of the East Pasture Old Slough. Though not documented as supporting breeding habitat, the Old Slough and ditches may provide non-breeding habitat. Construction activities adjacent to or within California red-legged frog habitat documented as breeding habitat would not be conducted until August. Pre-construction surveys would be completed in all construction areas to confirm that no red-legged frogs are present. Frogs encountered would be relocated.

Tidewater goby: Construction would not occur in or directly adjacent to existing tidewater goby habitat during the typical season of reproduction for tidewater goby documented in the literature (late April – early summer; Swift 2003). Prior to construction in the East Pasture Old Slough Pond, extensive seining would be performed after some dewatering to lower water levels and to increase the efficiency of trapping. Minnow traps and dipnets may also be used to increase capture rates. Captured fish would be immediately relocated to Tomasini Creek.

California black rail and California clapper rail: The East Pasture is across Lagunitas Creek from established habitat for California black rail and California clapper rail, but is not currently identified as rail habitat. The project would comply with directives to not come within 250 feet of established rail habitat prior to August 31 by delaying construction in the northern portion of the East Pasture until September.

Northwestern pond turtle: Prior to construction in the ditches and East Pasture Old Slough, water levels would be lowered to the extent possible, and turtles would be trapped and relocated to appropriate habitat, either Lagunitas Creek or the Martinelli Ponds in the Martinelli Ranch directly to the north of the Giacomini Ranch.

Effectiveness of Proposed Additional Mitigation Measures

California red-legged frog: The mitigation measures should reduce any potential impacts to negligible levels.

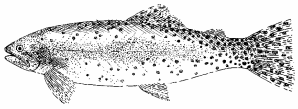
Tidewater goby: The mitigation measures would be expected to reduce impacts, but impacts cannot be eliminated. Even with extensive seining, some mortality of fish would be expected, because tidewater goby burrow in the mud, making it extremely difficult to trap all fish. Construction would, therefore, result in incidental take. The proposed mitigation measure would result in this alternative having moderate adverse impacts on tidewater goby during construction.

California black rail and California clapper rail: The mitigation measures should reduce any potential impacts to negligible levels.

Northwestern pond turtle: The mitigation measures would be expected to reduce impacts, but would not eliminate them. Even with dewatering of the channels and extensive trapping, some mortality of turtles would be expected. The proposed mitigation measure would result in this alternative having moderate adverse impacts on turtles during construction.

Cumulative Impacts: Generally, the No Action Alternative would not result in major or substantial cumulative impacts on common or special status species wildlife habitat or use in the Project Area with other proposed projects or plans in the region. Cumulative effects for most species, if any effects exist, would be characterized as beneficial negligible.

There are a number of projects in the Seashore and Marin County region that would have -- or have had -- effects on California red-legged frogs and red-legged frog breeding habitat. These projects include the Bear Valley Creek Watershed and Fishery Enhancement Project; Coastal Watershed Restoration – Drake's Estero Road Crossing; Coastal Watershed Restoration – Geomorphic Restoration Project; Horseshoe Pond Restoration Project; and Wetland Restoration Project at Big Lagoon. The Bear Valley Creek and Drake's Estero Road Crossing project would cause temporary impacts to non-breeding habitat. The Drake's Estero project is scheduled to be constructed in 2007, and there is no definitive timeframe for construction of the Bear Valley



Creek project. The Geomorphic Restoration Project, which would also be constructed in 2007 and 2008, would have moderate impacts on red-legged frog breeding habitat, but these impacts are being mitigated to negligible or minor levels through a suite of pond creation, maintenance, and repair actions in the Seashore. The Horseshoe Pond Restoration Project has already been constructed and had at least moderate impacts on red-legged frog populations in this area, although some of the impacts have been mitigated through implemented or planned construction or enhancement of ponds in the upper watershed. Impacts to red-legged frog from implementation of the Big Lagoon project would potentially be major, but this project would not affect the same portion of the Core Area . Based on this range of impacts, cumulative effects from implementation of the No Action Alternative in combination with these constructed or proposed projects would remain negligible to minor adverse, because most of the impacts are being mitigated to negligible or minor levels.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The effects of the No Action Alternative on wildlife habitat and use in the Project Area and support of wildlife species in the watershed would generally range from moderate adverse to minor beneficial (Table 70). Under the No Action Alternative, levees, tidegates, and culverts in the Giacomini Ranch are not breached or removed, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. Construction of the No Action Alternative would have only very negligible adverse effects, if any, on High Value Wildlife Habitats and use by common wildlife species, however, there could be minor to moderate adverse impacts on special status species such as tidewater goby.

Over the long-term, the No Action would be expected to would have minor beneficial effects on High Value Wildlife Habitats in the Project Area, although there may be some very negligible adverse impacts during construction of the 11-acre wetland restoration/mitigation component.
Under this alternative, the Giacomini Ranch would largely remain grassland, although it would change in nature due to the elimination of grazing or reduced grazing intensity and the elimination of intensive agricultural management practices. The acreage of wetland and riparian habitats would increase in the Giacomini Ranch, because of the 11-acre wetland restoration component, the reduced grazing pressure on riparian habitat, and the expansion of Freshwater Marsh habitats with the elimination of frequent ditching to drain pastures. These factors would potentially cause a minor increase of approximately 6 percent in High Value Wildlife Habitats. Over time, with slow decay or abrupt breaching of levees, grasslands would begin converting to brackish and tidal marsh habitats, thereby attracting a different assemblage of wildlife species. These brackish and tidal marsh habitats would possibly continue to evolve in the future in response to sea level rise, which may be increasing at a much greater rate than was originally predicted (Overpeck et al. 2006).

The small increase in High Value Wildlife Habitats would have a negligible beneficial effect over the long-term on use of the Project Area, with use by common and special status wildlife species potentially increasing by as much as 3 percent. The largest changes in wildlife use under this alternative would be expected to come from increased use of expanded Forested and Scrub Shrub Riparian habitat by resident and Neotropical migrant passerines or riparian bird species. In general, amphibians and reptiles would be the most adversely affected by the No Action Alternative. The No Action Alternative would have a negligible adverse effect on the number of non-native invasive wildlife species that would be present as a result of changes in conditions. Only a negligible beneficial would be expected in terms of support of wildlife species in southern portion of the Tomales Bay watershed, with most of the benefits coming from discontinuation of agricultural management practices in the Project Area that affect conditions in Lagunitas and, ultimately, the bay.

<u>*California red-legged frog*</u>: The No Action Alternative would have a negligible adverse effect on California red-legged frog breeding habitat units and distribution of the species in the Point Reyes Peninsula Core Area, but a minor adverse effect on distribution of red-legged frogs in the Project Area. Over the long-term, impacts could possibly increase to minor, because degradation of the levees and sea level rise could cause a measurable effect on breeding habitat units and regional distribution. Impacts during construction of the wetland mitigation/restoration component in the northern portion of the East Pasture where no breeding has been documented would be expected to be non-existent or very negligible. There is a potential for cumulative impacts with other projects proposed in the Seashore or Marin County region, but, based on evaluation of

impacts and proposed mitigation measures for those projects, impacts under this alternative would still be characterized as negligible to minor adverse.

Tidewater goby: The No Action Alternative would have very negligible beneficial effects on tidewater goby in the Project Area through a potential increase in quality of existing habitat, although, over the long term, slow decay or sudden breaching of levees could increase the benefits to tidewater goby by increasing the amount of available habitat. Impacts during construction would be expected minor to moderate at most, with implementation of mitigation measures designed to reduce the potential or amount of incidental take of this federally listed species.

Salmonids: The No Action Alternative would have a very negligible beneficial effect on salmonid rearing and passage habitat in the Project Area. No impacts to at the very most very negligible effects on salmonid habitat or salmonids would be expected to occur during construction of the wetland restoration/mitigation component

California black rail/California clapper rail: The No Action Alternative would have a negligible beneficial effect on California black rail by causing a barely detectable increase in appropriate breeding, foraging, and refugia habitat with restoration of 11.4 acres of mid- and high Tidal Salt Marsh. Impacts during construction would either be non-existent or very negligible, at most.

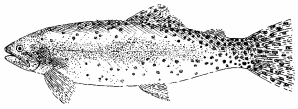
Other Special Status Species: The effects of the No Action Alternative would generally range from negligible beneficial effects to negligible to moderate adverse effects depending on the species. Impacts to these species during construction of the 11-acre wetland restoration/
mitigation component would be non-existent to negligible adverse.

Alternative A

Analysis: The effects of Alternative A on wildlife habitat and use in the Project Area and support of wildlife species in the watershed would generally range from moderate adverse to major beneficial. Under Alternative A, the East Pasture would be restored, with new public access facilities limited to the eastern and southern perimeters of the East Pasture. There would be no restoration or construction of new public access facilities in the West Pasture or Olema Marsh, except for the potential future extension of the southern perimeter trail to Inverness Park. The levees along and tidegate/culvert in the West Pasture and Tomasini Creek would be retained, but not maintained. In the East Pasture, restoration would involve breaching of levees in the East Pasture along Lagunitas Creek, and excavation of new tidal channels. The southwestern corner of the creek bank would be regraded to a more stabile profile and actively revegetated with riparian vegetation. Most of the actions under this alternative focus on removal or restoration of agricultural infrastructure such as filling of ditches, ripping of compacted roads, fence removal, and removal of pumps, pipelines, and concrete spillways.

Wildlife Habitats and General Wildlife Use – Project Implementation: Over the long-term, the Alternative A would be expected to have moderate beneficial effects on High Value Wildlife Habitats in the Project Area, although there may be some minor adverse impacts during construction in the East Pasture. The largest single change under this alternative relative to the No Action Alternative would come from the substantial conversion of grassland to salt and brackish marsh through breaching of the East Pasture levee, removal of agricultural infrastructure, and tidal reconnection and expansion of the historic tidal slough. Through these actions, more than two-thirds of the East Pasture would be expected to shift from grassland to marsh. A transitional period would be expected over the short-term during which, as pasturelands slowly convert through exposure to saline conditions to marsh, restored areas would be dominated by a mix of non-native opportunistic, moderately salt-tolerant species characteristic of brackish conditions such as brass buttons, annual beard-grass, loosestrife, birdfoot trefoil, curly dock, and others. During this period, impacts to High Value Wildlife habitats would be negligible adverse, because much of the habitat being disturbed consists of highly managed pasturelands: while these type of habitats provide value, they are of lower value than many other unmanaged or less managed habitats.

The moderate increase in High Value Wildlife Habitats would have a minor beneficial effect over the long-term on use of the Project Area by wildlife, with use by common and special status wildlife species measurably increasing. Some of the largest changes in wildlife use under this alternative would be expected to come from increased use of expanded marsh and riparian habitats by waterbirds such as California black rail, marsh passerines, and resident and Neotropical migrant passerines or riparian bird species. Abundance and areal



extent of fish and invertebrate species would increase, as well. As with the No Action Alternative, however, amphibians and reptiles would be the taxa most adversely affected by implementation of this alternative.

Under Alternative A, Tidal Salt Marsh, a High Value Wildlife Habitat, would increase more than 350 percent relative to both baseline conditions and the No Action Alternative. Tidal Brackish Marsh could increase almost 50 percent through expansion of tidal reconnection of the East Pasture and the East Pasture Old Slough and limited creation of new tidal channels. The conversion of agricultural lands to Tidal Salt Marsh would decrease abundance of some species, but increase abundance of others. Grassland-associated species such as western meadowlarks, savannah sparrows, and grasshopper sparrows would dwindle in numbers, as would voles and other ground-based mammals that are prey for raptor species. Use by certain waterfowl and shorebirds that utilize open, ponded pasture such as yellowlegs and green-winged teal would also decrease, although preservation of the shallowly flooded and sparsely vegetated flats in the northeastern corner of the East Pasture would continue to provide alternate high tide habitats for waterfowl and shorebirds during the winter as it does now.

However, the conversion to marsh would benefit six special-status bird species: California black rail, great egret, saltmarsh common yellowthroat, short-eared owl, and peregrine falcon, by expanding foraging, nesting and/or rearing, and refuge habitat. These habitats would also benefit generalist waterbirds such as great egret and generalist shorebirds such as willet, godwit, and greater yellowlegs. Salt marsh also provides foraging habitat for raptors species - such as short-eared owl, white-tailed kite, northern harrier, and peregrine falcon - drawn to the site by small vertebrates such as California voles, shrews, and garter snakes. Other species also use marshes for foraging, including small mammals, passerine birds, and shorebirds. The Muted Tidal Brackish Marsh - Mudflat/Panne in the southeastern portion of the East Pasture would continue to attract moderately high numbers of shorebirds and waterfowl during the winter and provide alternate habitat for these species during high tide conditions within Tomales Bay.

In addition to substantially expanding the areal extent of tidal salt marsh habitat, Alternative A would improve the quality of existing salt marsh habitat through cessation of agricultural practices: removal of irrigation infrastructure and elimination of active grazing would lead to an increase in structural complexity and the percentage of native plant species in the salt marsh community, which would result in a greater diversity of habitat patches and an increase in high-quality edge habitat. The value of the newly created Tidal Salt Marsh and Tidal Brackish Marsh habitats to wildlife would be promoted by the presence of a large tract of undiked tidal salt and brackish marsh habitats immediately adjacent to the East Pasture in the undiked marsh. While not physically contiguous, this proximity between areas encourages a synergistic effect in which wildlife numbers would be higher together than they would have been separately, because of the affinity of many species for unfragmented, larger habitats.

Under Alternative A, Tidal Salt Marsh–High/Upland Ecotone habitat would almost triple, with this higher elevation habitat establishing in the southern portion of the East Pasture where tidal influence is restricted to higher high and extreme storm tides. This habitat provides refuge for salt marsh species such as California clapper rail, California black rail during high tides and winter flood events. The salt marsh upland ecotone habitat also provides resting and cover habitat for those species that travel frequently between open water, marsh, riparian forest, and grassland habitats, including the saltmarsh common yellowthroat, song sparrow, savannah sparrow, wrentit, and other passerine birds.

Grazing removal would favor natural expansion of riparian habitat along Fish Hatchery Creek and the western perimeter where groundwater flow creates optimal conditions for riparian vegetation. Riparian habitat, on the other hand, would continue to potentially decrease in Olema Marsh in response to what appears to be increasing water levels caused by poor drainage from undersized culverts and other factors. Open water and Freshwater Marsh communities would increase as a result. Overall, Forested and Scrub Shrub Riparian Habitat could increase more than 10 percent from removal of grazing and agricultural management, although some riparian habitat would be eliminated to create the through-trail component for the eastern perimeter trail and possibly also the potential future extension of the southern perimeter trail to Inverness Park.

The eastern perimeter trail would result in a permanent loss of 0.54 acres of riparian habitat and another 0.34 acres of temporary loss from trimming or limb removal. Trimmed vegetation would regrow relatively quickly, but, even with rapid regrowth, the trail would still represent a disturbance factor and would fragment the already narrow Tomasini Creek east bank riparian corridor. This fragmentation could affect the relative abundance and success of breeding for species observed to breed in this riparian thicket, including saltmarsh common yellowthroat and Swainson's thrush (J. Evens, ARA, pers. comm.). Construction of the southern

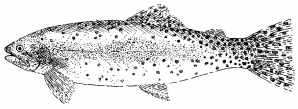
perimeter trail and the possible extension of that trail to Inverness Park could also affect common yellowthroat, which is known to breed in the general vicinity of both of those areas. Construction of the southern perimeter trail would involve only limited removal of vegetation for the bridge, but one of the two possible options for extending the southern perimeter trail to Inverness Park includes widening of the Sir Francis Drake Boulevard road berm through placement of fill in wetlands and removal of a considerable amount of riparian revegetation. The other option would involve a boardwalk through the West Pasture and would have much less direct impacts to wildlife habitat. Riparian habitat provides structural refuge critical to passerine birds, including saltmarsh common yellowthroat; mammals, such as southwestern river otter, dusky-footed woodrat, and black-tailed deer; and amphibians, including California red-legged, and Pacific tree frog. Many vertebrate species utilize tidal salt marsh and freshwater marsh habitats for foraging, but also require nearby high-quality riparian forest or scrub shrub habitat for resting and refuge.

Under Alternative A, the extent of subtidal and intertidal channels in the Project Area would increase more than 10 percent relative to existing conditions. This change would result from removal of the levees between Lagunitas Creek and the East Pasture and reconnection and expansion of the historic slough (East Pasture Old Slough). Breaching of the levees would allow for saline and brackish waters to inundate existing channels and the existing Old Duck Pond. The increase in sub- and intertidal waters in the East Pasture would benefit species such as the southwestern river otter, waterfowl and waterbirds, fish-eating raptors, and estuarine fish and invertebrates. This increase in tidally driven subtidal and intertidal habitats would account for the corresponding loss in non-tidal freshwater pond and channel habitat due to the expansion of tidal influence into the historic slough channels and the Old Duck Pond in the East Pasture. Expansion of these lower energy subtidal and intertidal habitats could provide new habitat for numerous estuarine and brackish aquatic species, including tidewater and arrow goby. Tidal channel creation would be limited in the northeastern corner of the East Pasture to preserve the shallow shorebird area where prolonged ponding has created sparsely vegetated flats that attract waterfowl and shorebirds during the winter, particularly when tides are high in Lagunitas Creek and the adjacent undiked marshlands.

As discussed under the No Action Alternative, the current conversion of approximately half of the West Pasture freshwater marsh from Freshwater Marsh to Muted Tidal Brackish Marsh would continue. Since repair of the failed tidegates in 2003, tidal waters have flowed into the marsh during the higher high tides in winter and have remained ponded there for several months due to poor drainage conditions. This saltwater intrusion has increased maximum and average salinities within the marsh and started to convert at least the lower-elevation northern portions of the Freshwater Marsh habitat to Muted Tidal Brackish Marsh. This conversion may have already caused impacts to the California red-legged frog population, as abundance has not rebounded since the initial baseline study documented relatively high numbers in 2001 (G. Fellers, USGS, unpub. data). Numbers of these frogs would be expected to continue to remain low under Alternative A.

In addition to the red-legged frog, another special status species, the Northwestern pond turtle, would be adversely affected by these changes, with barely detectable to measurable changes in habitat and numbers expected. These same factors would also, however, have a beneficial effect on the amphibian and reptile community by decreasing the extent of appropriate habitat for a non-native predator of the red-legged frog, the bullfrog, which occurs in the East Pasture, Tomasini Creek, and the West Pasture. Some of the adverse impacts to native amphibian and reptile species from loss of a portion of this marsh may be countered to some degree by increases in Freshwater Marsh habitat on the perimeter of the Giacomini Ranch where groundwater influence is strong because of the lack of draining and ditching activities. This issue is discussed further under the Special Status Species portion of this section. While negatively affecting frogs, the conversion of this habitat would benefit passerine bird species, such as salt marsh common yellowthroat and red-winged blackbird, which use tall vegetation for nesting and resting habitat while maintaining close proximity to more open foraging habitat.

As discussed under the No Action Alternative, increasing water levels in Olema Marsh and the associated decline in riparian habitat would result in a decline in riparian-associated avian species (e.g. warbling vireo, Swainson's thrush, and Wilson's warbler) at the marsh, although there may be an increase in species (e.g. swallows) that nest in cavities in snags and forage over the expanding Freshwater Marsh. The increasing water levels and predicted subsequent expansion of Freshwater Marsh would continue to support marsh wrens, song sparrows, salt marsh common yellowthroat, and Virginia rails, as well as migratory waterfowl. The expansion of freshwater marsh may increase breeding potential for waterfowl species such as mallard, gadwall, and Canada goose in Olema Marsh. In addition, it could increase habitat for California red-legged frog and bullfrog, both of which currently occur in the marsh.



Wildlife Habitats and General Wildlife Use – Long-Term Changes: The brackish and tidal marsh habitats described above would eventually develop after a short-term (~ 10 years) transitional period in which grassland is converted into marsh. These habitats would possibly continue to evolve in the future in response to sea level rise, which may be increasing at a much greater rate than was originally predicted (Overpeck et al. 2006). The projected rate of 3 feet of sea level rise by 2100 could lead to regular inundation of large portions of the East and West Pastures below 4 ft NAVD88, converting lower elevation portions of the pasture to subtidal and intertidal unvegetated habitats and higher elevations portions to intertidal emergent wetland habitats. This shift would attract specific avian species such as diving ducks, dabbling ducks, marsh-associated passerines, and other aquatic species.

Wildlife Habitats and General Wildlife Use – Construction: Construction of Alternative A would generally have only negligible adverse effects on High Value Wildlife Habitats and use by common wildlife species. Special status species are discussed individually.

Three of the proposed construction activities would have the highest potential to affect both common and special status wildlife species. These activities are regrading of the southwestern levee in the East Pasture and creek bank to a more stable profile, filling of drainage ditches, and tidal reconnection of the East Pasture Old Slough Pond. Grading of the southwestern levee in the East Pasture has the potential to negatively affect aquatic organisms in the White House Pool reach such as California freshwater shrimp through incidental sediment discharge during earthmoving and removal of willows that provide overhanging shade and habitat complexity in surface waters. Similar impacts could occur in areas where the levee is breached.

During removal of agricultural infrastructure, a portion of the drainage ditch system would be plugged with a dense clay material, filled to surrounding elevation grades, and finely graded. This 0.27 acres of ditch system supports a relatively depauperate aquatic community, comprised only of a few hardy invertebrates, mosquitofish, threespine stickleback, arrow goby, and crayfish. However, in 2006, tidewater goby were discovered in the East Pasture Old Slough Pond, the northernmost remnant of a historic slough system that has been leveed, dredged, and, in many areas, straightened to be part of the ditch system. Because this area is not tidally connected or connected to existing muted tidal habitats, this fish must have established either during the period when the East Pasture was completely flooded in December 2005-January 2006 or through access of the pond via a leaking set of tidegates. The ditches also support northwestern pond turtle and very low numbers of adult red-legged frog. The pond, adjacent portions of the ditch system, and a shoal on the outboard side of the levee would be shallowly excavated to improve hydraulic connection of the East Pasture Old Slough with Tomales Bay. Some tall emergent vegetation within the ditch would be removed. These actions have the potential to impact wildlife either through direct mortality or through disruption of the breeding cycle. Non-resident species such as waterfowl, waterbirds, and southwestern river otter would not be impacted unless nesting or breeding was occurring: as noted earlier, pre-construction surveys would be conducted prior to initiating construction to ensure that construction activities do not disrupt breeding, nesting, or fledging/rearing.

Based on the scale and timing of construction activities that could affect High Value Wildlife Habitats and use by common wildlife species, the impacts of construction are characterized as negligible adverse. The intensity of construction impacts on special status species is addressed separately below. Mitigation measures are discussed in a separate sub-section below.

Invasive Wildlife Species: Alternative A would have a minor adverse effect on the number of non-native invasive wildlife species that would be present as a result of changes in conditions. Under this alternative, most of the invasive species already present in the Project Area would be expected to remain, with a possible establishment into or expansion of numbers or extent within the fully tidal East Pasture and the muted tidal West Pasture by some of the aquatic invasive species such as European green crab, Korean shrimp, and possibly the New Zealand burrowing isopod and yellowfin goby. These species represent animals already present within the Project Area and Tomales Bay watershed.

There is a potential for future invasion as well by animals that are not yet found in the watershed, but that are likely to invade this estuary in the future because of their rapid spread within other regional estuaries such as San Francisco Bay. Some of the most highly invasive taxa within estuarine habitats are fish and invertebrates. Recent studies on restored and natural marshes of varying age in the Sacramento Delta and northern San Francisco Bay have found that the invertebrate community is dominated by non-native polycheates, crustaceans, and bivalves, some of which are having profound effects on the Bay-Delta ecosystem (Simenstad and Bollens 2002). Among these species are Asian clam (*Potamocorbula amurensis*),

which is a highly invasive species currently found in very high densities in northern San Francisco Bay sediments, and Chinese mitten crab (*Eriocheir sinensis*), which was introduced into San Pablo Bay sometime before 1994 and has subsequently spread throughout the South Bay and Bay-Delta areas. The Asian clam and some of its counterparts have been strongly linked with largescale reductions in phytoplankton biomass that have changed over the past few decades the food chain dynamics of the Bay-Delta ecosystem.

As with the No Action Alternative, Alternative A would have some effect on freshwater and terrestrial invasive species, as well. Under both the No Action Alternative and Alternative A, the northern half of the freshwater marsh in the West Pasture would continue to convert to Muted Tidal Brackish Marsh habitat. In addition to California red-legged frog and Pacific tree frog, this marsh also supports an unknown number of bullfrogs, which were sighted for the first time in 2006 (P. Kleeman, *USGS, pers. comm*.). Other invasive freshwater aquatic species include mosquitofish and crayfish, both of which are currently found within the Project Area. Reintroduction of tidal action to the East Pasture, combined with filling of a portion of the drainage ditches, would decrease numbers and areal extent of these species, although mosquitofish have also occur in more saline waters in undiked areas (NPS, unpub. data), suggesting that this species can tolerate brackish conditions.

Over the long-term, then, numbers and areal extent of these species would contract in response to increased tidal inundation, but they would be likely to persist in creeks and fringe habitats along the ranch perimeter where conditions are more appropriate. While changes in some portions of the Giacomini Ranch might be detrimental to freshwater species, the current trend in Olema Marsh of conversion of riparian habitat to Freshwater Marsh and permanently flooded Open Water would be expected to continue, thereby maintaining or even increasing numbers of bullfrogs. Mosquitofish and crayfish have not been observed in this system, but the marsh is difficult to survey, so it is possible that at least mosquitofish occur there.

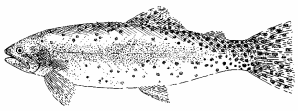
The largescale conversion of grassland to marsh habitats would reduce at least the areal extent of potential habitat for red fox and wild turkey. These species, however, are somewhat opportunistic and would be expected to persist along the edges of the Giacomini Ranch where conditions are appropriate. These species would continue to access East and West Pasture grassland areas for foraging, resting, and other purposes.

Wildlife Conditions in the Watershed: Tidal reconnection of the 350-acre East Pasture to Lagunitas Creek would have a minor beneficial effect in terms of support of wildlife species in southern portion of the Tomales Bay watershed. Tidal reconnection would increase considerably the potential for export of sources of carbon such as dissolved and particulate organic carbon, phytoplankton, seeds and other plant matter, and aquatic organisms to the bay. In addition, marine and estuarine species that wander into the southern portion of the bay in search of food would be able to access the East Pasture through the newly reconnected East Pasture Old Slough. This tidal channel network would provide not only access to food sources, but refugia. In addition, as with the No Action Alternative, discontinuation of agricultural management practices in the Project Area would also affect conditions in Lagunitas and, ultimately, the bay. Watershed habitat quality would be improved by discontinuation of levee maintenance, withdrawal of water for irrigation, infrequent pumping of waters from the ranch into Lagunitas Creek, and crossing of Lagunitas Creek by cattle.

California red-legged frog: Similar to the No Action Alternative, Alternative A would have a negligible adverse effect on California red-legged frog breeding habitat units and distribution of the species in the Point Reyes Peninsula Core Area, but a minor adverse effect on distribution of red-legged frogs in the Project Area. Over the long-term, impacts could possibly increase to minor, because degradation of the levees in the West Pasture and sea level rise could cause a measurable effect on breeding habitat units and regional distribution. Impacts during construction of the wetland mitigation/restoration component in the northern portion of the East Pasture where no breeding has been documented would be expected to be non-existent or very negligible.

Baseline studies documented two general areas that provide breeding habitat for red-legged frog. The largest of these is the West Pasture freshwater marsh. Breeding also has sporadically occurred in adjacent Fish Hatchery Creek, creating another 1.0 acre of breeding habitat in the West Pasture. The second breeding habitat is in the Olema Marsh and is assumed to comprise all of the areas with Freshwater Marsh and Open Water, which total 39 acres. There is no documented breeding habitat in the East Pasture, although a few adult frogs were observed during baseline surveys (Fellers and Guscio 2002).

As discussed under the No Action Alternative, the pattern of saltwater intrusion converting the northern half of the West Pasture freshwater marsh to brackish marsh would continue. The southern half would still not be



affected by salinity intrusion, perhaps because of slightly higher elevations, which reduce the reach of tides, and high perennial freshwater inflow from the 1906 Drainage and Inverness Ridge groundwater. The Park Service is conducting a habitat enhancement project in 2006 that would slightly expand higher elevation Freshwater Marsh habitat by approximately 0.4 acres. In addition, continued increases in water levels in Olema Marsh due to poor drainage would continue to convert Forested and Scrub Shrub Riparian habitat to Freshwater Marsh and Open Water habitat, perhaps providing a very negligible increase in breeding habitat for red-legged frog. Because breeding frogs are currently located in the West Pasture, across Lagunitas Creek from the East Pasture, the large-scale conversion of grassland to marsh in the East Pasture is characterized as a minor adverse impact to non-breeding habitat.

While the West Pasture levees and infrastructure would remain under Alternative A, discontinuation of levee maintenance would result in slow decay of levee and tidegate facilities. The slow decay or sudden breach during large storm events of these facilities would allow for greater tidal flooding and thereby further reduce viable red-legged frog breeding habitat in the West Pasture. Under full tidal conditions, an additional 1.5 acres of breeding habitat would be lost through conversion to brackish or saline habitats. This impact could be increased over the long-term by sea level rise, which may be rising at a much higher rate than originally predicted. If the levees decayed or abruptly breached, impacts on red-legged frog in the Project Area and Point Reyes Peninsula Core Area would be characterized as minor, with the exact effect dependent on a number of factors, including annual variability in rainfall and runoff conditions and possible passive creation of Freshwater Marsh in other areas through discontinuation of agricultural management.

Impacts on red-legged frog during construction of the East Pasture restoration component would be expected to be negligible. There is no breeding habitat in the East Pasture, and only a few adult frogs have been occasionally been sighted in the East Pasture. Construction activities expected to have the most effect would be filling in of the drainage ditches, tidal reconnection of the East Pasture Old Slough and excavation, and construction of the eastern perimeter trail in the riparian habitat adjacent to Tomasini Creek. Possible mitigation measures are discussed in a separate sub-section below.

Tidewater goby: Alternative A would have minor to eventually moderate beneficial effects on tidewater goby in the Project Area after implementation through a potential increase in the areal extent of East Pasture habitat and quality of other existing habitats in Tomasini Creek and the West Pasture. Impacts during construction would be expected to be moderate, with implementation of mitigation measures designed to reduce the potential or amount of incidental take of this federally listed species.

Within the Project Area, Acreage of existing tidewater goby habitat in the Giacomini Ranch totals 11.3 acres. This species occurs primarily in three areas within the Giacomini Ranch: Tomasini Creek, the West Pasture Old Slough and possibly Fish Hatchery Creek, and the non-tidal East Pasture Old Slough Pond. A detailed description of these areas can be found under the No Action Alternative. Numbers of tidewater goby in the Project Area have also been relatively low within each of these sites, ranging from five to 22 at most. These sites represent the only known occurrence of this species in the Tomales Bay watershed, as, prior to 2002, the species had last been sighted in the bay in 1953. Genetic analyses indicate that this population is genetically distinct from the nearest existing occurrences of tidewater goby at Salmon Creek Marsh and Rodeo Lagoon (Jacobs and Earl 2005).

Similar to the No Action Alternative, construction of the East Pasture restoration component includes the captive propagation program described in Chapter 2 and tidal reconnection of the East Pasture Old Slough Pond with Lagunitas Creek and Tomales Bay. Under this alternative, the pond, the diked portion of slough adjacent to the pond, and a shoal on the outboard side of the levee would also be shallowly excavated to improve hydraulic connectivity of the reconnected slough with Lagunitas Creek. While approximately 0.3 acres of ditches would be filled in as part of the elimination of agricultural infrastructure under Alternative, A, there would be approximately 1.0 acre of new tidal channel creation. Possible mitigation measures are discussed in a separate sub-section below.

Following project implementation, Alternative A would result in minor to eventually moderate beneficial effects on tidewater goby by increasing areal extent of habitat within the East Pasture through tidal reconnection of the East Pasture Old Slough and creation of new tidal channels. These effects would remain relatively minor over the short-term until marsh conditions become better established within the East Pasture. During this transitional phase, existing habitat conditions would be maintained in the West Pasture Old Slough and Tomasini Creek through retention of the tidegates and associated hydrologic infrastructure: tidal influence in the West Pasture Old Slough is controlled via a tidegate on Fish Hatchery Creek. While tidegates are

intended to either eliminate or minimize tidal influence, tidegates on Tomasini Creek and Fish Hatchery Creek allow either a moderately reduced (Fish Hatchery) or the full range (Tomasini Creek) of high tides. In the case of Tomasini Creek, and possibly Fish Hatchery Creek, the tidegates appear to have more of an effect on tidewater goby by preventing complete drainage during low tides. This maintains permanent ponding or subtidal conditions within the creek, which may have become intertidal mudflat during low tides if it had been allowed to drain completely. The tidegate, along with natural gravel bar features create residual brackish pool habitat that provides habitat for the tidewater goby, despite the fact that the substrate and flow conditions are probably not optimal.

The only potential impacts to existing habitat in Tomasini Creek under this alternative would occur in conjunction with construction of the eastern perimeter trail and use. This trail would be constructed along the former railroad grade directly adjacent to Tomasini Creek and the primary tidewater goby habitat in the Project Area. Existing dense willow and blackberry (riparian) thickets that would be permanently or temporarily lost during construction provide cover for the creek. Perennial seeps on the Point Reyes Mesa appear to contribute substantially to maintenance of brackish conditions in the creek, which is subject to the full range of high tides. A brackish water species, tidewater goby is sensitive to higher salinity waters approaching marine salinities (~34 ppt), preferring salinities in the 12 ppt, although a wide range of salinities can be tolerated from 0.5 ppt up to at least 25 ppt (Swift 2003). As part of this trail component, a culverted berm would be used to construct the trail, which may adversely affect at least the surface-flow contribution of seeps from the mesa to Tomasini Creek.

In addition to creating new habitat and maintaining existing conditions in old habitat, tidal reconnection and discontinuation of agricultural management would also improve water quality within the East Pasture Old Slough, Tomasini Creek, and the Wet Pasture Old Slough. Based on observations of dead marine fish during the 2006 sampling, the East Pasture Old Slough Pond probably has at least short periods of sub-optimal water quality. A reduction or removal of grazing, manure spreading, levee maintenance, and ditch dredging would increase water quality within waters of these habitats, improving the quality of existing habitat for tidewater goby.

Over the long-term, the effects of Alternative A on tidewater goby habitat would increase slightly relative to short-term conditions, because of a maturation of tidal and brackish habitats following a transitional phase of development. In addition, slow decay or abrupt breaching of the Giacomini Ranch West Pasture levees -- which would be retained, but not maintained -- would have the potential to increase habitat for tidewater goby through creation of more tidal channels and side channels in the West Pasture. The trend of conversion of grassland to brackish and tidal marsh habitats would be intensified by sea level rise, which may be increasing at a much higher rate than originally predicted. The projected rate of 3 feet of sea level rise by 2100 (Overpeck et al. 2006) could lead to regular inundation of large portions of the East and West Pastures below 4 ft NAVD88, converting lower elevation portions of the pasture to subtidal and intertidal unvegetated habitats and higher elevations portions that would have developed into high marsh or remained grassland.

Central California coast steelhead, coastal California Evolutionarily Significant Unit (ESU) Chinook salmon, and central California coast coho ESU salmon: The effects of Alternative A on salmonid rearing and passage habitat in the Project Area would be minor beneficial. Negligible adverse impacts to salmonid habitat or salmonids would be expected to occur during construction of the wetland restoration/mitigation component.

As discussed under the No Action Alternative, the Project Area does not represent a potential breeding or spawning area for steelhead, coho or Chinook salmon, but rather important feeding, resting, and refugia habitat for salmonids as they migrate to the ocean or move upstream to spawning grounds. The importance of estuarine habitats varies between salmonid species: Chinook typically spend the most time in wetlands before outmigrating to the ocean (Simenstad et al. 1982, Aitkin 1998), although estuaries are important for some coho populations, as well (Magnusson and Hilborn 2003; Miller and Sadro 2003).

Steelhead has recently been found in Fish Hatchery Creek, Tomasini Creek, the section of Lagunitas Creek in the Project Area, and in Bear Valley Creek upstream of Olema Marsh. Coho occur in Lagunitas Creek and in Tomasini Creek. Chinook has been documented in upstream portions of Lagunitas Creek, but they have not been captured as yet in the Project Area. Salmonid presence in these watersheds indicates that, while impediments, the levees and tidegate facilities are still allowing some degree of fish passage. The levees severely constrain the potential for development of off-channel or rearing habitat on Tomasini Creek and Lagunitas Creek. Fish Hatchery Creek is not leveed within the West Pasture, although it is infrequently dredged. On Bear Valley Creek, Levee Road, Bear Valley Roads, and their culverts limit both passage and

rearing potential, along with the indistinct flow path in Olema Marsh created by excessive impoundment of waters.

The largest benefit to salmonids under this alternative would come from the minor increase in potential rearing habitat from tidal reconnection of the East Pasture Old Slough Pond with Lagunitas Creek. Aquatic edge habitat would increase approximately 13 percent relative to existing conditions, with edge habitat in the Project Area climbing from approximately 15 miles under existing conditions to 17 miles under Alternative A. While approximately 0.3 acres of ditches would be eliminated, another 1.0 acre of new tidal channels would be created. In addition, as with the No Action Alternative, discontinuation of agricultural management practices would measurably improve passage and rearing conditions for salmonids not only in the East Pasture, but in Lagunitas Creek. These management practices include levee maintenance, dredging, cattle crossing of Lagunitas Creek, pumping of creek water for irrigation, and other factors. There would be no change in Olema Marsh, other than water levels would be expected to continue their rise, which may further affect the ability of salmonids to reach upstream portions of the watershed.

Over the long-term, slow decay or abrupt breaching of the Giacomini Ranch West Pasture levee would have the potential to increase habitat for salmonids through creation of more tidal channels and side channels in the West Pasture. While these channels could provide more refugia and foraging habitat for salmonids, levee failure could also create an ecological sink such that water could flood in, but not flow out, causing extensive stranding of aquatic species. The potential for this scenario is greater in the West Pasture than the East Pasture. This trend toward tidal reconnection with levee failure would be intensified by sea level rise, which may be increasing at a much higher rate than originally predicted.

Construction would have only the potential for negligible adverse impacts associated with grading of the southwestern portion of the Giacomini Ranch levee on Lagunitas Creek and possible removal of riparian vegetation, although every effort would be made to retain as much of the established vegetation as possible. Construction would be scheduled to ensure that grading does not begin before July 15, which is the end of the typical period for smolt outmigration.

California black rail and California clapper rail: Over the long-term, Alternative A would have a major beneficial effect on California black rail and California clapper rail by substantially increasing appropriate breeding, foraging, and refugia habitat with restoration of more than 250 acres of low-, mid- and high Tidal Salt Marsh adjacent to existing rail habitat. During the transitional period following construction, however, only negligible to minor beneficial effects would be expected, as grassland begins the process of converting to brackish and tidal marsh, leading to temporary establishment of a more weedy, ruderal habitat that would have less benefits for rails. Impacts during construction to existing rail habitat in the undiked marsh across Lagunitas Creek from the undiked marsh would either be non-existent or negligible, at most.

As discussed under the No Action Alternative, breeding populations of California black rail have primarily occur in the undiked marsh north of the Giacomini Ranch and in Olema and Bear Valley marshes in intermittent years (ARA 2002). Small numbers (1-2 individuals) also occurred within the Project Area in brackish and freshwater marsh, with possible breeding one year in the West Pasture freshwater marsh (ARA 2002). Clapper rail historically occurred in Tomales Bay, and individuals were sighted in the undiked marsh north of the Giacomini Ranch during fall and winter between 1995 and 2001 (J. Evens, R. Stallcup, unpub. field notes). There have been no sightings since then, however, and there are no recent breeding records either from the bay.

Under Alternative A, habitat for the black rail in the Project Area and adjacent undiked marsh to the north of the Giacomini Ranch would almost triple from approximately 120 acres to more than 250 acres with restoration of the East Pasture. The restoration would provide benefits primarily to black rail, although clapper rail could benefit substantially, as well, from establishment of low and high Tidal Salt Marsh habitats. While rails do not currently use the East Pasture, the proximity of the restoration area to the undiked marsh makes it more likely that rails would expand into the East Pasture and use the newly created habitat. Almost 80 percent of the habitat created (> 200 acres) would be mid-marsh habitat, which is suitable for breeding, nesting, and foraging by black rails. The remainder would be high marsh/upland ecotone habitat, which would serve as refugia for rails during high tide and storm tide conditions. Most of the high marsh/upland ecotone habitat would occur on the nearby Tomasini Creek levee, the newly created high tide refugia in the northeastern portion of the West Pasture, and the higher intertidal elevations areas in the southern portion of the East Pasture. Increases in high marsh habitat in Giacomini Ranch could, at least temporarily, offset any decreases in this habitat in the undiked marsh habitat north of the ranch from accelerated rates of bank

slumping and channel widening that might be potentially being caused by a non-native isopod. This isopod would be likely to move south into the Giacomini Ranch once tidal connection and habitats are restored.

In other areas, decreases in rail numbers might be expected from continuation of existing conditions. Under this alternative, the West Pasture north levee would not be removed. Rails often use these levees during storms and extreme high tide events. While the levees are well above most of the higher high tides, they are often poorly vegetated due to trampling from cattle and people and are subject to disturbance pressures from people using the existing informal trail to view the rails who may inadvertently flush them into the open where they are vulnerable to predation. In addition, steadily increasing water levels in Olema Marsh, which is causing conversion of riparian to Freshwater Marsh and Open Water habitat, would potentially decrease suitability of this habitat for black rail.

Over the long-term, slow decay or abrupt breaching of the Giacomini Ranch West Pasture levee would have the potential to increase nesting, foraging, and roosting habitat for rails through creation of more low- and mid-marsh intertidal emergent marsh. This trend would be intensified by sea level rise, with the recently projected rate of 3 feet of sea level rise by 2100 (Overpeck et al. 2006) leading to regular inundation of large portions of the East and West Pastures below 4 ft NAVD88. While this trend could increase available rail habitat in the Giacomini Ranch, it would potentially decrease habitat and numbers of black rails in Olema Marsh, because of a continued rise in water levels. Loss of the West Pasture levee from decay or breaching would reduce the amount of high-tide refugia available. However, this loss would be offset to a large degree by creation of high tide refugia in the northeastern corner of the West Pasture through a 2006 habitat enhancement, the continued presence of the Tomasini Creek levee and higher elevations areas in the West Pasture, and restoration of high marsh/upland ecotone areas in the southern portion of the East Pasture. As with the existing levees, some of these areas may be subject to disturbance or predation pressures from birds and mammals with the exception of the created high tide refugia in the West Pasture.

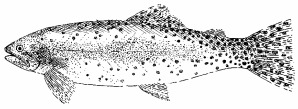
Construction would be expected to have only negligible adverse effects, if any, on rails, because it would not affect existing rail habitat and would be conducted outside of the documented breeding season (February through August 31).

Other Special Status Species: The effects of Alternative A on other special status species would generally range from minor beneficial effects to moderate adverse effects depending on the species. Impacts during construction of the East Pasture restoration component would range from beneficial negligible to moderate adverse.

Species included in this category are federally or state-listed threatened and endangered species that are only occasional visitors or vagrants to the Project Area or are listed as a Species of Concern by the Sacramento office of the USFWS. In general, restoration of the East Pasture and conversion of grassland to marsh, combined with discontinuation of agricultural management, would have negligible to minor beneficial effects over the long-term for most of these species. **California freshwater shrimp** would benefit from discontinuation of levee maintenance and grading and revegetation of the East Pasture southern levee through an increase in overhanging riparian vegetation that would provide sources of food and protection. California brown pelican, green sturgeon, Least Bell's vireo, and **southwestern river otter** would directly benefit from the absence of maintenance and management practices that have the potential to inadvertently affect individuals or populations or to decrease important habitat such as riparian forest and scrub-shrub.

Conversely, negligible to moderate adverse effects would be expected for certain freshwater- and grassland-associated special status species. The American peregrine falcon may benefit negligibly under this alternative during construction from the "flushing" of voles and other rodents, but, over the long-term, loss of grassland habitat would decrease, if not eliminate, rodent numbers and have a negligible adverse effect on this raptor. Species such as sandhill crane and bank swallow may also respond negatively to grassland conversion. **Saltmarsh common yellowthroat** could be adversely impacted by permanent or temporary removal of riparian habitat for construction of the eastern perimeter trail, southern perimeter trail, and the possible future extension of the southern perimeter trail to Inverness Park. Common yellowthroat is known to breed in the first two areas and also breeds in the riparian habitat along Sir Francis Drake Boulevard, but north of where the possible trail extension would occur.

California freshwater shrimp primarily occurs considerably upstream of the Project Area on Lagunitas and Olema Creeks, although it occasionally moves downstream on Lagunitas Creek into the White House Pool reach of Lagunitas Creek. The frequency of occurrence within the Project Area probably depends to a large



degree on flow and salinity conditions in this highly variable estuarine zone of the Lagunitas Creek delta. Minor adverse effects would be primarily associated with construction from actions such as levee removal, creek bank grading, and removal of riparian vegetation along the southern portion of the East Pasture, although every effort would be made to preserve as much riparian vegetation as possible. Over the long-term, negligible beneficial effects would be expected from discontinuation of agricultural management practices in Lagunitas Creek.

The largest impact would come from the loss of freshwater habitat for the **northwestern pond turtle**, which would lead to moderate adverse impacts during both construction and project implementation. Construction activities expected to have the most effect would be filling in of the drainage ditches, tidal reconnection of the East Pasture Old Slough and excavation, and construction of the eastern perimeter trail in the riparian habitat adjacent to Tomasini Creek. Following implementation, turtles may become restricted to freshwater portions of Tomasini Creek and pockets of freshwater marsh in the East Pasture along the ranch periphery, although much of the levee system possibly used for aestivation would remain. Over the long-term, the slow decay or abrupt breaching of the West Pasture levees could increase impacts for this species by affecting individuals in the West Pasture, as well as the East Pasture, through conversion of grassland to tidal and brackish marsh. The turtle may possibly move into Olema Marsh, which would have a small net increase in Freshwater Marsh habitat. It has not been documented currently in the marsh, although it occurs in nearby reaches of Lagunitas Creek, so it is possible that habitat conditions are not appropriate for this species (e.g., not enough basking or aestivation sites).

Proposed Additional Mitigation Measures: Standard BMPs would be implemented to reduce construction-related impacts to special status species and wildlife habitats are discussed under Chapter 2. All construction and staging/stockpiling areas would be cleared by biologists prior to use to ensure that there are no nesting or breeding species within the vicinity of the Project Area or staging/stockpile areas prior to implementation. Measures specific to certain species are described below:

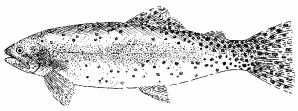
California red-legged frog: Construction activities would include removal of roads, fences, and ditches within the Project Area, and excavation of certain portions of the East Pasture Old Slough. Though not documented as supporting breeding habitat, the Old Slough and ditches may provide non-breeding habitat. Construction activities adjacent to or within California red-legged frog habitat documented as breeding habitat would not be conducted until August. Pre-construction surveys would be completed in all construction areas to confirm that no red-legged frogs are present. Frogs encountered would be relocated.

Tidewater goby: Construction would not occur in or directly adjacent to existing tidewater goby habitat during the typical season of reproduction for tidewater goby documented in the literature (late April – early summer; Swift 2003). Prior to construction in the East Pasture Old Slough Pond and ditches, extensive seining would be performed after some dewatering to lower water levels and increase the efficiency of trapping. Minnow traps and dip nets may also be used to increase capture rates. Captured fish would be immediately relocated to Tomasini Creek.

Central California coast steelhead, coastal California ESU Chinook salmon, and central California coast coho ESU salmon: Work affecting Lagunitas Creek would be conducted after July 15 during low flow periods to minimize impacts to salmonids and other aquatic organisms. BMPs identified in Chapter 2 to decrease sedimentation and impacts to wetlands would mitigate potential impacts associated with selective deconstruction of levees, regrading of creek banks, construction of the eastern perimeter trail, and installation of a pre-fabricated bridge. In addition to these BMPs, other actions would be taken to minimize impacts, including use of an excavator rather than a bulldozer to remove fill and excavation in sensitive creek areas during periods when construction area is exposed to the extent possible.

California black rail and California clapper rail: The East Pasture is across Lagunitas Creek from established habitat for California black rail and California clapper rail, but is not currently identified as rail habitat. The project would comply with directives to not come within 250 feet of established rail habitat prior to August 31 by delaying construction in the northern portion of the East Pasture until September.

California freshwater shrimp: Construction conducted in the White House Pool reach would comply with BMPs identified in Chapter 2 to decrease sedimentation and impacts to wetlands would mitigate potential impacts associated with selective deconstruction of levees, regrading of creek banks, and installation of a pre-



fabricated bridge. Pre-construction surveys would be conducted, and any shrimp found would be relocated upstream outside of the construction zone.

Northwestern pond turtle: Prior to construction in the ditches and East Pasture Old Slough, water levels would be lowered to the extent possible, and turtles would be trapped and relocated to appropriate habitat, either Lagunitas Creek or the Martinelli Ponds in the Martinelli Ranch directly to the north of the Giacomini Ranch.

Saltmarsh common yellowthroat: Prior to construction of the southern perimeter trail, the eastern perimeter trail, or the possible future extension of the southern perimeter trail to Inverness Park, pre-construction surveys would be conducted to ensure that no active nests are present or that nesting and fledging have been completed prior to construction being conducted within or in the immediate vicinity (< 100 feet) of riparian habitat that is either known to support or believed capable of supporting common yellowthroat.

Effectiveness of Proposed Additional Mitigation Measures

California red-legged frog: The proposed mitigation measures should reduce any potential impacts to negligible levels.

Tidewater goby: The proposed mitigation measures would be expected to reduce impacts, but impacts cannot be eliminated. Even with extensive seining, some mortality of fish would be expected, because tidewater goby burrow in the mud, making it extremely difficult to trap all fish. Construction would, therefore, result in incidental take. The proposed mitigation measure would result in this alternative having moderate adverse impacts on tidewater goby during construction.

Central California coast steelhead, coastal California ESU Chinook salmon, and central California coast coho ESU salmon: The proposed mitigation measures should reduce any potential impacts to negligible levels.

California black rail and California clapper rail: The proposed mitigation measures should reduce any potential impacts to negligible levels.

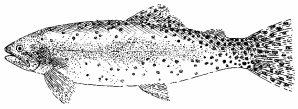
California freshwater shrimp: The proposed mitigation measures should reduce any potential impacts to negligible levels.

Northwestern pond turtle: The proposed mitigation measures would be expected to reduce impacts, but would not eliminate them. Even with dewatering of the channels and extensive trapping, some mortality of turtles would be expected. The proposed mitigation measure would result in this alternative having moderate adverse impacts on turtles during construction.

Saltmarsh common yellowthroat: The proposed mitigation measures should reduce any potential impacts to negligible levels.

Cumulative Impacts: Based on the similarity in impacts for California red-legged frog between the No Action Alternative and Alternative A, cumulative impacts would be the same as described under the No Action Alternative for California red-legged frog.

Expansion of tidal marsh habitats in the historic wetlands of the Giacomini Ranch—including low-marsh, mid-marsh, high-marsh, and high-marsh/upland ecotone habitats -- would also have a cumulatively beneficial effect with the large number of proposed and ongoing wetland restoration projects in greater San Francisco Bay on California black and clapper rail regional populations. A list of some of these projects can be found at the beginning of this chapter and include Hamilton Wetland Restoration Project, Napa-Sonoma Marsh Restoration Project, and the South Bay Salt Pond Restoration Project. Some winters, when conditions are right, numbers of black rails in Tomales Bay swell with immigrants arriving from San Francisco Bay, some of which remain to breed here (J. Evens, ARA, *pers. comm*.). In addition, California clapper rails from San Francisco Bay occasionally end up in Tomales Bay in fall and early-winter, although their presence here is usually short-lived. (J. Evens, ARA, *pers. comm*.). The increase in marsh area and elevational diversity in both Tomales and San Francisco Bay will increase the amount of breeding habitat and make a significant contribution to reproductive success of the California black rail. The viability of California clapper rail meta-populations will increase with the increase in available habitat, and the overall number of rails is likely to increase. While Tomales Bay will always hold fewer birds than San Francisco Bay marshlands, it will provide



– particularly with restoration of the Project Area -- an important alternative to San Francisco Bay that may help long-term viability of regional meta-populations by buffering them from threats arising from stochastic events such as floods or oil spills. With expanded habitat opportunities, Tomales Bay has the potential to be a population source for both species should occurrences elsewhere be drastically affected by stochastic events.

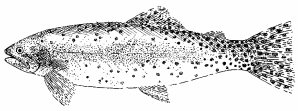
Similar connectivity between San Francisco Bay and Tomales Bay exists in terms of many aquatic species, including shorebirds and waterfowl during both migratory and non-migratory periods (J. Takekawa, USGS, *pers. comm*.). Significant exchange of migratory bird populations occur between these two estuaries, particularly for species such as dunlin (*Calidris alpina*), canvasback (Aythya valisineria), greater scaup (*Aythya marila*), and surf scoter (*Melanitta perspicillata*; Warnock et al. 1995, J. Takekawa, USGS, unpub. data). Tomales Bay often represents an initial stopover area during spring migration (J. Takekawa, USGS, *pers. comm*.). The direct and indirect implications of implementation of several large restoration projects in both San Francisco and Tomales Bay on these waterbirds are less clear than for rails. Depending upon which restoration approach the salt pond projects adopt in terms of emphasizing tidal marsh versus managed salt pond and the indirect impacts of these projects on external mudflats, these projects could alternately have either adverse or beneficial impacts on shorebird and waterfowl numbers in general and on specific shorebird and duck species in particular. Also, the impacts could be mixed, benefiting some species but adversely affecting others. It is important to remember that, for fish, birds, and some marine mammals, the estuarine wetlands of the greater San Francisco Bay area, including Tomales Bay, function as an interactive mosaic of habitats; estuarine dependent animals may shift from one site to another as conditions change (J. Evens, ARA, *pers. comm*.).

Because many of the San Francisco Bay restoration projects are still being developed or are just being implemented, it is difficult to anticipate how the mosaic of different wetland habitats being created or restored will function in concert with one another and thereby affect viability and population dynamics of shorebirds and waterfowl in general and individual avian species in particular. In general, the proposed project in Tomales Bay, in combination with other restoration projects in San Francisco Bay, would be expected to 1) have a cumulatively beneficial effect to most estuarine dependent species, 2) partially offset and/or complement the effects of projects in San Francisco Bay, OR 3) have no impact at all depending upon the species in question.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The **e**ffects of Alternative A on wildlife habitat and use in the Project Area and support of wildlife species in the watershed would generally range from moderate adverse to major beneficial. Under Alternative A, the East Pasture would be restored, with new public access facilities limited to the eastern and southern perimeters of the East Pasture. Over the long-term, Alternative A would be expected to have moderate beneficial effects on High Value Wildlife Habitats in the Project Area, although there may be some minor adverse impacts during construction in the East Pasture. The largest single change under this alternative relative to the No Action Alternative would come from the substantial conversion of grassland to salt and brackish marsh through breaching of the East Pasture levee, removal of agricultural infrastructure, and tidal reconnection and expansion of the historic tidal slough. Through these actions, more than two-thirds of the East Pasture would be expected to shift from grassland to marsh after a relatively short-term transitional period where weedy, ruderal species may temporarily establish.

The moderate increase in High Value Wildlife Habitats would have a minor beneficial effect over the long-term on use of the Project Area by wildlife, with use by common and special status wildlife species potentially increasing measurably. The largest changes in wildlife use under this alternative would be expected to come from increased use of expanded marsh and riparian habitats by waterbirds such as California black rail, and marsh passerines, and of expanded riparian habitats by resident and Neotropical migrant passerines or riparian bird species. As with the No Action Alternative, amphibians and reptiles would be the taxa most adversely affected by implementation of this alternative. Alternative A would also have a minor adverse effect on the number of non-native invasive wildlife species that would be present as a result of changes in conditions. Construction of Alternative A would generally have only negligible adverse effects on High Value Wildlife Habitats and on use by common wildlife species. Only a negligible beneficial effect would be expected in terms of support of wildlife species in southern portion of the Tomales Bay watershed and in terms of



regional population-level effects on species such as rails, shorebirds, and waterfowl from cumulative interactions with other proposed and ongoing projects in San Francisco Bay.

California red-legged frog: Similar to the No Action Alternative, Alternative A would have a negligible adverse effect on California red-legged frog breeding habitat units and distribution of the species in the Point Reyes Peninsula Core Area, but a minor adverse effect on distribution of red-legged frogs in the Project Area. Over the long-term, impacts could possibly increase to minor, because degradation of the levees in the West Pasture and sea level rise could cause a measurable effect on breeding habitat units and regional distribution. Impacts during construction of the wetland mitigation/restoration component in the northern portion of the East Pasture where no breeding has been documented would be expected to be non-existent or very negligible. There is a potential for cumulative impacts with other projects proposed in the Seashore or Marin County region, but, based on evaluation of impacts and proposed mitigation measures for those projects, impacts under this alternative would still be characterized as negligible to minor adverse.

Tidewater goby: Alternative A would have very minor to eventually moderate negligible beneficial effects on tidewater goby in the Project Area after implementation through a potential increase in the areal extent of East Pasture habitat and quality of other existing habitats in Tomasini Creek and the West Pastureexisting habitat, although, over the long term, slow decay or sudden breaching of levees could increase the benefits to tidewater goby by increasing the amount of available habitat. Impacts during construction would be expected to be minor to moderate at most, with implementation of mitigation measures designed to reduce the potential or amount of incidental take of this federally listed species.

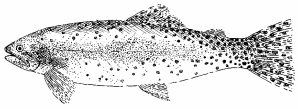
Central California coast steelhead, coastal California Evolutionarily Significant Unit (ESU) Chinook salmon, and central California coast coho ESU salmon: The effects of Alternative A on salmonid rearing and passage habitat in the Project Area would be beneficial minor. Negligible adverse impacts to salmonid habitat or salmonids would be expected to occur during construction of the wetland restoration/mitigation component. Standard BMPs and other measures would be used to reduce impacts to negligible levels.

California black rail and California clapper rail: Over the long-term, Alternative A would have a major beneficial effect on California black rail and California clapper rail by substantially increasing appropriate breeding, foraging, and refugia habitat with restoration of more than 250 acres of low-, mid- and high Tidal Salt Marsh adjacent to existing rail habitat. During the transitional period following construction when grassland converts to marsh, however, only negligible to minor beneficial effects would be expected. Impacts during construction to existing rail habitat in the undiked marsh across Lagunitas Creek from the undiked marsh would either be non-existent or negligible, at most, particularly with implementation of proposed mitigation measures.

Other Special Status Species: The effects of Alternative A on other special status species would generally range from minor beneficial effects to moderate adverse effects depending on the species. Impacts during construction of the East Pasture restoration component would range from beneficial negligible to moderate adverse. Mitigation measures are proposed where appropriate to reduce impacts to the extent possible.

Alternative B

Analysis: The effects of Alternative B on wildlife habitat and use in the Project Area and support of wildlife species in the watershed would generally range from moderate adverse to major beneficial (Table 70). Under Alternative B, the East and West Pastures would be restored, with new public access facilities limited to the eastern and southern perimeters of the East Pasture. In the West Pasture, existing informal trail on the West Pasture north levee would be removed, although there would still be the potential for future extension of the southern perimeter trail to Inverness Park. There would be no restoration in Olema Marsh. The levees along and tidegate/culvert in Tomasini Creek would be retained, but not maintained. In the Giacomini Ranch, restoration would involve complete removal of levees in the East Pasture along Lagunitas Creek and breaching of levees in the West Pasture. Relative to Alternative A, more tidal channels would be excavated. A freshwater marsh component would be constructed in the Tomasini Triangle in the East Pasture just north of the Giacomini dairy facility to offset increased loss of freshwater marsh in the West Pasture with removal of the Fish Hatchery Creek tidegate and the north levee. The entire southern levee of the East Pasture would be removed and regraded in areas to a more stabile profile and actively revegetated with riparian vegetation.



Wildlife Habitats and General Wildlife Use – Project Implementation: Over the long-term, the Alternative B would be expected to have major beneficial effects on High Value Wildlife Habitats in the Project Area, although there may be some minor adverse impacts during construction in the East and West Pastures. As with Alternative A, the largest change under this alternative relative to existing conditions would come from the substantial conversion of grassland or pasture to salt and brackish marsh through removal or breaching of the East and West Pasture levees, removal of agricultural infrastructure such as tidegates, and reconnection and expansion of the tidal channel network in the East Pasture. Through these actions, more than two-thirds of the East Pasture and one-third of the West Pasture would be expected to shift from grassland to tidal or brackish marsh. A transitional period would be expected over the short-term during which, as pasturelands slowly convert through exposure to saline conditions to marsh, restored areas would be dominated by a mix of non-native opportunistic, moderately salt-tolerant species characteristic of brackish conditions such as brass buttons, annual beard-grass, loosestrife, birdfoot trefoil, curly dock, and others. During this period, impacts to High Value Wildlife habitats would be negligible adverse, because much of the habitat being disturbed consists of highly managed pasturelands: while these types of habitats provide value, they are of lower value than many other unmanaged or less managed habitats.

The major increase in High Value Wildlife Habitats would have a moderate beneficial effect over the long-term on use of the Project Area by wildlife, with use by common and special status wildlife species increasing appreciably relative to existing conditions. Some of the largest changes in wildlife use under this alternative relative to Alternative A would be expected to come from increased use of expanded marsh and riparian habitats in the West Pasture. While restoration efforts in the East Pasture would increase, general wildlife use patterns would be relatively similar to those under Alternative A, although High Value Wildlife Habitats in the East Pasture would increase measurably relative to Alternative A.

Under Alternative B, Tidal Salt Marsh, a High Value Wildlife Habitat, would increase more than 40 percent relative to Alternative A. However, the largest increase in High Value Wildlife Habitats under this alternative comes from Tidal Salt Marsh-High/Upland Ecotone. This change results from several factors, including the fact that elevations are generally higher in the West Pasture than in the East Pasture. These elevations, combined with the strong influence from groundwater and drainages flowing from or off of the Inverness Ridge, would maintain many of the Freshwater Marsh, Wet Meadow, and Seasonally Flooded-Ponded Pasture/Grassland habitats that currently exist on the western and southern boundaries of the West Pasture. Tidal Salt Marsh and Tidal Brackish would establish primarily in the lower elevation northern and eastern portions of the West Pasture. The value of the newly created Tidal Salt Marsh and Tidal Brackish Marsh habitats to wildlife would be promoted by the presence of a large tract of undiked tidal salt and brackish marsh habitats immediately adjacent to the East Pasture in the undiked marsh. While not physically contiguous, this proximity between areas encourages a synergistic effect in which wildlife numbers would be higher together than they would have been separately, because of the affinity of many species for unfragmented, larger habitats. In addition, preservation of the shallowly flooded and sparsely vegetated flats in the northeastern corner of the East Pasture would continue to provide alternate high tide habitats for waterfowl and shorebirds during the winter as it does now.

Removal of the Fish Hatchery Creek tidegate would magnify the effects of saltwater intrusion on the West Pasture freshwater marsh, leading to loss of another 1.5 acres relative to the current trend in marsh loss and conditions described under the No Action Alternative and Alternative A.
This loss would be offset to some degree by creation of a 5.4-acre freshwater marsh in the Tomasini Triangle portion of the East Pasture, which is above the range of most tides except extreme tides. To preclude influence by even extreme tides, a low berm would be constructed that would also function as high water refugia for wildlife during flooding. While negatively affecting frogs, the conversion of this habitat would benefit passerine bird species, such as salt marsh common yellowthroat, California black rails, and red-winged blackbird, which use tall vegetation for nesting and resting habitat while maintaining close proximity to more open foraging habitat.

In general, acreage of Forested and Scrub Shrub Riparian habitat continues to expand under Alternative B from passive and active revegetation efforts. While the culverted berm through-trail component of the eastern perimeter trail would be replaced with a boardwalk under this alternative, direct impacts to riparian habitat would remain similar to those described under Alternative A. Impacts to groundwater flow from the Point Reyes Mesa would be reduced, however, with a boardwalk, which could have positive effects on the tidewater goby population in Tomasini Creek, as well as on aquatic organisms. The effects of the southern perimeter trail and the possible future extension of that trail to Inverness Park would be identical to those described under Alternative A. There would also be identical adverse effects on riparian habitat and

associated species in Olema Marsh from increasing water levels caused by poor drainage from undersized culverts and other factors. Open water and Freshwater Marsh communities would increase as a result.

Habitat changes with restoration in the West Pasture would attract higher numbers of waterbirds such as California black rail, marsh passerines, and resident and Neotropical migrant passerines or riparian bird species. The restored habitats would also benefit generalist waterbirds such as great egret and generalist shorebirds such as willet, godwit, and greater yellowlegs. Salt marsh also provides foraging habitat for raptors species - such as short-eared owl, white-tailed kite, northern harrier, and peregrine falcon - drawn to the site by small vertebrates such as California voles, shrews, and garter snakes. Abundance of raptors such as peregrine falcons would decrease relative to existing conditions, because numbers of rodents would be expected to be lower. Grassland-associated species such as western meadowlarks, savannah sparrows, and grasshopper sparrows would dwindle in numbers. Conversely, use by species such as osprey could increase, because of the higher abundance of fish and invertebrates in restored West Pasture and East Pasture channels. Abundance and areal extent of fish and invertebrate species would increase in the West Pasture, as well. While filling of the borrow ditch north of the West Pasture north levee would decrease subtidal/intertidal habitat, creation of a new tidal channel linking the undiked marsh to the West Pasture would increase use by aquatic organisms.

As with the No Action Alternative and Alternative A, amphibians and reptiles would be the taxa most adversely affected by implementation of this alternative. Red-legged frog and northwestern pond turtle numbers would drop in the West Pasture with increased tidal influence, but the Tomasini Triangle freshwater marsh may buffer frogs and turtles in the East Pasture from some of the adverse effects of increased tidal inundation in that pasture.

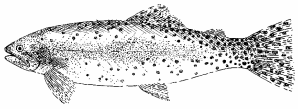
Wildlife Habitats and General Wildlife Use – Long-Term Changes: As described under Alternative A, the brackish and tidal marsh habitats described above would eventually develop after a short-term (~ 10 years) transitional period in which grassland is converted into marsh. These habitats would possibly continue to evolve in the future in response to sea level rise, which could lead to regular inundation of large portions of the East and West Pastures below 4 feet NAVD88 should sea level rise at the currently projected rate of 3 feet by 2100 (Overpeck et al. 2006). This shift would benefit aquatic organisms such as fish and invertebrates, as well as specific avian species such as diving ducks, dabbling ducks, marsh-associated passerines, and other waterbirds.

Wildlife Habitats and General Wildlife Use – Construction: Construction of Alternative B would generally have minor adverse effects on High Value Wildlife Habitats and use by common wildlife species. Special status species are discussed individually.

Six of the proposed construction activities would have the highest potential to affect both common and special status wildlife species. These activities are regrading of the southern levee in the East Pasture and creek bank to a more stable profile; filling of drainage ditches; tidal reconnection of the East Pasture Old Slough Pond; removal and breaching of levees; removal of the Fish Hatchery Creek tidegate; and filling of the borrow ditch in the undiked marsh north of the West Pasture. Potential impacts to wildlife of changes to ditches and the East Pasture Old Slough are described in detail under Alternative A. Grading of the levee and creek banks and levee removal have the potential to negatively affect aquatic organisms such as California freshwater shrimp, salmonids, southwestern river otter, northwestern pond turtle, and other species through incidental sediment discharge during earthmoving and removal of willows that provide overhanging shade and habitat complexity in surface waters.

Under Alternative B, the borrow ditch in the undiked marsh would be filled, and a new tidal channel created that connects a tidal channel in the undiked marsh with the West Pasture. The Fish Hatchery Creek tidegate and the West Pasture levee would be totally removed. These actions have the potential to negatively affect resident and non-resident aquatic organisms in the creek and borrow ditch such as fish and macroinvertebrates, as well as southwestern river otter and California black rail, through either direct mortality or disruption of the breeding cycle. Non-resident species such as waterfowl, waterbirds, southwestern river otter, and rails would not be impacted unless nesting or breeding was occurring.

Based on the scale and timing of construction activities that could affect High Value Wildlife Habitats and use by common wildlife species, the impacts of construction are characterized as minor adverse. The intensity of construction impacts on special status species is addressed separately below.



Invasive Wildlife Species: Alternative B would have very similar minor adverse effect on the number of non-native invasive wildlife species that would be present as a result of changes in conditions as Alternative A, with increases in numbers and extent of aquatic invasives expected in the West Pasture. The largescale conversion of grassland to marsh habitats in the West Pasture would reduce the areal extent of potential habitat for red fox and wild turkey. These species, however, are somewhat opportunistic and would be expected to persist along the edges of the Giacomini Ranch where conditions are appropriate. These species would continue to access East and West Pasture grassland areas for foraging, resting, and other purposes.

Wildlife Conditions in the Watershed: Tidal reconnection of the 350-acre East Pasture and 200-acre West Pasture to Lagunitas Creek would have a moderate beneficial effect in terms of support of wildlife species in southern portion of the Tomales Bay watershed. As described under Alternative A, tidal reconnection would not only increase the potential for export of sources of carbon such as dissolved and particulate organic carbon, phytoplankton, seeds and other plant matter, and aquatic organisms to the bay, but for access by marine and estuarine species in search of food and refugia. In addition, watershed habitat quality would be improved by discontinuation of levee maintenance, withdrawal of water for irrigation, infrequent pumping of waters from the ranch into Lagunitas Creek, and crossing of Lagunitas Creek by cattle.

California red-legged frog: While freshwater marsh acreage would increase due to creation of freshwater marsh in the East Pasture, Alternative B would still be characterized as having a minor adverse effect on California red-legged frog breeding habitat units in the Point Reyes Peninsula Core Area, at least over the short-term, through further reductions in existing breeding habitat in the West Pasture freshwater marsh. This would have a measurable effect on distribution of the species in the Project Area over the short-term. Over the long-term, however, freshwater marsh creation efforts in the East Pasture would eventually reduce impacts to breeding habitat units and distribution of the species in the Core Area to negligible. This alternative would still have a measurable effect on distribution of species in the Project Area, because the primary breeding habitat available in the Giacomini Ranch would be shifted from the West Pasture to the East Pasture, where breeding has not been documented. Impacts during construction would generally remain negligible despite the increase in the extent of restoration, because most of the heavy construction would occur in the East Pasture, which does not have breeding habitat.

Baseline studies documented two general areas that provide breeding habitat for red-legged frog. The largest of these is the West Pasture freshwater marsh. Breeding also has sporadically occurred in adjacent Fish Hatchery Creek, creating another 1.0 acre of breeding habitat in the West Pasture. The second breeding habitat is in the Olema Marsh and is assumed to comprise all of the areas with Freshwater Marsh and Open Water, which total 39 acres. There is no documented breeding habitat in the East Pasture, although a few adult frogs were observed during baseline surveys (Fellers and Guscio 2002).

Under Alternative B, saltwater intrusion into the West Pasture freshwater marsh would increase, leading to loss of an additional 1.5 acres relative to the No Action Alternative and Alternative A. Over the long-term, this impact could be intensified by sea level rise, which may be rising at a much higher rate than originally predicted. However, at least in the near-term future, the southern one-third of the marsh would still not be affected by salinity intrusion, because of higher elevations and high perennial freshwater inflow from the 1906 Drainage and Inverness Ridge groundwater. As noted under Alternative A, the Park Service is conducting a habitat enhancement project in 2006 that would slightly expand higher elevation Freshwater Marsh habitat in this area by approximately 0.4 acres. Restoration of the West Pasture would also affect non-breeding habitat in the West Pasture. However, under this alternative, most of the tidal and brackish marsh would be concentrated on the eastern and northern boundaries of the pasture, leaving much of the western and southern portions as they exist currently. Riparian habitat along Sir Francis Drake Boulevard would also increase slightly. Therefore, impacts to non-breeding habitat are characterized as minor adverse, at most.

Some of the loss of breeding habitat in the West Pasture freshwater marsh would be offset by creation of the 5.4-acre Tomasini Triangle freshwater marsh in the East Pasture. As described earlier, this marsh would generally be above the extent of high tides, but a low berm would be constructed to preclude tidal influence, as well as promote ponding within the marsh. The berm would also serve as refugia for wildlife during high tides. The marsh was designed based on a water budget developed by the hydrologists (KHE 2006a) to ensure that marsh was appropriately sized to maintain ponded conditions within the deepest portions of the marsh through at least July or August of each year, except perhaps during extreme drought years. Drawdown or drying up of the marsh in the fall would benefit red-legged frogs, because it would discourage successful establishment by bullfrogs, which can be predators of red-legged frog. Bullfrog tadpoles require permanent ponding. Hydrologic sources for this marsh would principally come from surface run-off generated by the 10-

acre rural/lightly urbanized subwatershed to the southeast of the Tomasini Triangle and groundwater inflow from the Point Reyes Mesa. In addition to the Tomasini Triangle, continued increases in water levels in Olema Marsh due to poor drainage would continue to convert Forested and Scrub Shrub Riparian habitat to Freshwater Marsh and Open Water habitat, perhaps providing a very negligible increase in breeding habitat for red-legged frog.

Impacts on red-legged frog during construction would continue to be negligible despite the increase in size of the proposed project. There is no breeding habitat in the East Pasture, and only a few adult frogs have been occasionally been sighted in the East Pasture. Construction activities expected to have the most effect would be filling in of the drainage ditches, tidal reconnection of the East Pasture Old Slough and excavation, and construction of the eastern perimeter trail in the riparian habitat adjacent to Tomasini Creek. Possible mitigation measures are discussed in a separate sub-section below.

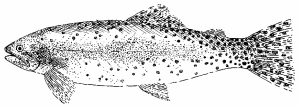
Tidewater goby: Alternative B would have moderate to eventually major beneficial effects on tidewater goby in the Project Area after implementation through a potential increase in the areal extent of East and West Pasture habitat and the quality of existing habitats in Tomasini Creek. Impacts during construction would be expected to be moderate, with implementation of mitigation measures designed to reduce the potential or amount of incidental take of this federally listed species.

Within the Project Area, Acreage of existing tidewater goby habitat in the Giacomini Ranch totals 11.3 acres. This species occurs primarily in three areas within the Giacomini Ranch: Tomasini Creek, the West Pasture Old Slough and possibly Fish Hatchery Creek, and the non-tidal East Pasture Old Slough Pond. A detailed description of these areas can be found under the No Action Alternative. Numbers of tidewater goby in the Project Area have also been relatively low within each of these sites, ranging from five to 22 at most. These sites represent the only known occurrence of this species in the Tomales Bay watershed, as, prior to 2002, the species had last been sighted in the bay in 1953. Genetic analyses indicate that this population is genetically distinct from the nearest existing occurrences of tidewater goby at Salmon Creek Marsh and Rodeo Lagoon (Jacobs and Earl 2005).

Similar to Alternative A, construction of the East Pasture restoration component includes tidal reconnection of the East Pasture Old Slough Pond with Lagunitas Creek and Tomales Bay, with shallow excavation of a portion of the slough to improve hydraulic connectivity of the reconnected slough with Lagunitas Creek. While approximately 0.3 acres of ditches would be filled in as part of the elimination of agricultural infrastructure under Alternative, A, the extent of tidal channel creation would increase under Alternative B, creating approximately 9.3 acres of habitat for tidewater goby. Over the long-term, the effects of Alternative A on tidewater goby habitat would increase slightly relative to short-term conditions, because of a maturation of tidal and brackish habitats following a transitional phase of development. The beneficial effects over the long-term could be intensified by sea level rise, which would increase the extent of area subject to regular inundation by tides.

During the transitional phase, existing habitat conditions would be maintained in Tomasini Creek through retention of the tidegates and associated hydrologic infrastructure. Retention of the tidegates and flashboard dam structure on Tomasini Creek would maintain existing subtidal habitat conditions in the channel, as the structure prevents complete drainage during low tides. The tidegate, along with natural gravel bar features create residual brackish pool habitat that provides habitat for the tidewater goby, despite the fact that the substrate and flow conditions are probably not optimal. Relative to Alternative A, impacts to Tomasini Creek would be reduced by replacement of the culverted berm through-trail component of the eastern perimeter trail with a boardwalk that would improve flow conditions from seeps on the Point Reyes Mesa into the creek. These seeps may play a considerable role in reducing salinities in this reach of the creek and thereby creating appropriate habitat conditions for the tidewater goby. A brackish water species, tidewater goby is sensitive to higher salinity waters approaching marine salinities (~34 ppt), preferring salinities in the 12 ppt range (Swift 2003).

Restoration would also increase the areal extent of habitat and quality of existing tidewater goby habitat in the West Pasture. The primary restoration actions in the West Pasture involve breaching or removal of levees and tidegates. No tidal channel creation would be performed, but tidal channels would be expected to form naturally in response to increased tidal inundation, particularly in areas where remnant sloughs are still visible.



Because construction in the West Pasture would not directly affect tidewater goby habitat, impacts during construction would still be characterized as moderate adverse due to direct impacts of the East Pasture Old Slough Pond. Possible mitigation measures are discussed in a separate sub-section below.

Central California coast steelhead, coastal California Evolutionarily Significant Unit (ESU) Chinook salmon, and central California coast coho ESU salmon: The effects of Alternative B on salmonid rearing and passage habitat in the Project Area would be beneficial moderate. Potential minor adverse impacts to salmonid habitat or salmonids would be expected to occur during construction of the wetland restoration component due to removal of the Fish Hatchery Creek tidegate and filling of the borrow ditch adjacent to the West Pasture north levee.

As discussed under the No Action Alternative, the Project Area does not represent a potential breeding or spawning area for steelhead, coho or Chinook salmon, but rather important feeding, resting, and refugia habitat for salmonids as they migrate to the ocean or move upstream to spawning grounds. Steelhead has recently been found in Fish Hatchery Creek, Tomasini Creek, the section of Lagunitas Creek in the Project Area, and in Bear Valley Creek upstream of Olema Marsh. Coho occur in Lagunitas Creek and in Tomasini Creek. Chinook has been documented in upstream portions of Lagunitas Creek, but they have not been captured as yet in the Project Area. Salmonid presence in these watersheds indicates that, while impediments, the levees and tidegate facilities are still allowing some degree of fish passage. The levees severely constrain the potential for development of off-channel or rearing habitat on Tomasini Creek and Lagunitas Creek. Fish Hatchery Creek is not leveed within the West Pasture, although it is infrequently dredged. On Bear Valley Creek, Levee Road, Bear Valley Roads, and their culverts limit both passage and rearing potential, along with the indistinct flow path in Olema Marsh created by excessive impoundment of waters.

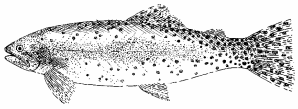
The largest benefit to salmonids under this alternative would come from the appreciable increase in potential rearing habitat from full tidal reconnection of the East and West Pastures with Lagunitas Creek. Aquatic edge habitat would increase approximately 28 percent relative to existing conditions, with edge habitat in the Project Area climbing from approximately 15 miles under existing conditions to 19 miles under Alternative B. While approximately 0.3 acres of ditches would be eliminated, a total of 9.3 acres of new and restored tidal channel would be created in the East Pasture Old Slough.

This alternative would also have moderate beneficial effects on passage and rearing conditions. Breaching of the levees and removal of the Fish Hatchery Creek tidegate would improve quality and accessibility of another 4.6 acres of tidally influenced channel. In addition, removal of the Fish Hatchery tidegate could increase the potential for passage for steelhead, which have been observed in the creek. There would be no change in Olema Marsh, other than water levels would be expected to continue rising, which may further affect the ability of salmonids to reach upstream portions of the watershed.

Construction would have the potential for only minor adverse impacts associated removal of the Fish Hatchery Creek tidegate, filling in of the borrow ditch, and grading and removal of levees and creek banks. The latter could potentially impact salmonids and other aquatic organisms though incidental sediment discharge and possible removal of riparian vegetation, although every effort would be made to retain as much of the established vegetation as possible. Construction would be scheduled to ensure that grading does not begin before July 15, which is the end of the typical period for smolt outmigration. Possible mitigation measures are discussed in a separate sub-section below.

California black rail and California clapper rail: Alternative B would have very similar major beneficial effects to Alternative A in terms of increasing habitat for California black rail and California clapper rail, with the proposed project restoring more than 350 acres of low-, mid- and high Tidal Salt Marsh adjacent to existing rail habitat. During the transitional period following construction, only negligible to minor beneficial effects would be expected, as grassland begins the process of converting to brackish and tidal marsh, leading to temporary establishment of a more weedy, ruderal habitat that would have less benefits for rails. Relative to Alternative A, impacts during construction would increase to moderate adverse, because of construction actions on and near the north levee in the West Pasture.

As discussed under the No Action Alternative, breeding populations of California black rail have primarily occur in the undiked marsh north of the Giacomini Ranch and in Olema and Bear Valley marshes in intermittent years (ARA 2002). Small numbers (1-2 individuals) also occurred within the Project Area in brackish and freshwater marsh, with possible breeding one year in the West Pasture freshwater marsh (ARA 2002).



Clapper rail historically occurred in Tomales Bay, and individuals were sighted in the undiked marsh north of the Giacomini Ranch during fall and winter between 1995 and 2001 (J. Evens, R. Stallcup, unpub. field notes). There have been no sightings since then, however, and there are no recent breeding records either from the bay.

Under Alternative B, habitat for the black rail in the Project Area and adjacent undiked marsh to the north of the Giacomini Ranch would almost triple from approximately 120 acres to more than 350 acres with restoration of the East and West Pastures. The restoration would provide benefits primarily to black rail, although clapper rail could benefit substantially, as well, from establishment of low and high Tidal Salt Marsh habitats. While rails do not currently use the East Pasture, the proximity of the restoration area to the undiked marsh makes it more likely that rails would expand into the East Pasture and use the newly created habitat. As with Alternative A, steadily increasing water levels in Olema Marsh would potentially decrease suitability of this habitat for black rail by converting riparian habitat to Freshwater Marsh and Open Water habitat,

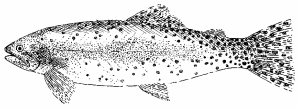
As noted earlier, this alternative greatly increases the amount of high marsh/upland ecotone habitat relative to Alternative A. This change probably results from the generally higher elevations present in the West Pasture compared to the East Pasture, although some portion of that gain in ecotone habitat would come from the East Pasture. Mid-marsh habitats would be concentrated primarily in the lower elevation northern and eastern portions of the West Pasture, with ecotonal habitats fringing these areas to the south and west. Through filling of the borrow ditch, connectivity of these new mid-marsh and high marsh/upland ecotone habitats to existing habitat in the undiked marsh north of Giacomini Ranch would be greatly enhanced and would strongly increase the potential for establishment of restored habitats in the West Pasture by rails. Increases in high marsh habitat in Giacomini Ranch could, at least temporarily, offset any decreases in this habitat in the undiked marsh habitat north of the ranch from accelerated rates of bank slumping and channel widening that might be potentially being caused by a non-native isopod. This isopod would be likely to move south into the Giacomini Ranch once tidal connection and habitats are restored.

High tide refugia rails would continue to exist in the refugia created in the northeastern corner of the West Pasture through a separate enhancement project conducted in 2006; on the Tomasini Creek levees; and in the higher elevation portions of the East and West Pasture. This alternative would also incorporate a component that would link the created refugia in the West Pasture with the alluvial levees in the undiked marsh to improve habitat connectivity. While removal of the north levee in the West Pasture could be viewed as a potential impact in terms of reducing high tide refugia, these levees do not provide optimal refugia habitat, because they poorly vegetated due to trampling from cattle and people and subject to disturbance pressures from people using the existing informal trail to view the rails who often inadvertently flushed them into the open where they are vulnerable to predation. Under Alternative B, removal of the levees would result in removal of this trail, which would be replaced with a viewing area near the road pull-out.

Construction would be expected to have potential moderate adverse effects on rails. While construction would be conducted outside of the documented breeding season for clapper rails (February through August 31), the filling of the borrow ditch and extension of the tidal channel in the undiked marsh into the West Pasture could negatively affect rails through temporary impacts to habitat and disturbance from noise. Possible mitigation measures are discussed in a separate sub-section below.

Other Special Status Species: The effects of Alternative B on other special status species would generally range from minor beneficial effects to moderate adverse effects depending on the species. Impacts during construction of the East and West Pasture restoration components would range from beneficial negligible to moderate adverse. Proposed mitigation measures proposed for some of these species are described in a separate sub-section below.

Species included in this category are federally or state-listed threatened and endangered species that are only occasional visitors or vagrants to the Project Area or are listed as a Species of Concern by the Sacramento office of the USFWS. These species include **California freshwater shrimp**, California brown pelican, green sturgeon, Least Bell's vireo, American peregrine falcon, sandhill crane, bank swallow, **northwestern pond turtle**, **southwestern river otter**, and **saltmarsh common yellowthroat**. Impacts from implementation of this alternative would be beneficial or only have negligible to minor adverse effects from conversion in habitat type for most of these species, except northwestern pond turtle, which is characterized as having moderate adverse effects. A detailed description of effects can be found under Alternative A.



California freshwater shrimp primarily occurs considerably upstream of the Project Area on Lagunitas and Olema Creeks, although it occasionally moves downstream on Lagunitas Creek into the White House Pool reach of Lagunitas Creek. The frequency of occurrence within the Project Area probably depends to a large degree on flow and salinity conditions in this highly variable estuarine zone of the Lagunitas Creek delta. Minor adverse effects would be primarily associated with construction from actions such as levee removal, creek bank grading, and removal of riparian vegetation along the southern portion of the East Pasture, although every effort would be made to preserve as much riparian vegetation as possible. Over the long-term, negligible beneficial effects would be expected from discontinuation of agricultural management practices in Lagunitas Creek.

Similar to red-legged frog, **northwestern pond turtles** would be negatively affected by conversion of grassland and freshwater marsh habitats to tidal and brackish marsh habitats in both the East and the West Pastures. Construction activities expected to have the most effect would be filling in of the drainage ditches, tidal reconnection of the East Pasture Old Slough and excavation, construction of the eastern perimeter trail along Tomasini Creek, and removal of the Fish Hatchery Creek tidegate. Following implementation, turtles may become restricted to freshwater portions of Tomasini Creek and Fish Hatchery Creek and pockets of freshwater marsh along the ranch periphery. In the East Pasture, the Tomasini Creek levee would remain, which could maintain aestivation habitat.

As with Alternative A, **saltmarsh common yellowthroat** could be adversely impacted by permanent or temporary removal of riparian habitat for construction of the eastern perimeter trail, southern perimeter trail, and the possible future extension of the southern perimeter trail to Inverness Park. Common yellowthroat is known to breed in the first two areas and also breeds in the riparian habitat along Sir Francis Drake Boulevard, but north of where the possible trail extension would occur.

Proposed Additional Mitigation Measures: Standard BMPs would be implemented to reduce impacts to special status species and wildlife habitats are discussed under Chapter 2. All construction and staging/stockpiling areas would be cleared by biologists prior to use to ensure that there are no nesting or breeding species within the vicinity of the Project Area or staging/stockpile areas prior to implementation. Measures specific to certain species are described below:

California red-legged frog: Construction activities would include removal of ditches excavation of certain portions of the East Pasture Old Slough. Though not documented as supporting breeding habitat, the Old Slough and ditches and other areas within the East and West Pastures may provide non-breeding habitat. Construction activities adjacent to or within California red-legged frog habitat documented as breeding habitat would not be conducted until August. Pre-construction surveys would be completed in all construction areas to confirm that no red-legged frogs are present. Frogs encountered would be relocated.

Tidewater goby: Construction would not occur in or directly adjacent to existing tidewater goby habitat during the typical season of reproduction for tidewater goby documented in the literature (late April – early summer; Swift 2003). Prior to construction in the East Pasture Old Slough Pond, ditches, and Fish Hatchery Creek for removal of the tidegate, extensive seining would be performed after some dewatering to lower water levels and increase the efficiency of trapping. Minnow traps and dip nets may also be used to increase capture rates. Captured fish would be immediately relocated to Tomasini Creek, the West Pasture Old Slough, or other appropriate habitat.

Central California coast steelhead, coastal California ESU Chinook salmon, and central California coast coho ESU salmon: Work affecting Lagunitas Creek and Fish Hatchery Creek would be conducted after July 15 to minimize impacts to salmonids. BMPs identified in Chapter 2 to decrease sedimentation and impacts to wetlands would mitigate potential impacts associated with selective deconstruction of levees, regrading of creek banks, construction of the eastern perimeter trail, and installation of a pre-fabricated bridge. In addition to these BMPs, other actions would be taken to minimize impacts, including use of an excavator rather than a bulldozer to remove fill and excavation in sensitive creek areas during periods when construction area is exposed to the extent possible. During removal of the tidegate on Fish Hatchery Creek, water levels within the construction zone would be lowered, and extensive seining would be performed to remove any salmonids prior to construction. Captured fish would be relocated to appropriate upstream habitats.

California black rail and California clapper rail: The proposed project would comply with directives to not come within 250 feet of established rail habitat prior to August 31 by delaying construction in the northern portion of the East Pasture until September.

California freshwater shrimp: Construction conducted in the White House Pool reach would comply with BMPs identified in Chapter 2 to decrease sedimentation and impacts to wetlands would mitigate potential impacts associated with selective deconstruction of levees, regrading of creek banks, and installation of a pre-fabricated bridge. Pre-construction surveys would be conducted, and any shrimp found would be relocated upstream outside of the construction zone.

Northwestern pond turtle: Prior to construction in the ditches, East Pasture Old Slough, and Fish Hatchery Creek, water levels would be lowered to the extent possible, and turtles would be trapped and relocated to appropriate habitat, either Lagunitas Creek or the Martinelli Ponds in the Martinelli Ranch directly to the north of the Giacomini Ranch.

Saltmarsh common yellowthroat: Prior to construction of the southern perimeter trail, the eastern perimeter trail, or the possible future extension of the southern perimeter trail to Inverness Park, pre-construction surveys would be conducted to ensure that no active nests are present or that nesting and fledging have been completed prior to construction being conducted within or in the immediate vicinity (< 100 feet) of riparian habitat that is either known to support or believed capable of supporting common yellowthroat.

Effectiveness of Proposed Additional Mitigation Measures

California red-legged frog: The proposed mitigation measures should reduce any potential impacts to negligible levels.

Tidewater goby: The mitigation measures would be expected to reduce impacts, but impacts cannot be eliminated. Even with extensive seining, some mortality of fish would be expected, because tidewater goby burrow in the mud, making it extremely difficult to trap all fish. Construction would, therefore, result in incidental take. The proposed mitigation measures would result in this alternative having moderate adverse impacts on tidewater goby during construction.

Central California coast steelhead, coastal California ESU Chinook salmon, and central California coast coho ESU salmon: The proposed mitigation measures should reduce any potential impacts to minor levels.

California black rail and California clapper rail: The proposed mitigation measures should result in no more than moderate adverse impacts on rails during construction.

California freshwater shrimp: The proposed mitigation measures should reduce any potential impacts to negligible levels.

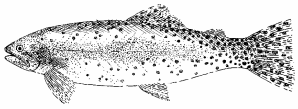
Northwestern pond turtle: The mitigation measures would be expected to reduce impacts, but would not eliminate them. Even with dewatering of the channels and extensive trapping, some mortality of turtles would be expected. The proposed mitigation measures would result in this alternative having moderate adverse impacts on turtles during construction.

Saltmarsh common yellowthroat: The proposed mitigation measures should reduce any potential impacts to negligible levels.

Cumulative Impacts: Cumulative impacts would be the same as the No Action Alternative for the California red-legged frog and Alternative A for California black rails, California clapper rails, shorebirds, and waterfowl.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The effects of Alternative B on wildlife habitat and use in the Project Area and support of wildlife species in the watershed would generally range from moderate adverse to major beneficial. Under Alternative B, the East and West Pastures would be restored, with new public access facilities limited to the



eastern and southern perimeters of the East Pasture. Over the long-term, Alternative B would be expected to have major beneficial effects on High Value Wildlife Habitats in the Project Area, although there may be some minor adverse impacts during construction in the East and West Pastures. As with Alternative A, the largest change under this alternative relative to existing conditions would come from the substantial conversion of grassland or pasture to salt and brackish marsh through removal or breaching of the East and West Pasture levees, removal of agricultural infrastructure such as tidegates, and reconnection and expansion of the tidal channel network in the East Pasture. Through these actions, more than two-thirds of the East Pasture and one-third of the West Pasture would be expected to shift from grassland to tidal or brackish marsh. A transitional period would be expected over the short-term during which, as pasturelands slowly convert through exposure to saline conditions to marsh. These habitats would possibly continue to evolve in the future in response to sea level rise, which could lead to regular inundation of large portions of the East and West Pastures below 4 feet NAVD88 should sea level rise at the currently projected rate of 3 feet by 2100 (Overpeck et al. 2006).

The major increase in High Value Wildlife Habitats would have a moderate beneficial effect over the long-term on use of the Project Area by wildlife, with use by common and special status wildlife species increasing appreciably relative to existing conditions. Some of the largest changes in wildlife use under this alternative relative to Alternative A would be expected to come from increased use of expanded marsh and riparian habitats in the West Pasture. While restoration efforts in the East Pasture would increase, general wildlife use patterns would be relatively similar to those under Alternative A. Construction of Alternative B would generally have minor adverse effects on High Value Wildlife Habitats and use by common wildlife species: effects on special status species is summarized below. Alternative B would have very similar minor adverse effects as Alternative A on the number of non-native invasive wildlife species that would be present, with increases in numbers and extent of aquatic invasives expected from restoration of the West Pasture. Tidal reconnection of the 350-acre East Pasture and 200-acre West Pasture to Lagunitas Creek would have a moderate beneficial effect in terms of support of wildlife species in the southern portion of the Tomales Bay watershed. For the San Francisco Bay region in general, the proposed project, in combination with other proposed and ongoing restoration projects, would be expected to generally have a cumulatively negligible beneficial effect on regional populations of California black rails, California clapper rails, waterfowl, and shorebirds.

California red-legged frog: While freshwater marsh acreage would increase due to creation of freshwater marsh in the East Pasture, Alternative B would still be characterized as having a minor adverse effect on California red-legged frog breeding habitat units in the Point Reyes Peninsula Core Area, at least over the short-term, through further reductions in existing breeding habitat in the West Pasture freshwater marsh. This would have a measurable effect on distribution of the species in the Project Area over the short-term. Over the long-term, however, freshwater marsh creation efforts in the East Pasture would eventually reduce impacts to breeding habitat units and distribution of the species in the Core Area to negligible. This alternative would still have a measurable effect on distribution of species in the Project Area, because the primary breeding habitat available in the Giacomini Ranch would be shifted from the West Pasture to the East Pasture, where breeding has not been documented. Impacts during construction would generally remain negligible despite the increase in the extent of restoration, because most of the heavy construction would occur in the East Pasture, which does not have breeding habitat. There is a potential for cumulative impacts with other projects proposed in the Seashore or Marin County region, but, based on evaluation of impacts and proposed mitigation measures for those projects, impacts under this alternative would still be characterized as negligible to minor adverse.

Tidewater goby: Alternative B would have moderate to eventually major beneficial effects on tidewater goby in the Project Area after implementation through a potential increase in the areal extent of East and West Pasture habitat and the quality of existing habitats in Tomasini Creek. Impacts during construction would be expected to be moderate, with implementation of mitigation measures designed to reduce the potential or amount of incidental take of this federally listed species.

Central California coast steelhead, coastal California Evolutionarily Significant Unit (ESU) Chinook salmon, and central California coast coho ESU salmon: The effects of Alternative B on salmonid rearing and passage habitat in the Project Area would be beneficial moderate. Potential minor adverse impacts to salmonid habitat or salmonids would be expected to occur during construction of the wetland restoration component due to removal of the Fish Hatchery Creek and filling of the borrow ditch adjacent to the West Pasture north levee.

California black rail and California clapper rail: Alternative B would have very similar major beneficial effects to Alternative A in terms of increasing habitat for California black rail and California clapper rail, with the proposed project restoring more than 350 acres of low-, mid- and high Tidal Salt Marsh adjacent to existing rail habitat. During the transitional period following construction, only negligible to minor beneficial effects would be expected, as grassland begins the process of converting to brackish and tidal marsh, leading to temporary establishment of a more weedy, ruderal habitat that would have less benefits for rails. Relative to Alternative A, impacts during construction would increase to moderate adverse, because of construction actions on and near the north levee in the West Pasture.

Other Special Status Species: The effects of Alternative B on other special status species would generally range from minor beneficial effects to moderate adverse effects depending on the species. Impacts during construction of the East and West Pasture restoration components would range from beneficial negligible to moderate adverse.

Alternative C

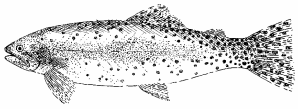
Analysis: The effects of Alternative C on wildlife habitat and use in the Project Area and support of wildlife species in the watershed would generally range from major adverse to major beneficial (Table 70). As with Alternative B, the East and West Pastures would be restored, with new public access facilities limited to the eastern and southern perimeters of the East Pasture. However, under this alternative, there would also be restoration of Olema Marsh. Some of the other major changes under Alternative C that would affect wildlife would be the partial realignment of Tomasini Creek into one of its historic alignments, native grass revegetation efforts at higher elevations of the East Pasture grasslands, and complete removal of levees from the West Pasture. Relative to Alternative B, tidal channel excavation, revegetation, and non-native invasive plant removal efforts in the East and West Pastures would be increased.

It should be noted that the Olema Marsh, and the ponded conditions that maintain habitat described above for the red-legged frog, also represents the barrier to steelhead and potentially salmon access to Bear Valley Creek. The physical conditions necessary to support breeding habitat of the red-legged frog are the same conditions which limit or eliminate potential salmonid access to the watershed. Evaluation of these potentially conflicting conditions warrants the extended discussion below.

Wildlife Habitats and General Wildlife Use – Project Implementation: Over the long-term, Alternative C would be expected to have major beneficial effects on High Value Wildlife Habitats in the Project Area, although there may be some moderate adverse impacts during construction in the Project Area. Under this alternative, the dramatic rate of gain in High Value Wildlife Habitats between each of the alternatives would slow considerably. While Alternative B represented an almost 40 percent increase in High Value Wildlife Habitats from Alternative A, Alternative C would only increase the acreage of High Value Wildlife Habitats relative to Alternative B by 3 percent.

As with Alternative B, the largest change under this alternative relative to existing conditions would come from the substantial conversion of grassland or pasture to salt and brackish marsh through removal or breaching of the East and West Pasture levees, removal of agricultural infrastructure such as tidegates, and reconnection and expansion of the tidal channel network in the East Pasture. Through these actions, more than two-thirds of the East Pasture and one-third of the West Pasture would be expected to shift from grassland to tidal or brackish marsh or to remain shallowly flooded, sparsely vegetated flats such as the existing shallow shorebird area in the East Pasture. A transitional period would be expected over the short-term during which, as pasturelands slowly convert through exposure to saline conditions to marsh, restored areas would be dominated by a mix of non-native opportunistic, moderately salt-tolerant species characteristic of brackish conditions such as brass buttons, annual beard-grass, loosestrife, birdfoot trefoil, curly dock, and others. During this period, impacts to High Value Wildlife habitats in the Giacomini Ranch would be considered negligible adverse, because much of the habitat disturbed consists of highly managed pasturelands: while these types of habitats provide value, they are of lower value than many other unmanaged or less managed habitats.

Most of the gain in High Value Wildlife Habitat under Alternative C would come from restoration of Olema Marsh. While active native grass revegetation efforts in the Giacomini Ranch would more than quadruple the extent of this habitat relative to Alternative B, this habitat was considered to have a lower priority in an



estuarine context than many of the other aquatic wildlife habitats, although it would serve an important role as refugia for aquatic species and home to many terrestrial species.

The major increase in High Value Wildlife Habitats would have a moderate beneficial effect over the long-term on use of the Project Area by wildlife, with use by common and special status wildlife species increasing appreciably relative to existing conditions. In general, the trends in wildlife use predicted under Alternative B would continue under Alternative C. Some of the largest changes in wildlife use under this alternative relative to Alternative B would be expected to come from increased use of expanded marsh and riparian habitats in Olema Marsh and Tomasini Creek. While restoration efforts in the East Pasture and the West Pasture would increase, general wildlife use patterns would be relatively similar to those under Alternative B, probably due to the small increase between Alternatives B and C in acreage of High Value Wildlife Habitats in the Giacomini Ranch.

Currently, impoundment of waters within Olema Marsh precludes tidal influence. Removal of a small berm that is limiting outflow of waters from the marsh would improve hydraulic connectivity with Lagunitas Creek. The dewatering expected with removal of the berm and possible replacement of the Levee and Bear Valley Road culverts would dramatically lower water surface levels in Olema Marsh by as much as 1- to 4 feet or more. In addition, replacement of the Levee Road culvert would lower the tidal threshold such tides lower than the current threshold of 4.5 feet MLLW would be able to flow into the marsh. These changes, combined with subsidence or lowering of ground surface elevations in response to dewatering (see discussion under Geologic Resources), would greatly increase the extent of area that is tidally influenced within the marsh to approximately between 10 and 20 acres (KHE 2006a). However, strong permanent sources of freshwater flow to Olema Marsh from Bear Valley Creek and Inverness Ridge in the form of groundwater and small drainages would likely further reduce the salinity of tidal waters flowing into the marsh from Lagunitas Creek. Salinities in Lagunitas Creek at its confluence with Bear Valley Creek already typically fall within the brackish range (0.5 – 20 ppt), because of where the marsh is located along the salinity gradient in the estuary.

These changes would have profound implications for the mix of High Value Wildlife Habitats that would develop over the long-term. Under Alternative C, acreage of Tidal Salt Marsh, a High Value Wildlife Habitat, would remain very similar to that under Alternative B. However, Tidal Brackish Marsh would increase more than 100 percent relative to Alternative B, because of increased tidal influence in Olema Marsh. Forested and Scrub Shrub Riparian Habitat would increase by as much as 16 percent, due in large part to lowered water surface levels in Olema Marsh. Under existing conditions, riparian habitat along the fringe of the Freshwater Marsh was essentially being drowned by the steady increases in water surface levels that appeared to be occurring over the last decade. Increases in Tidal Brackish Marsh and Forested and Scrub Shrub Riparian habitats would come at the expense of decreases in Freshwater Marsh habitat, which would drop by as much as 10- 20 percent under Alternative C.

As with the Giacomini Ranch, a relatively short-term (~10 years) period would be expected to occur in which the marsh adjusts to these altered conditions. During this period, considerable die-back of Freshwater Marsh vegetation would take place, leaving dead stands of tall emergents and larger expanses of open water areas. Decomposition of vegetation, combined with other chemical changes in the soils related to dewatering and subsidence, would potentially cause short-term water quality problems, specifically increases in nutrients and acidity and possibly decreases in dissolved oxygen. Because of the buffering influence of flow from Bear Valley Creek and Inverness Ridge groundwater and drainage flow during this period, problems with acidity would temporary and transient in nature. These trends in vegetation die-back and water quality would continue until equilibrium with changed conditions is reached at which point vegetation would begin to reestablish, creating the new mix of vegetation communities predicted over the long-term. While water levels would drop under Alternative C relative to existing conditions, the marsh would continue to be permanently ponded due to the strong amount of permanent freshwater inflow from Bear Valley Creek, Inverness Ridge groundwater and drainages, and, to some extent, Lagunitas Creek. Total water depths would simply be lower, and there may be more pockets of seasonally flooded habitats on the perimeter. Some changes may also occur in Bear Valley Marsh, because of the indirect effect that lowering of water surface levels in Olema Marsh would have on upstream water levels in Bear Valley Creek. Changes in this marsh would not be expected to be as dramatic. Overall these conditions would result in moderate adverse impacts to High Value Habitat in the short-term, though in the long-term, these conditions would stabilize, resulting in long-term major beneficial effects on High Value Habitat as natural processes are restored.

From a wildlife perspective, the short-term effects of these changes in Olema Marsh would generally range from minor to moderate adverse. Resident and Neotropical migrant birds and other animals associated with

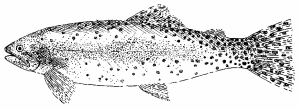
riparian habitat would probably continue to use the fringing riparian habitat, most of which would not be directly affected by the expected changes. Some birds would also continue to nest in emergent vegetation, even as it dies back, while standing water remains in marsh (e.g. marsh wrens, red-winged blackbirds). As water levels decline, a decrease in the presence of migratory waterfowl may be observed, particularly those species that forage at greater depths. Shallower water depths may benefit aerial foragers (e.g. swallows) over Olema Marsh by increasing insect populations. Aquatic species such as threespine stickleback and invertebrates would be adversely affected as water quality conditions reach equilibrium. Amphibians such as California red-legged frog, Pacific tree frog, and northwestern pond turtle would likely leave the marsh during this period, perhaps moving into adjacent riparian habitat, Bear Valley Creek Marsh, or into the Olema Creek watershed less than 0.5 miles away. Some mortality of these species may occur, although construction itself is expected to have minor to moderate adverse impacts. Abundance of opportunistic species such as southwestern river otter and certain bird species may increase temporarily within the marsh in response to the sudden increase in food availability.

Over the long-term, as brackish vegetation and freshwater marsh habitat rebounds in Olema Marsh, a recovery of freshwater marsh-associated species (e.g. marsh wrens, red-winged blackbirds, rails) would be expected. There is potential for more waterfowl nesting by species such as mallard and gadwall as vegetative cover reestablishes around the edges and in Olema Marsh. Abundance of certain waterbirds such as California black rail may increase. An increase in riparian-associated bird species abundance and diversity would be expected over the long-term due to expansion of riparian habitat. Species such as warbling vireo, Swainson's thrush, and Wilson's warbler would be expected to benefit as structure complexity returns to riparian habitat at Olema Marsh.

One of the other actions under Alternative C is partial realignment of Tomasini Creek into one its historic flow paths. Under this alternative, the existing Tomasini Creek channel would remain, as would the tidegates and flashboard dam structure, but the old channel would be leveed off from the new one. This change would convert the old Tomasini Creek channel into more of a backwater slough that would continue to receive freshwater influence from groundwater flowing off the Point Reyes Mesa, as well as occasional overbank flooding from Tomasini Creek during large storm events. This change would increase the areal extent of Muted and Tidal Subtidal/Intertidal habitats within the East Pasture. Abundance and areal extent of fish and invertebrate species would be expected to increase, as a result. Salmonids such as steelhead and coho would now be moving through the East Pasture on their way to or from spawning grounds in the upper watershed and would be better able to take advantage of the larger extent of aquatic edge or potential refugia habitat provided by the enhanced tidal channel network in the East Pasture. A similar beneficial effect would be expected over the long-term for tidewater goby. The old Tomasini Creek channel would continue to provide habitat for salmonids and tidewater goby, with the tidegate/flashboard still maintaining permanent subtidal conditions.

In addition, under this alternative, the through-trail component of the eastern perimeter trail would be eliminated in favor of constructing two spur trails. This would decrease potential impacts to the Tomasini backwater slough from erosion and permanent and temporary removal of riparian vegetation. It would also benefit riparian associates such as Swainson's thrush and saltmarsh common yellowthroat that uses the riparian vegetation and Mesic Coastal Scrub habitats on the Point Reyes Mesa through decreasing impacts from construction- and project-related habitat loss and possible disturbance from trail users.

Wildlife Habitats and General Wildlife Use – Long-Term Changes: As discussed under Alternative A for Giacomini Ranch, the brackish, tidal marsh, and riparian habitats described would eventually develop after a short-term (~ 10 years) transitional period in which grassland is converted into marsh. In addition, Olema Marsh would also respond to dramatic changes in physical conditions with a short-term transitional period in which existing vegetation would die-back considerably and create more expanses of open water until equilibrium is reached at which point new habitats would begin to develop. Over the long-term, these habitats would possibly continue to evolve in response to sea level rise, which could lead to regular inundation of large portions of the East and West Pastures below 4 feet NAVD88 should sea level rise at the currently projected rate of 3 feet by 2100 (Overpeck et al. 2006). This change would also affect Olema Marsh, as impoundment would no longer preclude inflow from Lagunitas Creek. However, predicting the magnitude of this change is difficult given the adaptive restoration approach proposed for this component of the proposed project. In general, sea level rise would intensify the conversion of Freshwater Marsh to Tidal Brackish Marsh.



Wildlife Habitats and General Wildlife Use – Construction: Construction of Alternative C would generally have minor adverse effects on High Value Wildlife Habitats and use by common wildlife species. Special status species are discussed individually.

Nine of the proposed construction activities would have the highest potential to affect both common and special status wildlife species. These activities are regrading of the southern levee in the East Pasture and creek bank to a more stable profile; filling of drainage ditches; tidal reconnection of the East Pasture Old Slough Pond; removal and breaching of levees; removal of the Fish Hatchery Creek tidegate; filling of the borrow ditch in the undiked marsh north of the West Pasture; partial realignment of Tomasini Creek; shallow excavation of Bear Valley Creek, and possible replacement of the Levee Road and Bear Valley Road culverts. Potential impacts to wildlife from most of these construction activities are discussed under Alternatives A and B. As described in Chapter 2, standard BMPs would be employed to minimize sediment discharge, and efforts would be made to preserve larger willows and other riparian trees during regrading of the creek bank.

Under Alternative C, the Bear Valley Creek channel would be shallowly excavated using either an excavator working from adjacent uplands or a dragline. Culverts on Bear Valley Creek at Bear Valley Road and Levee Road may also be replaced with new culverts or bridges, and the channel bottom, excavated to improve hydraulic conveyance. Tomasini Creek would be partially realigned into one of its historic alignments. These construction activities have the potential to negatively affect aquatic organisms such as fish (e.g., salmonids) and potentially macroinvertebrates, as well as amphibians and reptiles. Non-resident species such as waterfowl, waterbirds, southwestern river otter, and rails would not be impacted unless nesting or breeding was occurring.

Based on the scale and timing of construction activities that could affect High Value Wildlife Habitats and use by common wildlife species, the impacts of construction are characterized as minor to moderate adverse. The intensity of construction impacts on special status species is addressed separately below.

Invasive Wildlife Species: Alternative C would have very similar minor adverse effect on the number of non-native invasive wildlife species that would be present as a result of changes in conditions as Alternatives A and B, with increases in numbers and extent of aquatic invasives expected in Olema Marsh.

Wildlife Conditions in the Watershed: Tidal reconnection of the Giacomini Ranch and Olema Marsh to Lagunitas Creek would have a moderate beneficial effect in terms of support of wildlife species in southern portion of the Tomales Bay watershed. As described under Alternative A, tidal reconnection of the Giacomini Ranch and, under this alternative, Olema Marsh would not only increase the potential for export of sources of carbon such as dissolved and particulate organic carbon, phytoplankton, seeds and other plant matter, and aquatic organisms to the bay, but for access by marine and estuarine species in search of food and refugia. In addition, watershed habitat quality would be improved by rerouting of the Tomasini Creek and its associated sediment, pathogen, and contaminant load into the East Pasture than into Tomales Bay. These benefits would complement those achieved under Alternative A from discontinuation of agricultural management practices in the Giacomini Ranch and the portion of Lagunitas Creek in the Project Area such as levee maintenance, withdrawal of water for irrigation, infrequent pumping of waters from the ranch into Lagunitas Creek, and crossing of Lagunitas Creek by cattle.

California red-legged frog: Alternative C would result in appreciable or moderate adverse impacts over the short-term to California red-legged frog breeding habitat units in the Seashore-owned and managed-portions of the Point Reyes Peninsula Core Area, as well as on distribution of red-legged frogs in the Project Area. These impacts would occur principally because of proposed activities in the Olema Marsh and the expected conversion of a large portion of the West Pasture freshwater marsh to tidal brackish marsh. However, over the long-term, impacts to California red-legged frog breeding habitat units would be reduced to minor, as freshwater marsh reestablishes within the Olema Marsh, and mitigation habitats in the East Pasture and the Olema Creek become established. There would still be appreciable effects on distribution of the species within the Project Area, because appropriate breeding habitat would be relocated to areas not expected to be affected by salinity intrusion. Impacts during construction would be characterized as minor adverse, because excavation would be performed in the Olema Marsh.

Baseline studies documented two general areas that provide breeding habitat for red-legged frog. The largest of these is the West Pasture freshwater marsh. Breeding also has sporadically occurred in adjacent Fish Hatchery Creek, creating another 1.0 acre of breeding habitat in the West Pasture. The second breeding habitat is in the Olema Marsh and is assumed to comprise all of the areas with Freshwater Marsh and Open

Water, which total 39 acres. There is no documented breeding habitat in the East Pasture, although a few adult frogs were observed during baseline surveys (Fellers and Guscio 2002).

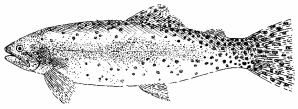
The effects of Alternative C on red-legged frog breeding and non-breeding habitat in the East and West Pasture would be similar to Alternative B. Changes to the West Pasture freshwater marsh and non-breeding habitat with restoration would be identical to those described under Alternative B, with approximately two-thirds of the 7.2-acre marsh converted to brackish marsh with saltwater intrusion. The non-saline portion would be expanded by 0.4 acres by habitat enhancement efforts scheduled in 2006. As with Alternative B, some of the loss of breeding habitat in the West Pasture freshwater marsh would be offset by creation of the 5.4-acre Tomasini Triangle freshwater marsh in the East Pasture. There are no breeding individuals believed to be using the East Pasture currently, but low numbers of adult individuals have been sighted (Fellers and Guscio 2002). Effects on non-breeding habitat for red-legged frog in the East Pasture would still be characterized as moderate adverse due to the large-scale conversion of grassland to brackish and salt marsh, loss of drainage ditches through filling, and, under this alternative, partial realignment of Tomasini Creek and revegetation in the southern portion of the East Pasture. The latter two components would only be expected to have only short-term effects until vegetation becomes established.

The largest impact under Alternative C would come with restoration of Olema Marsh. While California red-legged frogs are known to occur in the Olema Marsh, along with bullfrogs, conditions within the area did not allow for an effective assessment of red-legged frog use. Over the short-term, the dramatic physical and water quality changes that would occur in Olema Marsh with a decrease in impoundment conditions described earlier under this alternative would have temporary adverse effects on red-legged frog breeding habitat as the system moves towards equilibrium. Extensive vegetation die-back would occur due to lowering of water surface levels, leading to larger expanses of open water. In the summer as stream flow drops, temporary drops in pH may occur, although these episodes would be expected to be relatively short-lived. Nutrient pulses and instability and dissolved oxygen conditions within marsh waters would be more persistent and would continue until the marsh began to come into equilibrium with changed conditions. The majority of these conditions would initially occur in the early fall after breeding and metamorphosis is typically complete, however, it is possible that water quality fluctuations may persist into the following breeding season.

Some of the short-term impacts to red-legged frog would be offset by creation of approximately 2 acres of freshwater ponds in the adjacent Olema Creek watershed less than 0.5 miles from Olema Marsh. The lower reaches of this watershed just above its confluence with Lagunitas Creek recently began supporting breeding red-legged frogs after the creek reestablished connectivity with its historic eastern floodplains and converted pasture to a complex marsh system with both permanently and seasonally flooded habitats. Several ponds would be created on the west side of Olema Creek several years prior to implementation of restoration in Olema Marsh to ensure that additional habitat is available. These ponds would be excavated to varying depths to provide both shallow water and deep water aquatic and emergent habitat for frogs. Ponds would be designed to remain inundated from waters received from Olema Creek flood overflow and surface runoff until late July or August using a similar construction approach to that described under Chapter 2 for the created freshwater marsh in the Tomasini Triangle (Alternative B) such as stockpiling excavated topsoil and mixing topsoil with a material such as bentonite.

Over the long-term, conditions for red-legged frogs in Olema Marsh would improve. Once the marsh has adjusted to changes in water surface levels, marsh vegetation is expected to reestablish. As described earlier, the areal extent of Tidal Brackish Marsh would increase considerably in Olema Marsh under Alternative C, because of increases in tidal influence caused by decreases in marsh impoundment conditions and possibly lowering of the Bear Valley Road culvert elevation through replacement with a bridge. Acreage of Tidal Brackish Marsh is expected to increase to between 10 and 20 acres under this alternative, depending upon the adaptive restoration components implemented, degree of marsh subsidence, and other factors (KHE 2006a). Freshwater Marsh would re-establish elsewhere in the marsh, due in large part to the continued strong permanent freshwater influence from Bear Valley Creek and the Inverness Ridge drainages and groundwater. While water levels would not be as deep as under existing conditions, the marsh would continue to be fully inundated, with the exception of perhaps some pockets along the marsh perimeter that would be more seasonal in nature. These conditions could change somewhat in future because of sea level rise, which may increase the extent of tidal influence and Tidal Brackish Marsh habitats in the marsh.

Impacts on red-legged frog during construction would be minor adverse. In the Giacomini Ranch, construction activities would be expected to have only negligible adverse effects, because most of the heavy construction occurs in the East Pasture, and there is no breeding habitat in the East Pasture, and only a few



adult frogs have been sighted. These impacts are discussed in more detail under Alternative B. With restoration of Olema Marsh, the intensity of potential impacts to breeding habitat would increase, principally because of the shallow channel excavation that would be performed in the Olema Marsh portion of Bear Valley Creek. While construction would occur outside the breeding season and critical periods for tadpoles (after July), non-breeding adults and young could still be harmed or disturbed through construction. Possible mitigation measures are discussed in a separate sub-section below.

Tidewater goby: Alternative C would have minor to moderate adverse effects on tidewater goby and tidewater goby habitat in the Project Area over the short-term, but would have major beneficial effects over the long-term through an increase in extent of potential habitat and an improvement in quality for most of the existing habitats. Impacts during construction would be expected to be moderate, with implementation of mitigation measures designed to reduce the potential or amount of incidental take.

Within the Project Area, Acreage of existing tidewater goby habitat in the Giacomini Ranch totals 11.3 acres. This species occurs primarily in three areas within the Giacomini Ranch: Tomasini Creek, the West Pasture Old Slough and possibly Fish Hatchery Creek, and the non-tidal East Pasture Old Slough Pond. A detailed description of these areas can be found under the No Action Alternative. Numbers of tidewater goby in the Project Area have also been relatively low within each of these sites, ranging from five to 22 at most. These sites represent the only known occurrence of this species in the Tomales Bay watershed, as, prior to 2002, the species had last been sighted in the bay in 1953. Genetic analyses indicate that this population is genetically distinct from the nearest existing occurrences of tidewater goby at Salmon Creek Marsh and Rodeo Lagoon (Jacobs and Earl 2005).

The effects of Alternative C on tidewater goby habitat would be very similar in most aspects to Alternative B, specifically with regards to tidal reconnection of the East Pasture Old Slough, filling of drainage ditches, and introduction of full tidal flushing to the West Pasture.
While approximately 0.3 acres of ditches in the East Pasture would be filled in as part of the elimination of agricultural infrastructure under Alternative, A, the extent of tidal channel creation would increase under Alternative C, creating approximately 11.6 acres of habitat for tidewater goby. The Park Service and CSLC would also continue with the proposed captive propagation program to expand the distribution of tidewater goby within the southern portion of the Tomales Bay watershed.

Under Alternative C, however, Tomasini Creek, the primary habitat for tidewater goby in the Project Area, would be partially realigned into one of its historic alignments. The old Tomasini Creek channel would be leveed off from the new channel in the vicinity of the Giacomini Hunt Lodge, thereby converting the old channel into more of a backwater slough feature. As with the other alternatives, existing habitat conditions would be maintained in Tomasini Creek through retention of the tidegates and associated hydrologic infrastructure. Retention of the tidegates and flashboard dam structure on Tomasini Creek, along with natural gravel bar features, create residual brackish pool habitat that provides habitat for the tidewater goby, despite the fact that the substrate and flow conditions are probably not optimal.

In some senses, realignment may improve conditions in the backwater slough portion of the old Tomasini Creek channel. Scour during high flows would be reduced considerably, with the height of the new levee designed to allow some flood overflow during larger storm events. Disconnection from the Tomasini Creek watershed would also reduce influx of nutrients and pathogens, as well as contaminants potentially being leaked from the West Marin Landfill. However, realignment of the creek would remove a major source of freshwater inflow during at least winter, spring, and early summer months. Creek flow often dries up or becomes subsurface near Mesa Road by late summer into fall. While fluvial contributions would be lost, the section of Tomasini Creek between the Giacomini Hunt Lodge and the bay also appears to receive considerable contributions of groundwater from the Point Reyes Mesa through either seep waters flowing down the face of the Mesa or from groundwater emerging at the toe of the Mesa directly into the Tomasini Creek channel. This contribution was evident during hydrodynamic modeling of the creek, because observed salinities in the creek were much lower than ones predicted on the basis of tidal and fluvial inflow. Based on modeling, salinities near the Giacomini Hunt Lodge during the summertime with typical low summer flows should range from 20.5 to 25.0 ppt, but actual salinities recorded during monitoring by the Seashore show that salinities actually range from 15.0 to 18.0 ppt in both surface and bottom waters (KHE 2006a). Eventually, the salinity structure of the Tomasini Creek backwater slough could become more strongly influenced by tides due to sea level rise.

While these factors would suggest that conditions acceptable for tidewater goby would be maintained – and, in some ways, improved -- in the old Tomasini Creek backwater slough, the direct impacts to existing habitat do pose a risk over the short-term for tidewater goby habitat. Realignment of the Tomasini Creek channel and creation of new channels in the East Pasture would dramatically increase potential habitat in the East Pasture, but these benefits would take time to realize due to need for the habitat to establish and mature during a transitional phase following implementation. This phenomenon would not be as pronounced in the West Pasture, because there would be no new channel excavation or direct impacts to existing channel habitat other than removal of the tidegate. The tidewater goby does not currently occur in Olema Marsh, but improvements in hydraulic connectivity and expansion of brackish habitats could increase the potential for the species to establish here. For this reason, impacts to tidewater goby over the short-term are characterized as moderate adverse, with major or substantial beneficial effects expected over the long-term.

Relative to Alternatives A and B, most of the impacts to what would now be the Tomasini backwater slough from the public access component would be eliminated by removal of the through-trail component and replacement with two spur trails, one of which would extend the Tomales Bay Trail south along the old railroad grade adjacent to the slough channel.

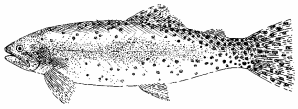
Construction activities would directly impact existing habitats in the East Pasture and Tomasini Creek, although impacts from earthmoving to the existing Tomasini Creek would be limited in scale. Construction in the West Pasture would not directly affect tidewater goby habitat. Due to incorporation of mitigation measures, impacts during construction would be characterized as moderate adverse. Possible mitigation measures are discussed in a separate sub-section below.

Central California coast steelhead, coastal California Evolutionarily Significant Unit (ESU) Chinook salmon, and central California coast coho ESU salmon: Similar to Alternative B, the effects of Alternative C on salmonid rearing and passage habitat in the Project Area would be beneficial and would generally range from moderate to major. Potential minor adverse impacts to salmonid habitat or salmonids would be expected to occur during construction of the wetland restoration component due to removal of the Fish Hatchery Creek tidegate, filling of the borrow ditch adjacent to the West Pasture north levee, and, under this alternative, partial realignment of Tomasini Creek and shallow excavation of Bear Valley Creek in Olema Marsh.

As discussed under the No Action Alternative, the Project Area does not represent a potential breeding or spawning area for steelhead, coho or Chinook salmon, but rather important feeding, resting, and refugia habitat for salmonids as they migrate to the ocean or move upstream to spawning grounds. Steelhead has recently been found in Fish Hatchery Creek, Tomasini Creek, the section of Lagunitas Creek in the Project Area, and in Bear Valley Creek upstream of Olema Marsh. Coho occur in Lagunitas Creek and in Tomasini Creek. Chinook has been documented in upstream portions of Lagunitas Creek, but they have not been captured as yet in the Project Area. Salmonid presence in these watersheds indicates that, while impediments, the levees and tidegate facilities are still allowing some degree of fish passage. The levees severely constrain the potential for development of off-channel or rearing habitat on Tomasini Creek and Lagunitas Creek. Fish Hatchery Creek is not leveed within the West Pasture, although it is infrequently dredged. On Bear Valley Creek, Levee Road, Bear Valley Roads, and their culverts limit both passage and rearing potential, along with the indistinct flow path in Olema Marsh created by excessive impoundment of waters.

The major benefit to salmonids under this alternative related to passage and rearing conditions would come from the considerable reduction in passage constraints associated with improvements in hydraulic connectivity of Bear Valley Creek with Lagunitas Creek and partial realignment of Tomasini Creek into an unregulated channel. In addition, these changes would also have moderate effect on the extent of rearing habitat along Bear Valley and Tomasini Creeks.

Under Alternative C, aquatic edge habitat in Giacomini Ranch would increase approximately 31 percent relative to existing conditions, with edge habitat in the Project Area climbing from approximately 15 miles under existing conditions to 19.6 miles under Alternative B. While approximately 0.3 acres of ditches would be eliminated, a total of 11.6 acres of new and restored tidal channel would be created in the East Pasture Old Slough. The old Tomasini Creek channel would remain, functioning somewhat as a backwater slough and thereby providing additional rearing and refugia habitat for salmon. As with Alternative B, removal of the levees and Fish Hatchery Creek tidegate would improve passage potential, extent of rearing habitat, and habitat quality in the West Pasture, with 4.6 acres of tidally influenced channel expected to develop in the West Pasture.



Passage potential in Tomasini Creek and Bear Valley Creek would improve immediately following implementation of the proposed project, but benefits to areal extent of rearing habitat and habitat quality would take longer to effect, with relatively short-term transitional phases expected in both systems as they adjust and respond to changed conditions. As has been described earlier, changes during the transitional phase would be much more dramatic in Olema Marsh than in Tomasini Creek, with extensive vegetation die-back predicted in response to dramatic reductions in water surface levels. These changes would have less of an effect on salmonids than some of the other aquatic species, because the lack of hydraulic connectivity and other constraints related to infrastructure has probably considerably reduced numbers of steelhead within this system, if not eliminated passage entirely. Therefore, Bear Valley Creek and Olema Marsh are not currently perceived as either key spawning or rearing habitat for steelhead, although this subwatershed once reportedly supported at least a modest run of this fish. Because of the lower values offered during the transitional phase in both the Giacomini Ranch and Olema Marsh, short-term effects were characterized as moderate, with long-term effects anticipated to be major.

Construction would have the potential for only minor adverse impacts associated removal of the Fish Hatchery Creek tidegate, filling in of the borrow ditch, tidegate, filling of the borrow ditch adjacent to the West Pasture north levee, and, under this alternative, partial realignment of Tomasini Creek and shallow excavation of Bear Valley Creek in Olema Marsh. Construction would be scheduled to ensure that grading does not begin before July 15, which is the end of the typical period for smolt outmigration. Possible mitigation measures are discussed in a separate sub-section below.

California black rail and California clapper rail: Alternative C would have very similar major beneficial effects to Alternative B in terms of increasing habitat for California black rail and California clapper rail, with the proposed project restoring more than 350 acres of low-, mid- and high Tidal Salt Marsh. During the transitional period following construction, only negligible to minor beneficial effects would be expected, as grassland and other habitats begin the process of converting to brackish and tidal marsh, leading to temporary establishment of a more weedy, ruderal habitat that would have less benefits for rails. Similar to Alternative B, impacts during construction would be moderate adverse, because of construction actions on and near the north levee in the West Pasture and in Olema Marsh.

As discussed under the No Action Alternative, breeding populations of California black rail have primarily occur in the undiked marsh north of the Giacomini Ranch and in Olema and Bear Valley marshes in intermittent years (ARA 2002). Small numbers (1-2 individuals) also occurred within the Project Area in brackish and freshwater marsh, with possible breeding one year in the West Pasture freshwater marsh (ARA 2002). Clapper rail historically occurred in Tomales Bay, and individuals were sighted in the undiked marsh north of the Giacomini Ranch during fall and winter between 1995 and 2001 (J. Evens, R. Stallcup, unpub. field notes). There have been no sightings since then, however, and there are no recent breeding records either from the bay.

Under Alternative C, benefits for black rail and clapper rail from restoration of the Giacomini Ranch would be almost identical to those under Alternative B, with breeding, foraging, resting, and refugia habitat almost tripling from approximately 120 acres to more than 350 acres with restoration of the East and West Pastures. The restoration would provide benefits primarily to black rail, although clapper rail could benefit substantially, as well, from establishment of low and high Tidal Salt Marsh habitats. Increases in high marsh habitat in Giacomini Ranch could, at least temporarily, offset any decreases in this habitat in the undiked marsh habitat north of the ranch from accelerated rates of bank slumping and channel widening that might be potentially being caused by a non-native isopod. This isopod would be likely to move south into the Giacomini Ranch once tidal connection and habitats are restored. Alternative C could improve the quality of refugia habitat in the East Pasture through efforts to increase the cover of native grasses in the southern portion of the pasture. The proximity of the East and West Pastures to the existing habitat in the adjacent undiked marsh would greatly increase the likelihood for successful establishment by rails in the restored areas.

As noted above, California black rails have bred in intermittent years in Olema Marsh and Bear Valley Marsh. With lowering of water surface levels and associated changes in the mix of riparian, brackish marsh, and freshwater marsh habitats, the suitability of these marshes for black rail would be enhanced, particularly if pockets of more seasonally flooded habitat develop on the perimeter. As with Giacomini Ranch, these minor beneficial effects would take place over the long-term, with conditions expected to be less desirable during the short-term due to the extensive die-back of vegetation and water quality problems that may occur during the transitional phase.

Construction would be expected to have potential moderate adverse effects on rails. While construction would be conducted outside of the documented breeding season for clapper rails (February through August 31), the filling of the borrow ditch and extension of the tidal channel in the undiked marsh into the West Pasture could negatively affect rails through temporary impacts to habitat and disturbance from noise. Possible mitigation measures are discussed in a separate sub-section below.

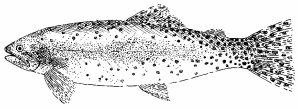
Other Special Status Species: The effects of Alternative C on other special status species would generally range from minor beneficial effects to moderate adverse effects depending on the species. Impacts during construction of the East and West Pasture and Olema Marsh restoration components would range from beneficial negligible to moderate adverse. Proposed mitigation measures proposed for some of these species are described in a separate sub-section below.

Species included in this category are federally or state-listed threatened and endangered species that are only occasional visitors or vagrants to the Project Area or are listed as a Species of Concern by the Sacramento office of the USFWS. These species include **California freshwater shrimp**, California brown pelican, green sturgeon, Least Bell's vireo, American peregrine falcon, sandhill crane, bank swallow, **northwestern pond turtle**, **southwestern river otter**, and **saltmarsh common yellowthroat**. Impacts from implementation of this alternative would be beneficial or only have negligible to minor adverse effects from conversion in habitat type for most of these species, except northwestern pond turtle, which is characterized as having moderate adverse effects. A detailed description of effects for most of the incidental visitors to the Project Area can be found under Alternative A.

California freshwater shrimp primarily occurs considerably upstream of the Project Area on Lagunitas and Olema Creeks, although it occasionally moves downstream on Lagunitas Creek into the White House Pool reach of Lagunitas Creek. The frequency of occurrence within the Project Area probably depends to a large degree on flow and salinity conditions in this highly variable estuarine zone of the Lagunitas Creek delta. Based on results of hydrodynamic modeling, there is a potential under Alternative C for minor adverse impacts to this species from a change in salinity structure of the White House Pool reach of Lagunitas Creek due to an increase in exchange with Olema Marsh, which would store a higher volume of brackish waters relative to existing conditions (KHE 2006a). These higher salinity conditions could preclude or discourage use of habitat in this area by freshwater shrimp. In addition to project-related effects, construction could result in minor adverse impacts from levee removal, creek bank grading, and removal of riparian vegetation along the southern portion of the East Pasture, although every effort would be made to preserve as much riparian vegetation as possible.

Similar to red-legged frog, **northwestern pond turtles** would be negatively affected by conversion of grassland and freshwater marsh habitats to tidal and brackish marsh habitats in both the East and the West Pastures. Construction activities expected to have the most effect would be filling in of the drainage ditches, tidal reconnection of the East Pasture Old Slough and excavation, construction of the eastern perimeter trail along Tomasini Creek, and removal of the Fish Hatchery Creek tidegate. Following implementation, turtles may become restricted to freshwater portions of Tomasini Creek and Fish Hatchery Creek and pockets of freshwater marsh along the ranch periphery. In the East Pasture, the Tomasini Creek levee would remain, which could maintain aestivation habitat. Northwestern pond turtle has not been observed in Olema Marsh, although it does occur in Lagunitas Creek. The potential changes in salinity structure for the White House Pool reach of Lagunitas Creek could have similar adverse impacts on turtles in the creek as described in freshwater shrimp above. Improvements in hydraulic connectivity between Lagunitas Creek and Olema Marsh may increase the potential for turtles to move into the Olema and Bear Valley marshes, although the southernmost portions of Olema Marsh would probably be too saline to be appropriate habitat.

Under Alternative C, construction-related effects on **saltmarsh common yellowthroat** would be reduced from minor under Alternative B to negligible with elimination of the through-trail component of the eastern perimeter trail. Saltmarsh common yellowthroat may actually benefit from this alternative after implementation, because of the considerable reduction in direct impacts to existing habitat from public access-related components and the increase in Forested and Scrub Shrub Riparian habitat in Olema Marsh from conversion of Freshwater Marsh with dewatering. Olema Marsh has historically supported a large breeding population of saltmarsh common yellowthroat.



Proposed Additional Mitigation Measures: Standard BMPs would be implemented to reduce impacts to special status species and wildlife habitats are discussed under Chapter 2. All construction and staging/stockpiling areas would be cleared by biologists prior to use to ensure that there are no nesting or breeding species within the vicinity of the Project Area or staging/stockpile areas prior to implementation. Measures specific to certain species are described below:

General: Impacts to aquatic organisms in construction areas such as Fish Hatchery Creek, East Pasture Old Slough Pond, and Bear Valley Creek/Olema Marsh would be minimized through dewatering affected channel areas to the extent possible and performing extensive seining to remove fish and macroinvertebrates prior to construction. Organisms would be relocated to areas outside the construction zone. In Olema Marsh, fine-mesh fencing or nets may be installed if possible on the perimeter of the channel excavation area to ensure that, once pre-construction surveys and seining have been completed, fish and other aquatic organisms do not automatically move back into the construction area. This measure may be difficult to implement due to the deep water depths unless some dewatering occurs prior to construction.

High Value Wildlife Habitats/General Wildlife Use: Implementation of restoration in Olema Marsh would have the potential for moderate adverse impacts over the short-term. Some of the impacts to general wildlife use, if not wildlife habitats, from water quality problems generated by lowering water surface levels could be potentially mitigated through extending the period of drawdown. Olema Marsh implementation would include adaptive management and monitoring. In order to reduce the potential water quality impacts associated with the reduction in water level and aquatic vegetation die off, the excavation and lowering of water level would be limited to excavation of only the fill area controlling water level.

California red-legged frog:

Construction Mitigations: Construction activities would include removal of ditches; excavation of certain portions of the East Pasture Old Slough; and shallow excavation of the portion of Bear Valley Creek in Olema Marsh. Olema Marsh is known breeding habitat for red-legged frog. Though not documented as supporting breeding habitat, the Old Slough and ditches and other areas within the East and West Pastures may provide non-breeding habitat. Construction activities adjacent to or within California red-legged frog habitat documented as breeding habitat would not be conducted until August. Pre-construction surveys would be completed in all construction areas to confirm that no red-legged frogs are present.

In Olema Marsh, fine-mesh fencing or nets may be installed if possible on the perimeter of the channel excavation area to ensure that, once pre-construction surveys and seining have been completed, fish and other aquatic organisms do not automatically move back into the construction area. This measure may be difficult to implement due to the deep water depths. Frogs encountered would be relocated.

Possible Project-Related Mitigation Measures - Olema Marsh: Proposed reductions in the Olema Marsh water level would result in reduction in static water level, which may result in large fluctuations in water quality and emergent vegetation conditions that could affect the viability of the marsh over the short-term for breeding habitat. For these reasons, several possible mitigation measures may be implemented to reduce short-term impacts to breeding habitat. One possible mitigation measure would involve construction of a creek bypass that would involve excavation of fill from the eastern edge of the marsh, with most of the material placed immediately to the west, essentially separating the flow channel from the marsh. In addition, another potential mitigation measure identified as part of the water quality section includes a more gradual approach to dewatering of Olema Marsh through limiting the excavation depths at the outflow of the Olema Marsh. Removal of vegetation along the excavated flow path and either notching or culverting the berm that currently constricts outflow would allow for a more gradual drawdown in water level that may reduce the potential water quality impacts associated with restoring the currently impounded marsh.

Tidewater goby: Construction would not occur in or directly adjacent to existing tidewater goby habitat during the typical season of reproduction for tidewater goby documented in the literature (late April – early summer; Swift 2003). Prior to construction in the East Pasture Old Slough Pond, ditches, Tomasini Creek, and Fish Hatchery Creek for removal of the tidegate, extensive seining would be performed after some dewatering to lower water levels and to increase the efficiency of trapping. Minnow traps and dip nets may also be used to increase capture rates. Captured fish would be immediately relocated to Tomasini Creek, the West Pasture Old Slough, or other appropriate habitat.

Central California coast steelhead, coastal California ESU Chinook salmon, and central California coast coho ESU salmon: Work affecting Lagunitas Creek, Fish Hatchery Creek, Tomasini Creek, and Bear Valley Creek would be conducted after July 15 to minimize impacts to salmonids. BMPs identified in Chapter 2 to decrease sedimentation and impacts to wetlands would mitigate potential impacts associated with selective deconstruction of levees, regrading of creek banks, construction of the eastern perimeter trail, and installation of a pre-fabricated bridge. In addition to these BMPs, other actions would be taken to minimize impacts, including use of an excavator rather than a bulldozer to remove fill and excavation in sensitive creek areas during periods when construction area is exposed to the extent possible. During removal of the tidegate on Fish Hatchery Creek, water levels within the construction zone would be lowered, and extensive seining would be performed to remove any salmonids prior to construction. Captured fish would be relocated to appropriate upstream habitats.

California black rail and California clapper rail: The proposed project would comply with directives to not come within 250 feet of established rail habitat prior to August 31 by delaying construction in the northern portion of the East, West Pasture, and Olema Marsh until September.

California freshwater shrimp: Construction conducted in the White House Pool reach would comply with BMPs identified in Chapter 2 to decrease sedimentation and impacts to wetlands would mitigate potential impacts associated with selective deconstruction of levees, regrading of creek banks, and installation of a pre-fabricated bridge. Pre-construction surveys would be conducted, and any shrimp found would be relocated upstream outside of the construction zone.

Northwestern pond turtle: Prior to construction in the ditches, East Pasture Old Slough, and Fish Hatchery Creek, water levels would be lowered to the extent possible, and turtles would be trapped and relocated to appropriate habitat, either to Lagunitas Creek or the Martinelli Ponds in the Martinelli Ranch directly to the north of the Giacomini Ranch.

Saltmarsh common yellowthroat: Prior to construction of the southern perimeter trail or the possible future extension of the southern perimeter trail to Inverness Park, pre-construction surveys would be conducted to ensure that no active nests are present or that nesting and fledging have been completed prior to construction being conducted within or in the immediate vicinity (< 100 feet) of riparian habitat that is either known to support or believed capable of supporting common yellowthroat.

Effectiveness of Proposed Additional Mitigation Measures

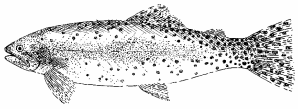
High Value Wildlife Habitats/General Wildlife Use: Mitigation measures proposed would be expected to reduce the severity of short-term impacts to use by wildlife from restoration of Olema Marsh, but potential short-term impacts to High Value Wildlife habitats may be unavoidable. Over the long-term, these impacts, however, would be mitigated by adjustment to changed conditions and reestablishment of a slightly different mix of High Value Wildlife Habitats.

California red-legged frog: The potential project-related mitigation measures proposed above, in combination with the habitat creation proposed under Alternative C as described in Chapter 2, would possibly further reduce the moderate short-term and long-term impacts to California red-legged frog. Construction-related mitigation measures would keep impacts during implementation of restoration to no more than minor.

Tidewater goby: The mitigation measures would be expected to reduce impacts, but impacts cannot be eliminated. Even with extensive seining, some mortality of fish would be expected, because tidewater goby burrow in the mud, making it extremely difficult to trap all fish. Construction would, therefore, result in incidental take. The proposed mitigation measures would result in this alternative having moderate adverse impacts on tidewater goby during construction.

Central California coast steelhead, coastal California ESU Chinook salmon, and central California coast coho ESU salmon: The proposed mitigation measures should reduce any potential impacts to minor levels.

California black rail and California clapper rail: The proposed mitigation measures should result in no more than moderate adverse impacts on rails during construction.



California freshwater shrimp: The proposed mitigation measures should reduce any potential impacts to negligible levels.

Northwestern pond turtle: The mitigation measures would be expected to reduce impacts, but would not eliminate them. Even with dewatering of the channels and extensive trapping, some mortality of turtles would be expected. The proposed mitigation measures would result in this alternative having moderate adverse impacts on turtles during construction.

Saltmarsh common yellowthroat: The proposed mitigation measures should reduce any potential impacts to negligible levels.

Cumulative Impacts: Based on the list of recently conducted, proposed, or reasonably foreseeable projects described under the No Action Alternative, cumulative impacts to California red-legged frog under Alternative C would not be expected to change from the impacts already characterized for the proposed project. Over the short-term, moderate adverse impacts to breeding habitat units in the Seashore-owned and managed portions of the Point Reyes Peninsula Core Area would occur from the dramatic changes in Olema Marsh and the conversion of a large portion of the West Pasture freshwater marsh to Tidal Brackish Marsh. However, these impacts would be reduced to moderate or less-than-significant levels through maturation of created habitat in the East Pasture Tomasini Triangle and the Olema Creek ponds as described under Alternatives B and/or C, as well as implementation of the project-related mitigation measures proposed above. Because many of the mitigation measures approved by USFWS for other Seashore projects involve maintenance or repair of existing ponds, these measures are expected to provide appropriate habitat value for frogs over a much shorter timeframe than those involving habitat creation such as the proposed project. Therefore, the cumulative impact of the proposed project with the projects identified under the No Action Alternative would not exacerbate the intensity of the impacts over the short-term, which are already characterized as moderate. Over the long-term, mitigation measures proposed for all the projects, including habitat creation, would reduce impacts to at least minor for the Point Reyes Peninsula Core Area.

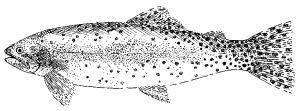
Cumulative impact for California black rails, California clapper rails, shorebirds, and waterfowl would be expected to be very similar to those described under Alternative A.

In terms of steelhead, the proposed project would be expected to have at least minor to moderate beneficial effects on fish in Bear Valley Creek should the proposed Bear Valley Creek Watershed and Fishery Enhancement Project be conducted. Through improvement of hydraulic connectivity and a decrease in water impoundment in Olema Marsh, Alternative C would increase passage potential and off-stream refugia for steelhead in the lower reaches of Bear Valley Creek. The Bear Valley Creek project could improve passage potential in the upper reaches of Bear Valley, thereby leading to a cumulatively beneficial effect on movement of steelhead into this watershed, particularly as the anadromy of the low to moderate numbers of steelhead observed in the past is uncertain.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The effects of Alternative C on wildlife habitat and use in the Project Area and support of wildlife species in the watershed would generally range from major adverse to major beneficial. As with Alternative B, the East and West Pastures would be restored, with new public access facilities limited to the eastern and southern perimeters of the East Pasture. However, under this alternative, there would also be restoration of Olema Marsh. Over the long-term, Alternative C would be expected to have major beneficial effects on High Value Wildlife Habitats in the Project Area, although there may be some minor adverse impacts during construction and moderate adverse impacts over the short-term from the dramatic changes expected in the Olema Marsh.

As with Alternative B, the largest change under this alternative relative to existing conditions would come from the substantial conversion of grassland or pasture to salt and brackish marsh. Through restoration, more than two-thirds of the East Pasture and one-third of the West Pasture would be expected to shift from grassland to tidal or brackish marsh. A transitional period would be expected over the short-term in the Giacomini Ranch during which, as pasturelands slowly convert through exposure to saline conditions to marsh, restored areas



would be dominated by a mix of non-native opportunistic, moderately salt-tolerant species characteristic of brackish conditions.

Most of the gain in High Value Wildlife Habitat under Alternative C would come from restoration of Olema Marsh. The major increase in High Value Wildlife Habitats would have a moderate beneficial effect over the long-term on use of the Project Area by wildlife, with use by common and special status wildlife species increasing appreciably relative to existing conditions. Some of the largest changes in wildlife use under this alternative relative to Alternative A would be expected to come from increased use of expanded marsh and riparian habitats in Olema Marsh and Tomasini Creek. While restoration efforts in the East Pasture and the West Pasture would increase, general wildlife use patterns would be relatively similar to those under Alternative B, probably due to the small increase between Alternatives B and C in acreage of High Value Wildlife Habitats in the Giacomini Ranch.

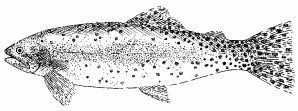
In the Olema Marsh restoration component, removal of a small berm that is limiting outflow of waters from the marsh would improve hydraulic connectivity with Lagunitas Creek. The dewatering expected with removal of the berm and possible replacement of the Levee and Bear Valley Road culverts would potentially lower water surface levels in Olema Marsh by as much as 1- to 4 feet or more. It should be noted that proposed mitigation actions to reduce impacts to the California red-legged frog would include reduction in marsh excavation to reduce potential water level drop, and effect of conditions described below. During the transitional period following implementation, considerable die-back of Freshwater Marsh vegetation would take place, leaving dead stands of tall emergents and larger expanses of open water areas subject to water quality problems. From a wildlife perspective, the short-term effects of these changes in Olema Marsh would generally range from minor to moderate adverse. Over the long-term, as brackish vegetation and freshwater marsh habitat rebounds in Olema Marsh, a recovery of freshwater marsh-associated species (e.g. marsh wrens, red-winged blackbirds, rails) would be expected, as well as an increase in riparian-associated bird species due to expansion of riparian habitat.

It should be noted that the Olema Marsh, and the ponded conditions that maintain habitat described above for the red-legged frog, also represents the barrier to steelhead and potentially salmon access to Bear Valley Creek. The physical conditions necessary to support breeding habitat of the red-legged frog are the same conditions which limit or eliminate potential salmonid access to the watershed.

Changes in the Giacomini Ranch component relative to Alternative B include partial realignment of Tomasini Creek into one of its historic alignments. The existing Tomasini Creek channel would remain, as would the tidegates and flashboard dam structure, but the old channel would be leveed off from the new one. This change would convert the old Tomasini Creek channel into more of a backwater slough that would continue to receive freshwater influence from groundwater flowing off the Point Reyes Mesa, as well as occasional overbank flooding from Tomasini Creek during large storm events. This change would be expected to increase the intensity of short-term impacts to tidewater goby through direct impacts to existing habitat, but, over the long-term, changes would be beneficial, because of the overall increase in habitat.

Alternative C would have very similar minor adverse effect on the number of non-native invasive wildlife species that would be present as a result of changes in conditions as Alternatives A and B, with increases in numbers and extent of aquatic invasives expected in Olema Marsh. Tidal reconnection of the Giacomini Ranch and Olema Marsh to Lagunitas Creek would have a moderate beneficial effect in terms of support of wildlife species in southern portion of the Tomales Bay watershed. For the San Francisco Bay region in general, the proposed project, in combination with other proposed and ongoing restoration projects, would be expected to generally have a cumulatively negligible beneficial effect on regional populations of California black rails, California clapper rails, waterfowl, and shorebirds.

California red-legged frog: Alternative C would result in appreciable or moderate adverse impacts over the short-term to California red-legged frog breeding habitat units in the Seashore-owned and managed-portions of the Point Reyes Peninsula Core Area, as well as on distribution of red-legged frogs in the Project Area. These impacts would occur principally because of proposed activities in the Olema Marsh and the expected conversion of a large portion of the West Pasture freshwater marsh to tidal brackish marsh. However, over the long-term, impacts to California red-legged frog breeding habitat units would be reduced to minor, as freshwater marsh reestablishes within the Olema Marsh, and mitigation habitats in the East Pasture and the Olema Creek become established. There would still be appreciable effects on distribution of the species within the Project Area, because appropriate breeding habitat would be relocated to areas not expected to be affected by salinity intrusion. Impacts during construction would be characterized as minor adverse, because



excavation would be performed in the Olema Marsh. Because many of the mitigation measures approved by USFWS for other Seashore projects involve maintenance or repair of existing ponds, these measures are expected to provide appropriate habitat value for frogs over a much shorter timeframe than those involving habitat creation such as the proposed project. Therefore, the cumulative impact of the proposed project with the projects identified under the No Action Alternative would not exacerbate the intensity of the impacts over the short-or long-term.

Tidewater goby: Alternative C would have moderate adverse effects on tidewater goby habitat on tidewater goby in the Project Area over the short-term, but would have major beneficial effects over the long-term through after implementation through a potential increase an increase in extent of potential habitat and an improvement in quality for most in the areal extent of East and West Pasture habitat and the quality of the existing habitats in Tomasini Creek. Impacts during construction would be expected to be moderate, with implementation of mitigation measures designed to reduce the potential or amount of incidental take of this federally listed species.

Central California coast steelhead, coastal California Evolutionarily Significant Unit (ESU) Chinook salmon, and central California coast coho ESU salmon: The effects of Alternative C on salmonid rearing and passage habitat in the Project Area would be beneficial and would generally range from moderate to major. Potential minor adverse impacts to salmonid habitat or salmonids would be expected to occur during construction of the wetland restoration component due to removal of the Fish Hatchery Creek tidegate, and filling of the borrow ditch adjacent to the West Pasture north levee, and, under this alternative, partial realignment of Tomasini Creek and shallow excavation of Bear Valley Creek in Olema Marsh.

California black rail and California clapper rail: Alternative C would have very similar major beneficial effects to Alternative B in terms of increasing habitat for California black rail and California clapper rail, with the proposed project restoring more than 350 acres of low-, mid- and high Tidal Salt Marsh adjacent to existing rail habitat. During the transitional period following construction, only negligible to minor beneficial effects would be expected, as grassland and other habitats begins the process of converting to brackish and tidal marsh, leading to temporary establishment of a more weedy, ruderal habitat that would have less benefits for rails. Impacts during construction would be moderate adverse, because of construction actions on and near the north levee in the West Pasture and in Olema Marsh.

Other Special Status Species: The effects of Alternative C on other special status species would generally range from minor beneficial effects to moderate adverse effects depending on the species. Impacts during construction of the East and West Pasture and Olema Marsh restoration components would range from beneficial negligible to moderate adverse.

Alternative D

Analysis: The effects of Alternative D on wildlife habitat and use in the Project Area and support of wildlife species in the watershed would generally range from major adverse to major beneficial and are almost identical to Alternative C. As with Alternative C, the East and West Pastures of the Giacomini Ranch and Olema Marsh would be restored. However, public access would be scaled back with conversion of the through-trail component on the southern perimeter to an enhanced spur trail with no bridge and no possible for future extension of the trail to Inverness Park. The eastern perimeter trail would include only one spur trail – the extension of the Tomales Bay Trail. Some of the other major changes under Alternative D that would affect wildlife would be the complete realignment of Tomasini Creek into one of its historic alignments; excavation of higher elevation intertidal and grassland areas to lower intertidal elevations; and replacement of the Tomasini Creek Mesa Road culvert. There would also be additional tidal channel creation relative to Alternative C in the East Pasture.

Wildlife Habitats and General Wildlife Use – Project Implementation: Over the long-term, Alternative D would be expected to have major beneficial effects on High Value Wildlife Habitats in the Project Area, although there may be some moderate adverse impacts during construction in the Project Area. Under this alternative as with Alternative C, the dramatic rate of gain in High Value Wildlife Habitats between each of the alternatives would slow considerably. While Alternative B represented an almost 40 percent increase in High Value Wildlife Habitats from Alternative A, Alternative D would only increase the acreage of High Value Wildlife Habitats relative to Alternative C by 3 percent. As with the other alternatives, the largest change under this alternative relative to existing conditions would come from the substantial conversion of grassland or pasture

and freshwater marsh to salt and brackish marsh. Under Alternative D, the degree of conversion is increased through excavation of at least 9 acres of grassland to intertidal elevations. Through these actions, almost 75 percent of the Giacomini Ranch would be expected to shift from grassland to tidal or brackish marsh. Most of the gain in High Value Wildlife Habitat under Alternative D would come from increased restoration of the East Pasture.

As with Alternative C, moderate adverse impacts would occur over the short-term to High Value Wildlife habitats from the changes expected in lowering of water surface levels in Olema Marsh, though in the long-term, these conditions would stabilize, resulting in long-term major beneficial effects on High Value Habitat as natural processes are restored.. These changes are discussed in more detail under Alternative C.

The major increase in High Value Wildlife Habitats relative to existing conditions would have a moderate beneficial effect over the long-term on use of the Project Area by wildlife, with use by common and special status wildlife species increasing appreciably relative to existing conditions. In general, the trends in wildlife use predicted under Alternative C would continue under Alternative D for the Giacomini Ranch West Pasture and Olema Marsh. Some of the largest changes in wildlife use under this alternative relative to Alternative C would be expected to come from increased use of expanded marsh and riparian habitats in the East Pasture and Tomasini Creek. Elimination of the bridge component on the southern perimeter trail and the Mesa Road spur trail would have negligible to minor benefits, at most, for wildlife, principally because of the reduction in the small amount (<0.1 acre) of permanent and temporary riparian habitat loss and continued disturbance from bridge maintenance activities.

Creation of additional intertidal salt and brackish marsh in the East Pasture through excavation would increase habitat for waterbirds such as California black rail and California clapper rail, as well as marsh-associated passerines (e.g., marsh wren) and colonial waterbirds (e.g., herons and egrets). The excavation would increase mid-marsh areas through lowering of higher elevation intertidal areas, as well as conversion of grassland.

Complete realignment of Tomasini Creek would increase the extent of backwater slough habitat retained in the old Tomasini Creek channel, but would not necessarily change the amount of High Value Wildlife Habitats or abundance and diversity of wildlife species expected to use the creek relative to Alternative C. To ensure that realignment does not inadvertently drain the created Tomasini Triangle freshwater marsh, the creek would be shallowly bermed on either side through the marsh to retain ponded conditions. The berm would be actively revegetated with riparian vegetation to increase the value of this berm as breeding, non-breeding, and refugia habitat for wildlife. This change to the Tomasini Triangle would reduce the size of the created marsh from 5.4 acres under Alternatives B and C to 5.2 acres under Alternative D.

Replacement of the Tomasini Creek Mesa Road culvert would improve hydraulic connectivity between upstream and downstream reaches of the creek and potentially have a negligible to minor indirect effect on riparian habitat upstream of Mesa Road. Improvement of flow conditions could reduce backwater flooding upstream of Mesa Road and thereby decrease the width of the currently sizeable Forested and Scrub Shrub Riparian corridor or maintain the width of the corridor, but convert the understory from marsh vegetation to shrubs more characteristic of drier conditions. A decrease in width of the riparian corridor would have negligible to minor effects on resident and Neotropical migrant passerines associated with riparian habitat, along with other amphibian, reptile, and mammalian species. Red-legged frog and pond turtle have not been observed in this reach of Tomasini Creek, although it could provide non-breeding habitat. While the existing culvert may not have precluded passage of steelhead and coho, replacement may improve conditions for passage.

Wildlife Habitats and General Wildlife Use – Long-Term Changes: As discussed under Alternative A for Giacomini Ranch, the brackish, tidal marsh, and riparian habitats described would eventually develop after a short-term (~ 10 years) transitional period in which grassland is converted into marsh. In addition, Olema Marsh would also respond to dramatic changes in physical conditions with a short-term transitional period in which existing vegetation would die-back considerably and create more expanses of open water until equilibrium is reached at which point new habitats would begin to develop. Over the long-term, these habitats would possibly continue to evolve in response to sea level rise, which could lead to regular inundation of large portions of the East and West Pastures below 4 feet NAVD88 should sea level rise at the currently projected rate of 3 feet by 2100 (Overpeck et al. 2006). This change would also affect Olema Marsh, as impoundment would no longer preclude inflow from Lagunitas Creek. However, predicting the magnitude of this change is

difficult given the adaptive restoration approach proposed for this component of the proposed project. In general, sea level rise would intensify the conversion of Freshwater Marsh to Tidal Brackish Marsh.

Wildlife Habitats and General Wildlife Use – Construction: Construction of Alternative D would generally have minor adverse effects on High Value Wildlife Habitats and use by common wildlife species. Special status species are discussed individually. Pre-construction surveys would be conducted as described under Alternative A.

Eleven of the proposed construction activities would have the highest potential to affect both common and special status wildlife species. These activities are regrading of the southern levee in the East Pasture and creek bank to a more stable profile; filling of drainage ditches; tidal reconnection of the East Pasture Old Slough Pond; removal and breaching of levees; removal of the Fish Hatchery Creek tidegate; filling of the borrow ditch in the undiked marsh north of the West Pasture; Tomasini Creek realignment; shallow excavation of Bear Valley Creek; and possible replacement of the Levee Road, Bear Valley, and Mesa Road culverts. Potential impacts to wildlife from most of these construction activities are discussed under Alternatives A, B, and C. As described in Chapter 2, standard BMPs would be employed to minimize sediment discharge, and efforts would be made to preserve larger willows and other riparian trees during regrading of the creek bank.

Under Alternative D, Tomasini Creek would be completely realigned, and the culvert on Mesa Road would be replaced. These construction activities have the potential to negatively affect aquatic organisms such as fish (e.g., salmonids) and potentially macroinvertebrates, as well as amphibians and reptiles. Non-resident species such as waterfowl, waterbirds, southwestern river otter, and rails would not be impacted unless nesting or breeding was occurring.

Based on the scale and timing of construction activities that could affect High Value Wildlife Habitats and use by common wildlife species, the impacts of construction are characterized as minor to moderate adverse. The intensity of construction impacts on special status species is addressed separately below.

Invasive Wildlife Species: Alternative D would have very similar minor adverse effect on the number of non-native invasive wildlife species that would be present as a result of changes in conditions as Alternatives A and B, with increases in numbers and extent of aquatic invasives expected in Olema Marsh.

Wildlife Conditions in the Watershed: Tidal reconnection of the Giacomini Ranch and Olema Marsh to Lagunitas Creek would have moderate beneficial effect in terms of support of wildlife species in southern portion of the Tomales Bay watershed. As described under Alternative A, tidal reconnection of the Giacomini Ranch and, under this alternative, Olema Marsh would not only increase the potential for export of sources of carbon such as dissolved and particulate organic carbon, phytoplankton, seeds and other plant matter, and aquatic organisms to the bay, but for access by marine and estuarine species in search of food and refugia. In addition, watershed habitat quality would be improved by rerouting of the Tomasini Creek and its associated sediment, pathogen, and contaminant load into the East Pasture than into Tomales Bay. These benefits would complement those achieved under Alternative A from discontinuation of agricultural management practices in the Giacomini Ranch and the portion of Lagunitas Creek in the Project Area such as levee maintenance, withdrawal of water for irrigation, infrequent pumping of waters from the ranch into Lagunitas Creek, and crossing of Lagunitas Creek by cattle.

California red-legged frog: Alternative D would have almost identical effects to Alternative C on California red-legged frog despite the complete realignment of Tomasini Creek. Over the short-term, Alternative C would have moderate adverse impacts on California red-legged frog breeding habitat units in the Point Reyes Peninsula Core Area and distribution of red-legged frogs in the Project Area, principally because of restoration of Olema Marsh and the conversion of the West Pasture freshwater marsh to brackish marsh. These effects would be offset through creation of the 5.2-acre Tomasini Triangle freshwater marsh and approximately 2 acres of freshwater marsh ponds in the adjacent Olema Creek watershed less than 0.5 miles from Olema Marsh, the latter of which would be constructed prior to restoration of Olema Marsh. Over the long-term, impacts to habitat units within the region would be reduced to minor through full establishment of the Tomasini Triangle freshwater marsh and reestablishment of freshwater marsh in Olema Marsh. However, as with Alternative C, this alternative would still be expected to have an appreciable or moderate effect over the long-term on distribution of frogs in the Project Area. Impacts during construction would be characterized as minor adverse, because excavation would be performed in Olema Marsh.

Project- and construction-related effects of Alternative D are almost identical to Alternative C and are described in more detail under Alternative C. While Tomasini Creek would be completely rerouted through the created Tomasini Triangle freshwater marsh, thereby reducing the marsh size by 0.2 acres relative to Alternative C, the low berms proposed to run along both sides of the rerouted creek in the marsh to ensure that ponding is retained would be expected to minimize adverse impacts from this change. In addition, low berms would be actively revegetated with riparian vegetation, thereby increasing their value as breeding, non-breeding, and refugia habitat for wildlife, including red-legged frog and northwestern pond turtle. Low berms would be designed to allow some flood overflow into the two marsh "cells" during large storm events to increase fluvial contributions to the marsh.

Tidewater goby: Alternative D would have almost identical effects to Alternative C on tidewater goby despite complete realignment of Tomasini Creek. While this alternative would have minor to moderate adverse effects on tidewater goby habitat in the Project Area over the short-term, it would have major beneficial effects over the long-term through an increase in extent of potential habitat and an improvement in quality for most of the existing habitats. Impacts during construction would be expected to be moderate, with implementation of mitigation measures designed to reduce the potential or amount of incidental take.

Project- and construction-related effects of Alternative D are almost identical to Alternative C and are described in more detail under Alternative C. While Tomasini Creek would be completely rerouted through the created Tomasini Triangle freshwater marsh under this alternative, the effects on tidewater goby would be considered similar. One slight change in effect is that the size of the backwater slough habitat feature created in the old Tomasini Creek channel would be enlarged relative to Alternative B by moving the rerouting point for Tomasini Creek further upstream. This change would be expected to have only negligible beneficial effects ultimately on tidewater goby relative to Alternative C. Also, additional tidal channel creation in the East Pasture could also increase habitat.

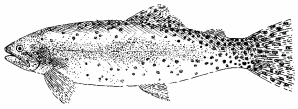
Central California coast steelhead, coastal California Evolutionarily Significant Unit (ESU) Chinook salmon, and central California coast coho ESU salmon: Similar to Alternative C, the effects of Alternative D on salmonid rearing and passage habitat in the Project Area would be beneficial and would generally range from moderate to major. Potential minor adverse impacts to salmonid habitat or salmonids would be expected to occur during construction of the wetland restoration component due to removal of the Fish Hatchery Creek tidegate, filling of the borrow ditch adjacent to the West Pasture north levee, shallow excavation of Bear Valley Creek in Olema Marsh, complete realignment of Tomasini Creek, and replacement of the Tomasini Creek Mesa Road culverts.

Project- and construction-related effects of Alternative D are almost identical to Alternative C and are described in more detail under Alternative C. While Tomasini Creek would be completely rerouted through the created Tomasini Triangle freshwater marsh under this alternative, the effects on salmonids would be very similar. Replacement of the Tomasini Creek Mesa Road culvert could slightly improve passage conditions for steelhead and coho. Additional tidal channel creation in the East Pasture could also increase rearing habitat.

California black rail and California clapper rail: Alternative C would have very similar major beneficial effects to Alternative B in terms of increasing habitat for California black rail and California clapper rail, with the proposed project restoring more than 350 acres of low-, mid- and high Tidal Salt Marsh. During the transitional period following construction, only negligible to minor beneficial effects would be expected. Impacts during construction would be moderate adverse, because of construction actions on and near the north levee in the West Pasture and in Olema Marsh.

The primary change to California black rail and California clapper rail under Alternative D would come from the slight increase in habitat relative to Alternative C from excavation of higher elevation intertidal and grassland areas to lower intertidal elevations. This increase and shift in intertidal habitats would be expected to have beneficial effects on rails.

Other Special Status Species: The effects of Alternative D on other special status species would be identical to Alternative C and generally range from minor beneficial effects to moderate adverse effects depending on the species. Impacts during construction of the East and West Pasture and Olema Marsh restoration components would range from beneficial negligible to moderate adverse.



Proposed Additional Mitigation Measures: Standard BMPs would be implemented to reduce impacts to special status species and wildlife habitats are discussed under Chapter 2. Measures specific to certain species are described below:

General: Mitigation measures would be the same as described under Alternative C.

California red-legged frog: Mitigation measures would be the same as described under Alternative C.

Tidewater goby: Mitigation measures would be the same as described under Alternative C.

Central California coast steelhead, coastal California ESU Chinook salmon, and central California coast coho ESU salmon: Mitigation measures would be the same as described under Alternative C.

California black rail and California clapper rail: *Mitigation measures would be the same as described under Alternative C.*

California freshwater shrimp: Mitigation measures would be the same as described under Alternative C.

Northwestern pond turtle: Mitigation measures would be the same as described under Alternative C.

Saltmarsh common yellowthroat: Mitigation measures would be the same as described under Alternative C.

Effectiveness of Proposed Additional Mitigation Measures

California red-legged frog: The effectiveness of proposed mitigation measures would be the same as described under Alternative C.

Tidewater goby: The effectiveness of proposed mitigation measures would be the same as described under Alternative C.

Central California coast steelhead, coastal California ESU Chinook salmon, and central California coast coho ESU salmon: The effectiveness of proposed mitigation measures would be the same as described under Alternative C.

California black rail and California clapper rail: The effectiveness of proposed mitigation measures would be the same as described under Alternative C.

California freshwater shrimp: The effectiveness of proposed mitigation measures would be the same as described under Alternative C.

Northwestern pond turtle: The effectiveness of proposed mitigation measures would be the same as described under Alternative C.

Saltmarsh common yellowthroat: The effectiveness of proposed mitigation measures would be the same as described under Alternative C.

Cumulative Impacts: Cumulative impacts would be the same as described under Alternative C.

Impairment Analysis: This alternative would not impair a resource identified in the Organic Act or as a goal in Park Service management policies or considered as necessary to fulfillment of purposes identified in enabling legislation or key to the natural or cultural integrity of the park.

Conclusions: The effects of Alternative D on wildlife habitat and use in the Project Area and support of wildlife species in the watershed would generally range from major adverse to major beneficial and are almost identical to Alternative C. As with Alternative C, the East and West Pastures of the Giacomini Ranch and Olema Marsh would be restored. However, public access would be scaled back with conversion of the through-trail component on the southern perimeter to an enhanced spur trail with no bridge and no possible for future extension of the trail to Inverness Park. The eastern perimeter trail would include only one spur trail – the extension of the Tomales Bay Trail. Some of the other major changes under Alternative D that

would affect wildlife would be the complete realignment of Tomasini Creek into one of its historic alignments; excavation of higher elevation intertidal and grassland areas to lower intertidal elevations; and replacement of the Tomasini Creek Mesa Road culvert.

Over the long-term, Alternative D would be expected to have major beneficial effects on High Value Wildlife Habitats in the Project Area, although there may be some minor adverse impacts during construction in the Project Area. Under this alternative as with Alternative C, the dramatic rate of gain in High Value Wildlife Habitats between each of the alternatives would slow considerably. As with the other alternatives, the largest change under this alternative relative to existing conditions would come from the substantial conversion of grassland or pasture to salt and brackish marsh. Under Alternative D, the degree of conversion is increased through excavation of at least 9 acres of grassland to intertidal elevations. Through these actions, almost 75 percent of the Giacomini Ranch would be expected to shift from grassland to tidal or brackish marsh

Most of the gain in High Value Wildlife Habitat under Alternative D would come from increased restoration of the East Pasture. The major increase in High Value Wildlife Habitats relative to existing conditions would have a moderate beneficial effect over the long-term on use of the Project Area by wildlife, with use by common and special status wildlife species increasing appreciably relative to existing conditions. In general, the trends in wildlife use predicted under Alternative C would continue under Alternative D for the Giacomini Ranch West Pasture and Olema Marsh. Some of the largest changes in wildlife use under this alternative relative to Alternative C would be expected to come from increased use of expanded marsh and riparian habitats in the East Pasture and Tomasini Creek. Construction of Alternative D would generally have minor to moderate adverse effects on High Value Wildlife Habitats and use by common wildlife species.

Creation of additional intertidal salt and brackish marsh in the East Pasture through excavation would increase habitat for waterbirds such as California black rail and California clapper rail, as well as marsh-associated passerines (e.g., marsh wren) and colonial waterbirds (e.g., herons and egrets). Complete realignment of Tomasini Creek would increase the extent of backwater slough habitat retained in the old Tomasini Creek channel, but would not necessarily change the amount of High Value Wildlife Habitats or abundance and diversity of wildlife species expected to use the creek relative to Alternative C. To ensure that realignment does not inadvertently drain the created Tomasini Triangle freshwater marsh, the creek would be shallowly bermed on either side through the marsh to retain ponded conditions. Replacement of the Tomasini Creek Mesa Road culvert would improve hydraulic connectivity between upstream and downstream reaches of the creek and potentially have a negligible to minor indirect effect on riparian habitat upstream of Mesa Road.

Alternative D would have very similar minor adverse effect on the number of non-native invasive wildlife species that would be present as a result of changes in conditions as Alternatives A and B, with increases in numbers and extent of aquatic invasives expected in Olema Marsh.
Tidal reconnection of the Giacomini Ranch and Olema Marsh to Lagunitas Creek would have moderate beneficial effect in terms of support of wildlife species in southern portion of the Tomales Bay watershed. For the San Francisco Bay region in general, the proposed project, in combination with other proposed and ongoing restoration projects, would be expected to generally have a cumulatively negligible beneficial effect on regional populations of California black rails, California clapper rails, waterfowl, and shorebirds.

California red-legged frog: Alternative D would have almost identical effects to Alternative C on California red-legged frog despite the complete realignment of Tomasini Creek. Rerouting of Tomasini Creek through the Tomasini Triangle would only reduce the size of the Tomasini Triangle freshwater marsh by 0.2 acres, and the marsh would be prevented from draining into the creek through construction of berms on either side of the creek that would be revegetated with riparian vegetation. Impacts during construction would be characterized as minor adverse, because excavation would be performed in Olema Marsh.

Tidewater goby: Alternative D would have almost identical effects to Alternative C on tidewater goby despite complete realignment of Tomasini Creek. While this alternative would have minor to moderate adverse effects on tidewater goby habitat in the Project Area over the short-term, it would have major beneficial effects over the long-term through an increase in extent of potential habitat and an improvement in quality for most of the existing habitats. Impacts during construction would be expected to be moderate, with implementation of mitigation measures designed to reduce the potential or amount of incidental take.

Central California coast steelhead, coastal California Evolutionarily Significant Unit (ESU) Chinook salmon, and central California coast coho ESU salmon: Similar to Alternative C, the effects of Alternative D on salmonid rearing and passage habitat in the Project Area would be beneficial and would generally range from moderate

to major. Potential minor adverse impacts to salmonid habitat or salmonids would be expected to occur during construction of the wetland restoration component.

California black rail and California clapper rail: Alternative C would have very similar major beneficial effects to Alternative B in terms of increasing habitat for California black rail and California clapper rail, with the proposed project restoring more than 350 acres of low-, mid- and high Tidal Salt Marsh. During the transitional period following construction, only negligible to minor beneficial effects would be expected. Impacts during construction would be moderate adverse, because of construction actions on and near the north levee in the West Pasture and in Olema Marsh. The primary change to California black rail and California clapper rail under Alternative D would come from the slight increase in habitat relative to Alternative C from excavation of higher elevation intertidal and grassland areas to lower intertidal elevations. This increase and shift in intertidal habitats would be expected to have beneficial effects on rails.

Other Special Status Species: The effects of Alternative D on other special status species would be identical to Alternative C and generally range from minor beneficial effects to moderate adverse effects depending on the species.

Cultural Resources

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

Since the early 1900s, a number of laws and policies have been enacted to protect cultural resources, including the Antiquities Act of 1906 (16 USC §432), the Archeological Resources Protection Act of 1979 (16 USC §470aa et seq.), and the National Historic Preservation Act of 1966, as amended (NHPA; 16 USC §470 et seq.). In addition to federal and state laws governing protection of cultural resources, Executive Order 11593 instructs all federal agencies to support the preservation of cultural properties. The Park Service incorporated direction from law and federal policy into development of the Cultural Resources Management Guidelines (NPS 1998), which recognizes five types of cultural resources: archeological resources, historic structures, ethnographic resources, cultural landscapes, and museum objects.

The California Office of Historic Preservation is responsible for oversight of the NHPA in California. The Office of Historic Preservation also is responsible for oversight of California Pubic Resources Codes Section 21083.2-21084.1, which state and local agencies to evaluate impacts of proposed projects to archaeological and historic structure resources. Federal and federally-sponsored programs and projects are reviewed pursuant to Sections 106 and 110 of the NHPA. Section 106 of the NHPA requires federal agencies to consider the effects of proposed federal undertakings on historic properties. NHPA requires federal agencies to initiate consultation with the State Historic Preservation Officer (SHPO) as part of the Section 106 review process. The State Office of Historic Preservation maintains the California Register of Historic Places. The California Register includes resources listed in or formally determined eligible for listing in the National Register of Historic Places, as well as some California State Landmarks and Points of Historical Interest. Properties of local significance that have been designated under a local preservation ordinance (local landmarks or landmark districts) or that have been identified in a local historical resources inventory may be eligible for listing in the California Register and are presumed to be significant resources for purposes of CEQA unless a preponderance of evidence indicates otherwise (PRC Section 5024.1, 14 CCR § 4850). The California Register is an authoritative guide to the state's historical resources and to which properties are considered significant for purposes of CEQA.

DOI has included the presence of historic or cultural resources and/or on properties listed or eligible for listing on the National Register of Historic Places and potential for impacts to them in its criteria for determining potential significance under NEPA for the purposes of determining whether an EIS should be prepared. Under CEQA, significant effects on cultural resources would be considered to occur if the proposed project causes a substantial adverse change in the significance of a historical or archaeological resource; directly or indirectly destroys a unique paleontological resource or site; or disturb any human remains, including those interred outside of formal cemeteries. Mandatory findings of significance under CEQA are triggered by elimination of important examples of the major period of California history and prehistory. CEQA guidelines for Marin and the Community Plan also examine the potential for the proposed project to cause a physical change that would adversely affect unique ethnic cultural values or religious or sacred sites within the Project Area.

General Assumptions and Methodologies:

- Cultural resource and historic structure surveys conducted as part of baseline studies found no potentially significant archaeological resources or historic structures, although some cultural landscape features were identified.
- The proposed project has the potential to affect cultural landscape features and other possible culture resources that have not yet been discovered through removal of agricultural and hydrologic management infrastructure and restoration of natural tidal and freshwater hydrologic processes. Because no other non-landscape cultural resources have been discovered in surveys conducted to date, this analysis is restricted to cultural landscapes only.
- While construction could have the potential to uncover previously undiscovered paleontological, archaeological, or historic resources, for the purposes of this evaluation, only the potential for impacts to known resources are assessed.
    - Evaluation takes into consideration compliance with standard BMPs that would require cultural resources specialist or tribal representative to be on-call during construction and, should resources be found, halting of construction until proper action can be taken.
- Intensity of impacts is evaluated with respect to their effects within the context of a cultural landscape. The proposed actions are evaluated at the cultural landscape scale (Table 71).

TABLE 71. CULTURAL RESOURCES -- CULTURAL LANDSCAPES

Source: Antiquities Act, ARPA, NHPA, SHPO, Park Service Management Policies, CCC/LCP Zone II, Marin CWP, Community Plan Nature: Beneficial, Adverse Context: Project Area Duration: Construction, Short-Term/Long-Term	
No Impact	There would be no potential for impact to cultural landscape features or other cultural resources associated with the proposed project.
Negligible	The proposed project would have **barely detectable effects** (i.e., no effect on integrity, and value and significance not compromised) on recorded features that are part of, but not integral to, the park's 12 cultural landscapes or that are listed in, nominated for, or proposed for nomination to the National or California Register of Historic Places; *OR* would have a **measurable effect** (i.e., some effect on integrity, but value and significance not compromised) on recorded features, but features are NOT part of the Seashore's 12 cultural landscapes and are not being listed, nominated for, or proposed for nomination to the National or California Register of Historic Places.
Minor	The proposed project would have **barely detectable effects** (i.e., no effect on integrity, value, or significance) on recorded features that are integral to the park's 12 cultural landscapes or that are listed, nominated for, or proposed for nomination to the National or California Register of Historic Places; *OR* would have **measurable effects** (i.e., some effect on integrity, but value and significance not compromised) on recorded features that are part of, but not integral to, the Seashore's 12 cultural landscapes or that are listed, nominated for, or proposed for nomination to the National or California Register of Historic Places; *OR* would have **appreciable or striking effects** (i.e., moderate to major effects on integrity that affect value and significance) on recorded features, but features are NOT part of the Seashore's 12 cultural landscapes and are not listed, nominated for, or proposed for nomination to the National or California Register of Historic Places.
Moderate	The proposed project would have **measurable effects** (i.e., some effect on integrity, but value and significance not compromised) on recorded features that are integral to the park's 12 cultural landscapes or that are listed, nominated for, or proposed for nomination to the National or California Register of Historic Places; *OR* would have **appreciable effects** (i.e., moderate effects on integrity that affect value and significance) on recorded features that are part of, but not integral to, the Seashore's 12 cultural landscapes or that are listed, nominated for, or proposed for nomination to the National or California Register of Historic Places.

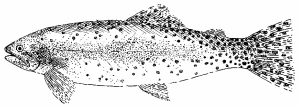


TABLE 71. CULTURAL RESOURCES -- CULTURAL LANDSCAPES

Major or Substantial	The proposed project would have **appreciable effects** (i.e., moderate effects on integrity that affect value and significance) on recorded features that are **integral to** the park's 12 cultural landscapes or that are listed, nominated for, or proposed for nomination to the National or California Register of Historic Places; *OR* would have **substantial or major effects** (i.e., major effects on integrity that have appreciable effects on value and significance) on recorded features that are **part of, but not integral to**, the Seashore's 12 cultural landscapes or that are listed, nominated for, or proposed for nomination to the National or California Register of Historic Places.

Impact Analysis

TABLE 72. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR CULTURAL RESOURCES
All impacts would be considered Project Area and are considered Short-Term/Long-Term, unless otherwise specified.

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Cultural Resources – Cultural Landscapes	No Impact	Adverse - Minor	Adverse - Minor	Adverse - Minor	Adverse - Minor

No Action Alternative

Analysis: The No Action Alternative would have no impact on known cultural resource landscape features identified in the Project Area (Table 72). Under the No Action Alternative, levees, tidegates, and culverts in the Giacomini Ranch are not breached or removed, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. The Park Service is required under its existing agreement with CalTrans to restore wetlands as mitigation for impacts caused by CalTrans to aquatic habitat from a road repair on State Route 1 in Marin County in exchange for the Park Service receiving monies to purchase and restore the Giacomini Ranch. The remainder of the levee would not be deconstructed, although there would be no levee maintenance. Olema Marsh is also not restored, and there would be no new public access facilities.

Surveys of the Giacomini Ranch in 2002 identified two previously unrecorded cultural landscape features: a portion of the North Pacific Coast Railroad grade (ASC-69/01-01) and a historic-period levee system and dam (ASC-69/01-02; Newland 2003). The dam was a temporary gravel dam that the Giacominis installed each summer to provide freshwater for irrigation purposes. The Giacominis stopped summer dam installation in 1998 prior to selling the property to the Park Service. While the original levee system was constructed more than 50 years ago, the degree of alteration to this system due to repairs and reinforcement (e.g., rip-rap) reduces its value as a historic resource (Mark Rudo, Park Service, *pers. comm*.). The study determined that neither resource was eligible for listing on the National Register of Historic Places (Newland 2003). In 2004, four additional landscape features were recorded by Garcia and Associates (2004): two manure lagoons and two corrals in the main complex. The corrals are not on Park Service property. None of these features was considered eligible for National Register of Historic Places listing (Garcia and Associates 2004).

Under the No Action Alternative, none of these landscape features would be impacted. This alternative would have no impact on historic properties. It is considered unlikely that the negligible amount of construction that would occur as part of the mitigation/restoration component would unearth other potentially significant archaeological or historic features, although the likelihood is considered extremely low. Construction BMPs would be instituted to ensure that any finds that occur during construction are handled properly.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: There would be no potential for cumulative effects with other projects, because the No Action Alternative would have no impact.

Impairment Analysis: The No Action Alternative would not result in impairment to park cultural resources.

Conclusions: The No Action alternative would have no impact on known cultural resources or cultural landscape features or historic properties, as there would be no large-scale restoration, demolition of agricultural infrastructure, or construction of public access facilities.

Alternative A

Analysis: Alternative A would have a minor adverse effect on cultural resource landscape features identified in the Project Area (Table 72). Under Alternative A, only the East Pasture would be restored, with new public access facilities limited to the eastern and southern perimeters of the East Pasture. There would be no restoration or construction of new public access facilities in the West Pasture or Olema Marsh. The levees along and tidegate/culvert in the West Pasture and Tomasini Creek would be retained. In the East Pasture, restoration would involve breaching of levees in the East Pasture along Lagunitas Creek, and excavation of new tidal channels. The southwestern corner of the creek bank would be regraded to a more stabile profile. Most of the actions under this alternative focus on removal or restoration of dairy infrastructure such as barn removal, filling of ditches, ripping of compacted roads, fence removal, and removal of pumps, pipelines, and concrete spillways.

As discussed under the No Action Alternative, surveys of the Giacomini Ranch in 2002 identified two previously unrecorded cultural landscape features: a portion of the North Pacific Coast Railroad grade (ASC-69/01-01) and a historic-period levee system and dam (ASC-69/01-02; Newland 2003). The dam is no longer in existence, although the pump housing remains. While the original levee system was constructed more than 50 years ago, the degree of alteration to this system due to repairs and reinforcement (e.g., rip-rap) reduces its value as a historic resource (Mark Rudo, Park Service, *pers. comm.*). The study determined that neither resource was eligible for listing on the National Register of Historic Places (Newland 2003). In 2004, four additional landscape features were recorded by Garcia and Associates (2004): two manure lagoons and two corrals in the main complex. The corrals are not on Park Service property. None of these features was considered eligible for National Register of Historic Places listing (Garcia and Associates 2004). None of the buildings on the property were considered to have cultural significance. Therefore, this alternative would have no impact on historic properties.

Under Alternative A, the two manure lagoons would be filled and regraded to blend with surrounding topography. This area would serve as a Viewing Area, with interpretative exhibits and other simple visitor facilities. An eastern perimeter trail would be constructed on the historic railroad bed using a combination of minor grading and placement of fill and culverts on a 3,200- linear-foot section that has problems with drainage from adjacent hillside and toeslope seeps. These actions would have striking effects on the integrity, significance, and value of these recorded features, but as the features are not part of or integral to the park's 12 cultural landscapes or considered eligible for listing to the National or California Register of Historic Places, these effects are considered adverse, but minor. There is a possibility that some of the earthwork that occurs in the East Pasture during construction would unearth other potentially significant archaeological or historic features, but the likelihood is considered relatively low. Construction BMPs would be instituted to ensure that any finds that occur during construction are handled properly.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: There is potentially one project that would have cumulative effects should Alternative A be implemented. The Giacomini Trust owns parcels along C Street on the eastern side of the dairy facility. These parcels are zoned Commercial-Residential (CRAB-2), with a minimum 10,000 square-foot-lot. It is unlikely that possible future development along C Street would have more than a cumulatively minor impact on cultural resources under Alternative A.

Impairment Analysis: Alternative A would not result in impairment to park cultural resources.

Conclusions: Alternative A would have minor adverse impacts on known, recorded landscape features through filling and regrading of manure lagoons and construction of a culverted berm trail on the historic railroad bed. However, this alternative would have no impact on historic properties.

Alternative B

Analysis: Alternative B would have very similar minor adverse effects on recorded cultural resource landscape features identified in the Project Area as Alternative A (Table 72), although, under this alternative, the culverted berm trail on the historic railroad bed would be replaced with a low-elevation boardwalk trail that would have slightly less impact on this cultural landscape feature (Table 72). Under Alternative B, the East and West Pastures would be restored, but not Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, although a viewing area would replace the informal existing trail on the West Pasture north levee, which would be removed. Restoration would involve complete removal of levees in the East Pasture along Lagunitas Creek and excavation of even more new tidal channels. Breaches would be created in the West Pasture levee. The whole southern East Pasture creek bank would be restored through removal of rip-rap bank stabilization and regraded, where needed, to a more stabile profile. As with Alternative A, this alternative would involve removal or restoration of dairy infrastructure and discontinuation of agricultural management practices.

With this and other alternatives, there is a possibility that some of the earthwork that occurs in the East and West Pastures during construction would unearth other potentially significant archaeological or historic features, but the likelihood is considered relatively low. Construction BMPs would be instituted to ensure that any finds that occur during construction are handled properly.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as discussed under Alternative A.

Impairment Analysis: Alternative B would not result in impairment to park cultural resources.

Conclusions: Alternative B would have very similar minor adverse effects on recorded cultural resource landscape features identified in the Project Area as Alternative A, although, under this alternative, the culverted berm trail on the historic railroad bed would be replaced with a low-elevation boardwalk trail that would have slightly less impact on this cultural landscape feature. This alternative would have no impact on historic properties.

Alternative C

Analysis: Alternative C would have very similar minor adverse effects on recorded cultural resource landscape features identified in the Project Area as Alternative B (Table 72). However, under this alternative, there would be no through trail on the historic railroad bed, but rather two spur trails that would only require minor clearing and grading and negligible amounts of fill, if any. Under Alternative C, the East and West Pastures would be restored, along with Olema Marsh. Restoration would involve complete removal of levees in the East and West Pastures along Lagunitas Creek and excavation of even more new tidal channels. Tomasini Creek would be realigned into one of its historic alignments midway through the East Pasture. In Olema Marsh, an adaptive restoration approach would be undertaken, with initial excavation of a shallow berm and the Bear Valley Creek channel to improve hydraulic connectivity and improve drainage of currently impounded waters. As with the other alternatives, this alternative would involve removal or restoration of dairy infrastructure and discontinuation of agricultural management practices.

No archaeological or historic structures have been identified in or near Olema Marsh, although there is one recorded archaeological site, CA-MRN-378, to the west of Bear Valley Creek upstream of Bear Valley Road (Rudo 2006). This alternative would be unlikely to impact this recorded feature, either directly or indirectly. As with the other alternatives, there is a possibility that some of the earthwork that occurs in the East and

West Pastures and Olema Marsh during construction would unearth other potentially significant archaeological or historic features, but the likelihood is considered relatively low. Construction BMPs would be instituted to ensure that any finds that occur during construction are handled properly.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as discussed under Alternative A.

Impairment Analysis: Alternative C would not result in impairment to park cultural resources.

Conclusions: Alternative C would have very similar minor adverse effects on recorded cultural resource landscape features identified in the Project Area as Alternative B, although, under this alternative, a through trail would not be constructed on the historic railroad bed. The two spur trails proposed would involve only minor clearing and grading and possibly negligible fill. This alternative would have no impact on historic properties.

Alternative D

Analysis: Alternative D would have very similar minor adverse effects on recorded cultural resource landscape features identified in the Project Area as Alternative C (Table 72). However, under this alternative, there would be only one spur trail on the historic railroad bed that would only require minor clearing and grading. Under Alternative D as with Alternative C, the East and West Pastures would be completely restored, along with Olema Marsh. Almost all of the differences between Alternative D and C relate to excavation of a limited portion of the East Pasture to intertidal elevations, complete realignment of Tomasini Creek into one of its historic alignments, replacement of the Tomasini Creek Mesa Road culvert with a bridge or arch culvert, and further scaling back of new public access facilities through elimination of the bridge across Lagunitas Creek and one of the spur trails on the eastern perimeter. As with the other alternatives, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

As discussed under Alternative C, no archaeological or historic structures have been identified in or near Olema Marsh, although there is one recorded archaeological site, CA-MRN-378, to the west of Bear Valley Creek upstream of Bear Valley Road (Rudo 2006). This alternative would be unlikely to impact this recorded feature, either directly or indirectly. As with the other alternatives, there is a possibility that some of the earthwork that occurs in the East and West Pastures and Olema Marsh during construction would unearth other potentially significant archaeological or historic features, but the likelihood is considered relatively low. Construction BMPs would be instituted to ensure that any finds that occur during construction are handled properly.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as discussed under Alternative A.

Impairment Analysis: Alternative D would not result in impairment to park cultural resources.

Conclusions: Alternative D would have very similar minor adverse effects on recorded cultural resource landscape features identified in the Project Area as Alternative C, although, under this alternative, only one spur trail would be constructed on the historic railroad bed through minor clearing and grading. This alternative would have no impact on historic properties.

Public Health and Safety – Flooding

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

Federal and local regulations have been promulgated to reduce both the exposure of communities and parks to damaging flooding and the funds required to rebuild communities and parks following such major floods (Clearwater Hydrology and Nichols-Berman 2002). The National Flood Insurance Act of 1968 and the Flood Disaster Prevention Act of 1973 established the National Flood Insurance Program (NFIP) which is administered by the Federal Emergency Management Agency (FEMA; Clearwater Hydrology and Nichols Berman 2002). The NFIP provides insurance coverage to property owners within flood hazard areas that are delineated on published Flood Insurance Rate Maps (FIRMs) for both the 100-year and 500-year flood events (Clearwater Hydrology and Nichols-Berman 2002). In order to quality for the program, candidate municipalities and unincorporated county areas must adopt local floodplain development policies and enforce flood control measures for new construction and redevelopment projects within their jurisdictions (Clearwater Hydrology and Nichols-Berman 2002).

The Park Service specifically addresses flooding in its 2006 Management Policies, which are consistent with Executive Order 11988 and Directors Order 77-2. Parks are directed to "minimize potentially hazardous conditions associated with flooding" (NPS 2001; Section 4.6.4). Furthermore, parks should "avoid direct and indirect support of floodplain development and actions that could … increase flood risk" (NPS 2006, Section 4.6.4). When development must occur within a floodplain, non-structural measures should be used to reduce hazards to human life and property, while minimizing impacts to the natural resources of floodplains (NPS 2006; Section 4.6.4). Development must also be consistent with the standards and criteria of the NFIP (NPS 2006; Section 4.6.4). County policies and policies of LCP Zone II requires that new development not create a flood hazard, and the Coastal Resources Management Plant stipulates that projects should "minimize risks to life and property in areas of high geologic, flood, and fire hazard" (Section 30253).

The emphasis on public health and safety is reiterated under significance criteria developed by the DOI for NEPA and by the state for CEQA. Under NEPA, potentially significant impacts on public health and safety trigger the need to prepare an EIS. CEQA characterizes projects that place structures that would impede or redirect flood flows in 100-year flood hazard areas or that would expose people or structures to a significant risk of loss, injury or death involving flooding as having significant impacts. County CEQA guidelines focus on exposure of people or property to water-related hazards such as flooding without requiring that exposure creates a significant risk of loss, injury, or death.

General Assumptions and Methodologies

- Based on the Marin CWP, the Project Area falls within the 100-year flood hazard zone (Clearwater Hydrology and Nichols-Berman 2002).
- Hydrologic modeling shows that the existing levees control and constrain water level and process in association with 2-12 year flooding events. During larger scale events, the levees are predicted to overtop in many areas, and would play a very small role in controlling flooding conditions and water levels.
- The proposed project has the potential to affect flood risk to adjacent homes, properties, and roads through removal/replacement of agriculture and hydrologic management infrastructure and restoration of tidal and freshwater hydrologic processes. Specific actions that have the potential to affect flooding include removal or breaching of levees, excavation, construction of berms and bridges, and changes in sediment transport processes within the Project Area that affect net aggradation or erosion of the creek channel bottoms.
- In keeping with Park Service Management Policies, the project proponents identified flood risk and not elevating flood risk above currently existing levels as one of the project's primary constraints.

Public Health and Safety – Flooding: For this document, the intensity of impacts related to flood hazards associated with the proposed project will be analyzed by assessing increases in flood risk to homes, properties, and roads. As NEPA, CEQA, and local ordinances focus on increases in risks to public safety, analysis will target actions that increase flooding of homes, garages, driveways, and public roads such that flooding of these areas could **increase** the risk of injury or **increase** the risk that homeowners could not leave to access emergency services or that emergency services such as ambulances or paramedics could not

access the property or properties. Because adjacent properties and roads already flood frequently, impact thresholds will be based on **changes** in flooding that could pose risks to public safety, not just the presence or absence of flooding. Changes in flooding will be evaluated using changes in vertical flood height (feet).

Impact thresholds are based on potential increases in vertical flood elevation that could pose negligible to major or substantial risks to public health and safety (Table 73). Changes in vertical flood elevation will be assessed using results of computer hydraulic modeling (KHE 2006a) and topographic information (USGS 2003b). Changes in vertical flood elevation and risk to public health and safety will be assessed using the threshold criteria outlined below for three general areas (Figure 41):

1) East Levee Road and properties and homes along Levee Road;
2) West Levee Road adjacent to White House Pool County Park and Olema Marsh, and
3) Sir Francis Drake Boulevard in Inverness Park and properties and homes on the east side of the road contiguous with the Giacomini Ranch West Pasture.

Based on information provided by County public works, roads are assumed for analysis purposes to be closed to the public when there is ≥ 1 foot of water. Changes in vertical flood elevations would differ depending on the severity of the flood event, which were analyzed through hydraulic modeling for the 2- to 100-year flood events. When differences exist in changes in vertical flood elevations, either the largest beneficial change or the largest adverse change is used to rate the intensity of effects, however, some alternatives could involve both adverse and beneficial effects. These are discussed under each of the alternatives.

TABLE 73. PUBLIC HEALTH AND SAFETY - FLOODING

Source: Flood Disaster Prevention Act, Park Service Management Policies, Marin CWP, CCC/LCP Zone II Nature: Beneficial, Adverse Context: Local Community Duration: Long-Term	
No Impact	There would be no potential for impact to flooding of adjacent properties, homes, and public roads associated with the proposed project.
Negligible	There would be a negligible change in vertical flood elevations for adjacent homes, garages, driveways, and public roads (<0.25 vertical feet) associated with the proposed project; *OR* If adverse and increases in flooding exceed 0.25 vertical feet, the increase would NOT impact any private properties or properties owned by other agencies, homes, garage, driveways, or public roads or increase flooding to levels that would increase risk to public health and safety by decreasing ability of homeowners to access emergency services or decrease of emergency services to properties and public roads.
Minor	There would be a minor change in vertical flood elevations for adjacent properties, homes, garages, driveways, and public roads (>0.25 and ≤ 0.5 vertical feet) associated with the proposed project; *OR* If increases in flooding exceed 0.5 vertical feet, the increase would cause only minor flooding of undeveloped portions of private properties or properties owned by other agencies. It would NOT increase flooding to levels that would increase risk to public health and safety by decreasing ability of homeowners to access emergency services or decrease of emergency services to properties and public roads.
Moderate	There would be a moderate change in vertical flood elevations for adjacent properties, homes, garages, driveways, and public roads (>0.5 and ≤ 1.0 vertical feet) associated with the proposed project; *OR* If adverse and increases in flooding exceed 1.0 vertical foot, the increase might cause moderate flooding of undeveloped portions of private properties or properties owned by other agencies, but it would NOT increase flooding to levels that would increase risk to public health and safety by decreasing ability of homeowners to access emergency services or decrease of emergency services to properties and public roads.
Major or Substantial	There would be a substantial or major change in vertical flood elevations for adjacent homes, garages, driveways, and public roads (>1.0 vertical feet) associated with the proposed project. If adverse, the increase would potentially increase risk to public health and safety by substantially increasing flooding of homes, driveways, and public roads to levels that would decrease ability of homeowners to access emergency services or decrease of emergency services to properties and public roads.

Figure 41. Flood Assessment Areas

Impact Analysis

TABLE 74. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR PUBLIC HEALTH AND SAFETY - FLOODING
All impacts would be considered Local Community and are considered Short-Term/Long-Term, unless otherwise specified.

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Public Health and Safety – Flooding Levee Road - East	No Impact	Beneficial - Minor	Beneficial - Minor	Beneficial - Minor	Beneficial - Minor
Public Health and Safety – Flooding Levee Road - West	No Impact	Beneficial - Moderate	Beneficial – Moderate/ Major	Beneficial – Moderate/ Major	Beneficial – Moderate/ Major
Public Health and Safety – Flooding Sir Francis Drake Blvd- Inverness Park	No Impact	No Impact	Adverse - Minor	Adverse - Moderate	Adverse - Moderate

No Action Alternative

Analysis: The No Action Alternative would have no impact on risks to public health and safety associated with flooding in the Project Area and local community (Table 74). Under the No Action Alternative, levees, tidegates, and culverts in the Giacomini Ranch are not breached or removed, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. The remainder of the levee would not be deconstructed, although there would be no levee maintenance. Olema Marsh is also not restored, and there would be no new public access facilities.

Under existing conditions, the Project Area and homes and county roads adjacent to the Project Area flood frequently. The Project Area and vicinity occurs in a low-lying alluvial valley at the confluence of at least five medium to large creeks, including Lagunitas Creek, Olema Creek, Bear Valley Creek, Fish Hatchery Creek, and Tomasini Creek. There are a number of smaller creeks that also cause flooding of roads and adjacent properties and homes.

Sir Francis Drake Blvd- Inverness Park: The closest homes to the Project Area are four homes along Sir Francis Drake Boulevard that are contiguous with the Giacomini Ranch West Pasture. While the West Pasture levees keep Lagunitas Creek waters far to their east, each of these properties is subject to flooding from the smaller Inverness drainages flowing adjacent to their property. Site surveys indicate that the elevation of these structures is 4- to 7 feet higher than the elevation of the West Pasture levee (10-12 feet). Hydrologic modeling suggests that the West Pasture levees overtop during flood events with 12-year recurrence interval (e.g. that occur, on average, every 12 years). For these homes, the West Pasture levees provide little in the way of protection for these homes from Lagunitas Creek flooding under flood events greater than the 12 year event. Hydrologic investigations and modeling conducted as part of baseline studies point to the primary flood risk currently for these properties and portions of Sir Francis Drake Boulevard in Inverness Park being the drainages that flow off the Inverness Ridge. These tributaries are culverted underneath Sir Francis Drake Boulevard and run either through or directly adjacent to at least three of these four properties and often deposit large amount of sediment that increase flood water stage or vertical flood elevation and cause back-up of floodwaters onto their properties (KHE 2006a).

Levee Road /Olema Marsh: Properties on Levee Road, directly south of the Giacomini Ranch East Pasture, are frequently flooded by Lagunitas Creek. A number of these homes have been elevated since the 1982 flood to decrease flood frequency. Hydrologic investigations and modeling conducted as part of baseline studies suggest that the height of the Giacomini Ranch East Pasture levees east of the Old Summer Dam locations is higher than the opposite creek bank where the Levee Road homes are located (KHE 2006a). This disparity between levee and creek bank height directs flood flows toward the homes (KHE 2006a). On average, flood flows overtop the southern bank of Lagunitas Creek during 3-year flood events (KHE 2006a). Local roads are typically posted with caution signs when there is approximately 4-6 inches of water on the road, and they are

typically closed when there is somewhere between 1- to 2 feet of water, although emergency vehicles would be able to continue to use roads unless there is more than 2 feet of water (P. Maendle, Senior Road Maintenance Supervisor, County Public Works, *pers. comm*.).

Under the No Action Alternative, there would be no short term changes to levees in portions of the Project Area that would affect flooding. Over time, it is possible that levees would degrade and start to increase flood relief for homes along Levee Road, particularly as there would be no levee maintenance under the No Action Alternative. Some of the levees breached during the December 2005 storm event, and, according to some Levee Road residents, this breaching was accompanied by a large drop in flood stage or floodwater elevations. These levees are currently in the process of being repaired by the Giacomini family.

Flood risks are sometimes elevated when creek or streambeds aggrade or increase in elevation due to excessive sediment deposition or discontinunities in sediment transport. Based on field investigations and results of hydraulic modeling, streambed elevations in the portion of Lagunitas Creek within the Project Area appear to be relatively stable and not actively decreasing or increasing (KHE 2006a). Under the No Action Alternative, stream power and transport capacity in Lagunitas Creek would remain to baseline conditions, with transport of at least silts and fine sands occurring throughout the Project Area, except in between White House Pool and the cattle crossing (KHE 2006a). These results suggest that sediment transport processes in Lagunitas Creek under the No Action Alternative should not affect channel and streambed morphology or change the potential for flooding.

Within the Levee Road section, some of the worst flooding has occurred with the combination of high tides (>6.0 feet MLLW) and watershed flooding. This occurred in 1982 and during the New Year's Eve storm in 2005. Table 20 in Chapter 3 under Public Health and Safety shows the frequency of flooding relative to the vertical flood elevations predicted by computer hydraulic modeling (2006a) and topographic surveys (USGS 2003b).

In Olema Marsh, surface water levels have increased nearly 6 feet since the early 1990s. These elevated static water levels would continue to threaten Levee and Bear Valley Roads, which are already frequently flooded during even smaller flood events. These roads serve as important connecting roadways for residents of Inverness Park, Inverness, and other areas on the Point Reyes Peninsula and are the only connection to the "mainland" portion of Marin County.

While levee degradation is not predictable, this analysis assumes that breaches in the levees could occur within 5 years depending on climatic conditions and other factors. Therefore, the No Action Alternative is considered to have no effect on flooding in the short term. Over the long-term, flooding could increase under the No Action Alternative, because of the projected increases in sea level due to sea level rise. Recently published studies suggest that sea level rise rates may be much greater than originally predicted, with water levels rising as much as 3 feet by 2100 (Overpeck et al. 2006).

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

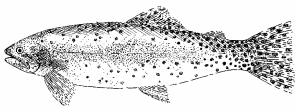
Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: There would be no potential for cumulative effects with other projects, because the No Action Alternative would have no impact.

Conclusions: The No Action alternative would have no impact on public health risks associated with flooding on Sir Francis Drake and Levee Road. The effects of levee degradation may be counter acted by sea level rise. Overall, long-term effects of the no action alternative would not impact existing public health risks associated with flooding on Sir Francis Drake and Levee Road.

Alternative A

Analysis: Alternative A would have beneficial minor to major effects by reducing risks to public health and safety associated with flooding in the Project Area and local community (Table 74). Under Alternative A, only the East Pasture would be restored, with new public access facilities limited to the eastern and southern



perimeters of the East Pasture and western margin of the West Pasture (programmatic evaluation of a trail access to Inverness Park). The southern perimeter trail would include construction of a single span bridge across Lagunitas Creek, near the old summer dam location. There would be no restoration or construction of new public access facilities in the West Pasture or Olema Marsh. The levees along and tidegate/culvert in the West Pasture and Tomasini Creek would be retained. In the East Pasture, restoration would involve breaching of levees in the East Pasture along Lagunitas Creek, and excavation of new tidal channels. The southwestern corner of the creek bank would be regraded to a more stabile profile. Most of the actions under this alternative focus on removal or restoration of agricultural infrastructure such as filling of ditches, ripping of compacted roads, fence removal, and removal of pumps, pipelines, and concrete spillways.

Sir Francis Drake Blvd- Inverness Park: In the West Pasture, the potential effects with respect to flooding of the four homes along Sir Francis Drake Boulevard would be the same as those described under the No Action Alternative. No change in vertical flood elevations would occur under the 2- to 10-year flood events.

As discussed under the No Action Alternative, hydrologic investigations and modeling conducted as part of baseline studies point to the primary flood risk currently for these properties and portions of Sir Francis Drake Boulevard in Inverness Park being the drainages that flow off the Inverness Ridge. These tributaries are culverted underneath Sir Francis Drake Boulevard and run either through or directly adjacent to at least three of these four homes and often deposit large amount of sediment that increase flood water stage or vertical flood elevation and cause back-up of floodwaters onto their properties (KHE 2006a).

Under Alternative A. public access facilities in the Sir Francis Drake/Inverness Park area include programmatic analysis of the trail between White House Pool and Inverness Park. There would be no overlooks in this area. The trail route to Inverness Park would be subject to flooding, but would be constructed in a manner that could withstand most flood flows.

Levee Road /Olema Marsh: As discussed under the No Action Alternative, properties on Levee Road, directly south of the Giacomini Ranch East Pasture, are frequently flooded by Lagunitas Creek. A number of these homes have been elevated since the 1982 flood to decrease flood frequency. As noted above, hydrologic investigations and modeling conducted as part of baseline studies show that the levees in the East Pasture maintain a disparate water level which acts to direct flows toward the homes.

Under Alternative A, the frequency of overbank flooding of the southern bank of Lagunitas Creek would be reduced. Because the greatest potential for flooding occurs when high creek discharge from storm events is combined with an extreme high tide (>6.0 feet MLLW), all hydraulic modeling of changes in vertical flood elevation assume an extreme high tide, as well as creek flooding (KHE 2006a).

For the eastern portion of Levee Road, modeling indicates that vertical flood elevations could drop as much as 0.3 to 0.5 feet during most flood event scenarios (2 to 100 year events) based on hydraulic modeling results, resulting in a minor beneficial effect on flooding for the local community (KHE 2006a).

Changes in vertical flood elevations in Lagunitas Creek increase with distance downstream from the Green Bridge due to changes in slope of the water surface (KHE 2006a). Based on results from hydraulic modeling, the portions of Levee Road directly adjacent to White House Pool County Park and Olema Marsh would have reductions in vertical flood elevations ranging as high as 0.5- to 0.9 feet during 10-year flood events under Alternative A (KHE 2006a), resulting in a moderate beneficial effect on flooding and flood risks in the local community. Levee Road is the primary connecting roadway for the local community and would be one of the exit routes for people in Inverness Park, Inverness, and other areas on the Point Reyes Peninsula.

During a 5-year flood event, this alternative would decrease the potential for flooding along at least short (~300 feet) section of Levee Road and reduce the depth of flooding in the lowest sections near Olema Marsh by as much 0.5- to 0.8 feet relative to baseline conditions (KHE 2006a). This reduction in flooding depth could potentially reduce the number of times, or duration of Levee Road closure. Based on these changes, Alternative A would have a moderate beneficial effect on the western portions of Levee Road.

Flood risks are sometimes be elevated when creek or streambeds aggrade or increase in elevation due to excessive sediment deposition or discontinunities in sediment transport. Based on field investigations and results of hydraulic modeling, streambed elevations in the portion of Lagunitas Creek within the Project Area would be relatively stable and not actively decreasing or increasing (KHE 2006a). Under Alternative A, stream power and transport capacity in Lagunitas Creek would be expected to remain very similar to that

under baseline conditions, at least in the reach upstream of White House Pool (KHE 2006a). Downstream of White House Pool, stream power would decrease slightly, although the capacity to transport at least silts and fine sands would remain equivalent (KHE 2006a). These results suggest that any changes in sediment transport processes in Lagunitas Creek caused by breaching of the East Pasture levee and other restoration or public access components should not affect channel and streambed morphology or change the potential for flooding.

Alternative A would include construction of the southern perimeter through-trail, including a new pedestrian-bicycle bridge across Lagunitas Creek. The approximately 2,750-foot enhanced trail from the Giacomini dairy facility would lead to construction of a 200-foot-long, 8-foot-wide bridge on Lagunitas Creek at the location of the old summer gravel dam that the Giacominis used to install for irrigation purposes. The bridge would be constructed at a relatively narrow portion of the Lagunitas Creek channel, which would enable the Park Service to construct the bridge such that none of the footings would be within the active floodplain. The bridge, however, would be within the 100-year floodplain, as would all of the other trail facilities constructed. Trails would be developed and maintained with the assumption that they would be flooded on a regular basis and would be constructed accordingly in terms of construction materials and methods. Therefore, trails are not included within development totals.

The bicycle-pedestrian bridge would be constructed to accommodate flows equal to or greater than the Green Bridge, which is located directly immediately upstream. Design elevations for the bridge would take into account reductions in vertical flood elevations in Lagunitas Creek with removal of the Lagunitas Creek levees under Alternative A. Based on hydraulic modeling analyses, the portions of Levee Road directly adjacent to White House Pool County Park and Olema Marsh would have reductions in vertical flood elevations ranging as high as in vertical flood elevations ranging as high as 0.5- to 0.9 feet during 10-year flood events under Alternative A (KHE 2006a). As a result, under restored conditions, elevation of the bridge would only need to exceed 15 feet NAVD88 to allow for conveyance of 10-year flood flows and 17.2 feet NAVD88 to allow for conveyance of the 50- and 100-year flood flows at the proposed location (KHE 2006a). The bridge would likely be designed to have at least 1- to 2-feet of freeboard. Using this type of approach, hydraulic modeling results suggest that the bridge would not have more than negligible adverse impacts on flooding in the Project Area.

Over the long-term, some of the benefits provided by Alternative A could be offset by increases in flooding related to projected increases in sea level due to sea level rise. Recently published studies suggest that sea level rise rates may be much greater than originally predicted, with water levels rising as much as 3 feet by 2100 (Overpeck et al. 2006). This rate of sea level rise could lead to regular inundation of large portions of the East Pasture below 4 ft NAVD88.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: The Bear Valley Creek Watershed Enhancement and Fishery Restoration Project would replace failing or underperforming hydrologic infrastructure at a number of locations on Bear Valley Creek within the Seashore boundaries. There is no definitive timeframe for construction of this project. This project would be expected to benefit hydrologic and ecological processes on Bear Valley Creek and Olema Marsh, which may have direct and indirect impacts on flooding in Olema Marsh and even Lagunitas Creek. The effect of this project on flooding in Olema Marsh and Lagunitas Creek would be expected to have no more than a minor beneficial effect on flooding. Cumulatively, Alternative A, in combination with the Bear Valley Creek Watershed Enhancement and Fishery Restoration Project, would be expected to still have minor beneficial effects on flooding and risks from flooding to public health and safety.

Conclusions: Alternative A would have minor beneficial effects on flooding and risks from flooding to public health and safety through a reduction in flood frequency on Levee Road and vertical flood elevations along Levee Road. These reductions would not only benefit safety and emergency access for homeowners adjacent to the Project Area, but would decrease the extent of flooding along a short section of Levee Road and possibly reduce the potential for closure of Levee Road due to excessive flooding during more frequent (up to 5-year) flood events. Alternative A would not result in changes to the existing conditions to the properties along Sir Francis Drake and Inverness Park. Construction of a bridge as part of the southern perimeter trail

would have no more than negligible adverse impacts on flooding, because bridge footings would be placed outside of the active floodplain, and the bridge would be high enough in elevation to allow for conveyance for larger flood flows.

Alternative B

Analysis: Alternative B would have beneficial minor to major effects on flooding and flood risks to public safety along Levee Road, but would have potentially minor adverse effects on private properties, if not homes, in Inverness Park adjacent to the West Pasture (Table 74). Under Alternative B, the East and West Pastures would be restored, but not Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture and western margin of the West Pasture (programmatic evaluation of a trail access to Inverness Park). The southern perimeter trail would include construction of a single span bridge across Lagunitas Creek, near the old summer dam location. A viewing area would replace the informal existing trail on the West Pasture north levee, which would be removed. Restoration would involve complete removal of levees in the East Pasture along Lagunitas Creek and excavation of even more new tidal channels. Breaches would be created in the West Pasture levee. The armored reach of Lagunitas Creek in the East Pasture would be restored through removal of rip-rap bank stabilization, regraded and revegetated. As with Alternative A, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

Sir Francis Drake Blvd- Inverness Park: The closest homes to the Project Area are four homes along Sir Francis Drake Boulevard that are contiguous with the Giacomini Ranch West Pasture. While the West Pasture levees keep Lagunitas Creek waters far to their east, each of these properties is subject to flooding from the smaller Inverness drainages flowing adjacent to their property. Site surveys indicate that the elevation of these structures is 4- to 7 feet higher than the elevation of the West Pasture levee (10-12 feet). Hydrologic modeling suggests that the West Pasture levees overtop during flood events with 12-year recurrence interval (e.g. that occur, on average, every 12 years). For these homes, the West Pasture levees provide little in the way of protection for these homes from Lagunitas Creek flooding under larger flood events.

As discussed under the No Action Alternative, hydrologic investigations and modeling conducted as part of baseline studies point to the primary flood risk currently for these properties and portions of Sir Francis Drake Boulevard in Inverness Park being the drainages that flow off the Inverness Ridge. These tributaries are culverted underneath Sir Francis Drake Boulevard and run either through or directly adjacent to at least three of these four homes and often deposit large amount of sediment that increase flood water stage or vertical flood elevation and cause back-up of floodwaters onto their properties (KHE 2006a).

Under Alternative B, the frequency of flooding in the West Pasture would increase from 12-year flood event s to 2-year flood events (KHE 2006a). Hydraulic modeling indicates that, under Alternative B, because levees in the southern portion of the pasture would not be completely removed, but outflow of waters would be increased by removal of the West Pasture north levee and Fish Hatchery Creek tidegate, vertical flood elevations in the West Pasture would decrease by as much as 0.4 feet under 2- to 10-year flood events (KHE 2006a). However, during 50-year flood events, vertical flood elevations would increase up to potentially 1.0 foot within the easternmost undeveloped portion of some of the private properties, because of the increase in the volume of water and the loss of the channeling effect that the levees might have on Lagunitas Creek flood flow (KHE 2006a). This increase in vertical flood elevation would cause increased flooding of the lower and one-tenth to one-third of the two private properties north of Fish Hatchery Creek. The latter is an undeveloped, marshy area that would already be flooded to a lesser degree under baseline conditions, while the former is pasture (KHE 2006a). While the flood peak under the 50-year event would be expected to be higher, the duration of flooding would be expected to decrease considerably, because the removal of the north levee and tidegate would not cause extensive ponding as they do under baseline conditions. Because the maximum 1-foot increase in vertical flood elevation would not negatively affect homes, driveways, or access routes to roads, the adverse changes under Alternative B during the 50-year flood event are characterized as minor.

Potential effects of flooding on public access facilities such as the bridge in the Sir Francis Drake/Inverness Park area would be the same under Alternative B as described under Alternative A.

Levee Road /Olema Marsh: Properties on Levee Road, directly south of the Giacomini Ranch East Pasture, are frequently flooded by Lagunitas Creek. A number of these homes have been elevated since the 1982 flood to

decrease flood frequency. As noted above, hydrologic investigations and modeling conducted as part of baseline studies show that the differences in height of the levees or creek banks between the East Pasture and the south bank of Lagunitas Creek/Levee Road acts to direct flows toward the homes.

Under Alternatives A and B, the frequency of overbank flooding of the southern bank of Lagunitas Creek would drop from a 3- year to 4-year flood recurrence interval or flood event. As some of the worst flooding occurs when high creek discharge from storm events is combined with an extreme high tide (>6.0 feet MLLW), all hydraulic modeling of changes in vertical flood elevation assume an extreme high tide, as well as creek flooding (KHE 2006a). Similar to Alternative A, vertical flood elevations for the eastern portion of Levee Road, where most of the homes occur, could drop as much as 0.3 to 0.5 feet during 5- to 10-year flood events based on hydraulic modeling results, resulting in a minor beneficial effect on flooding for the local community (KHE 2006a). As flood frequency either increases to a 2-year flood event or decreases to a 50-year flood event or greater, the change in vertical flood elevations under Alternative A relative to baseline conditions is actually smaller, ranging from approximately 0.1 to 0.3 feet (KHE 2006a). This decrease in vertical flood elevation reduction during larger storm events probably relates to the higher volumes of floodwater that offset, to some degree, increases in floodwater storage capacity in the Project Area with removal and/or breaching of the East Pasture and West Pasture levees.

Changes in vertical flood elevations in Lagunitas Creek increase with distance downstream from the Green Bridge due to changes in slope of the water surface (KHE 2006a). Based on results form hydraulic modeling, the portions of Levee Road directly adjacent to White House Pool County Park and Olema Marsh would have reductions in vertical flood elevations ranging as high as 0.6- to 1.1 feet during 10-year flood events under Alternative B (KHE 2006a), resulting in a moderate beneficial effect on flooding and flood risks in the local community. Levee Road is a major connecting roadway for the local community and would be one of the exit routes for people in Inverness Park, Inverness, and other areas on the Point Reyes Peninsula. Similar to Alternative A, this alternative would decrease the potential for flooding during a 5-year flood event along at least short (~300 feet) section of Levee Road relative to baseline conditions(KHE 2006a). Relative to Alternative A, it would also slightly further reduce the depth of flooding in the lowest sections near Olema Marsh, with water depths decreased by as much 0.75- to 0.9 feet relative to baseline conditions (KHE 2006a). This change in flooding depth could potentially change total flooding depth to the extent that Levee Road would be posted with a caution sign rather than closed, with water depths averaging less than 1 foot. Based on these changes, Alternative B would have a moderate to major beneficial effect on the western portions of Levee Road.

Under Alternative B, stream power and transport capacity in Lagunitas Creek would be expected to remain very similar to that under baseline conditions, at least in the reach upstream of White House Pool (KHE 2006a). Downstream of White House Pool, stream power would decrease considerably, causing a sufficient enough loss in transport capacity to cause potential deposition silts and fine sands carried by floodwater flows (KHE 2006a). The magnitude of this change, however, would not be expected to appreciably change channel or streambed morphology or to elevate flood risks for private properties, particularly as this reach is well downstream of directly adjacent residential areas. These results suggest that any changes in sediment transport processes in Lagunitas Creek caused by breaching and removal of levees and other restoration or public access components should not affect channel and streambed morphology or change the potential for flooding.

Potential effects of flooding on public access facilities such as the bridge in the Levee Road/Olema Marsh area would be the same under Alternative B as described under Alternative A.

Over the long-term, some of the benefits potentially provided by this alternative for Levee Road and Sir Francis Drake Boulevard properties may be negated by sea level rise, should rates of sea level rise be close to the much higher ones that were recently projected of 3 feet by 2100.

Possible Additional Mitigation Measures: One of the potential mitigation measures for reducing flood impacts to private properties on the east side of Sir Francis Drake Boulevard would be to construct levee or berms on the property perimeter, particularly for some of the lower elevation homes or developed properties or portions of properties. Levees would need to be at least 2- to 3- vertical feet in height to maintain existing flood protection under 50- and 100-year flood events. Levees would need to be constructed such that creek flow and surface run-off from the Inverness Ridge could be conveyed to the West Pasture without causing flooding in leveed areas. As discussed earlier, hydrologic investigations and modeling conducted as part of

baseline studies point to the primary flood risk currently for many of these properties and portions of Sir Francis Drake Boulevard in Inverness Park being the drainages that flow off the Inverness Ridge.

Effectiveness of Possible Additional Mitigation Measures: Levees would be effective at precluding inundation from Lagunitas Creek, but would tend to impound at least temporarily creek flow and surface run-off from the Inverness Ridge even if hydrologic infrastructure such as one-way flapgates on culverts were installed, thereby increasing the potential for flooding of these properties by upstream sources.

Cumulative Impacts: As with Alternative A. Alternative B, in combination with the Bear Valley Creek Watershed Enhancement and Fishery Restoration Project, would be expected to still have minor to major beneficial effects on flooding and risks from flooding to public health and safety.

Conclusions: Alternative B would have minor to major beneficial effects on flooding and risks from flooding to public health and safety for Levee Road and adjacent homes, however, modeling does show that on 50 year events and higher, there may be some minor increases in flood elevation on undeveloped portions of private properties adjacent to the West. As with Alternative A, Alternative B would reduce flooding of properties, homes, and driveways along Levee Road and decrease the extent, as well as the depth of flooding, on some of the lower elevation portions of Levee Road relative to baseline conditions during 5-year flood events. These reductions would not only benefit safety and emergency access for homeowners adjacent to the Project Area, but would reduce the potential for closure of Levee Road due to excessive flooding during at least 5-year flood events. While this alternative may increase vertical flood elevation effecting undeveloped portions of West Pasture properties, flood elevations during smaller and more frequent flood events, would likely decrease relative to baseline conditions. Construction of a bridge as part of the southern perimeter trail would have no more than negligible adverse impacts on flooding, because bridge footings would be placed outside of the active floodplain, and the bridge would be high enough in elevation to allow for conveyance for larger flood flows.

Alternative C

Analysis: Alternative C would have identical beneficial minor to major effects on flooding and flood risks to public safety along Levee Road, but would have potentially moderate adverse effects on undeveloped portions of private properties in Inverness Park adjacent to the West Pasture (Table 74). Under Alternative C, the East and West Pastures would be restored, along with Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture and western margin of the West Pasture (programmatic evaluation of a trail access to Inverness Park). The southern perimeter trail would include construction of a single span bridge across Lagunitas Creek, near the old summer dam location. Access along the eastern perimeter would be scaled back through removal of the through-trail component. Restoration would involve complete removal of levees in the East and West Pastures along Lagunitas Creek and excavation of even more new tidal channels. Tomasini Creek would be realigned into one of its historic alignments midway through the East Pasture. In Olema Marsh, an adaptive restoration approach would be undertaken, with initial excavation of a shallow berm and the Bear Valley Creek channel to improve hydraulic connectivity and improve drainage of currently impounded waters. As with the other alternatives, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

Sir Francis Drake Blvd- Inverness Park: The closest homes to the Project Area are four homes along Sir Francis Drake Boulevard that are actually contiguous with the Giacomini Ranch West Pasture. While the West Pasture levees keep Lagunitas Creek waters far to their east, each of these properties is subject to flooding from the smaller Inverness drainages flowing adjacent to their property. Site surveys indicate that the elevation of these structures is 4- to 7 feet higher than the elevation of the West Pasture levee (10-12 feet). Hydrologic modeling suggests that the West Pasture levees overtop during flood events with 12-year recurrence interval (e.g. that occur, on average, every 12 years). For these homes, the West Pasture levees provide little in the way of protection for these homes from Lagunitas Creek flooding under larger flood events.

Under Alternative C, the frequency of flooding in the West Pasture would be identical to that under Alternative B, with frequency increasing from 12-year flood events under baseline conditions to 2-year flood events (KHE 2006a). Hydraulic modeling indicates that vertical flood elevations in the West Pasture would increase by as

much as 0.3 to 1.6 feet under 2- to 50-year flood events (KHE 2006a). This is because the levees would be completely removed, allowing flood flows full access to the West Pasture floodplain. However, during the 100-year flood event, the rate of increase would be reduced to between 0.5 to 0.75 feet (KHE 2006a). These increases in vertical flood elevation under the 2- to 50-year flood events would cause increased flooding of the lower, undeveloped (e.g., pastures, backyards, open space) portions of some properties during the 10-year and 50-year flood events. The largest increase in flooding of private property would take place at the parcel directly adjacent to Fish Hatchery Creek, however, flooding would occur only in the lower, undeveloped, marshy portions of the property that would already be flooded to a lesser degree during at least 50-year events under baseline conditions (KHE 2006a). Based on modeling results, the only flood event under which flooding of private property would occur during restored, but not baseline conditions, for parcels adjacent to the 1906 drainage would be the 50-year flood event, and flooding would be limited to a very small portion of the eastern perimeter of the properties. These properties actually have a fence that could limit floodwater intrusion to some degree, although floodwaters could back up into the 1906 drainage box culvert that runs through one of these properties. While the flood peaks under some of the flood events would be expected to be higher, the duration of flooding would be expected to decrease considerably, because the removal of the north levee and tidegate would not cause extensive ponding as they do under baseline conditions.

Because the maximum 1.6-foot increase in vertical flood elevation would not negatively affect homes, driveways, or access routes to roads, the adverse changes under Alternative C during the 50-year flood event were characterized as moderate. As discussed under the No Action Alternative, hydrologic investigations and modeling conducted as part of baseline studies point to the primary flood risk currently for these properties and portions of Sir Francis Drake Boulevard in Inverness Park being the drainages that flow off the Inverness Ridge. These tributaries are culverted underneath Sir Francis Drake Boulevard and run either through or directly adjacent to at least three of these four homes and often deposit large amount of sediment that increase flood water stage or vertical flood elevation and cause back-up of floodwaters onto their properties (KHE 2006a).

Potential effects of flooding on public access facilities in the Sir Francis Drake/Inverness Park area would be the same under Alternative C as described under Alternative A.

Levee Road/Olema Marsh: Changes in flood frequency and vertical flood elevations along Levee Road, as well as sediment transport and deposition patterns in Lagunitas Creek, would be identical to those discussed under Alternative B.

One of the largest changes under Alternative C relative to the other alternatives would come from restoration of Olema Marsh. By decreasing surface water levels by as much 4- to 6- feet in the now highly impounded marsh through improvements in hydraulic connectivity and drainage, this alternative would reduce the flood risk to Levee and Bear Valley Roads from Bear Valley Creek associated with the steadily increasing water levels in Olema Marsh. These roads serve as important connecting roadways for residents of Inverness Park, Inverness, and other areas on the Point Reyes Peninsula and are a bottleneck for access to the rest of Marin County.

Potential effects of flooding on public access facilities in the Levee Road/Olema Marsh area would be the same under Alternative C as described under Alternative A and B.

Over the long-term, some of the benefits potentially provided by this alternative for Levee Road and Sir Francis Drake Boulevard properties may be negated by sea level rise, should rates of sea level rise be close to the much higher ones that were recently projected of 3 feet by 2100.

Possible Additional Mitigation Measures: Possible mitigation measures would be the same as discussed under Alternative B.

Effectiveness of Possible Additional Mitigation Measures: The effectiveness of the proposed mitigation measures would be the same as discussed under Alternative B.

Cumulative Impacts: As with Alternative A and B. Alternative C, in combination with the Bear Valley Creek Watershed Enhancement and Fishery Restoration Project, would be expected to still have minor to major beneficial effects on flooding and risks from flooding to public health and safety.

Conclusions: Alternative C would have identical minor to major beneficial effects on flooding and risks from flooding to public health and safety for Levee and Bear Valley Roads and adjacent homes as Alternative B. However, it could have a moderate adverse effect on flooding of private properties in the Sir Francis Drake – Inverness Park portion of the evaluation area during at least the 50-year flood event. As with Alternative B, Alternative C would reduce flooding of properties, homes, and driveways along Levee Road and decrease the extent, as well as the depth of flooding, on some of the lower elevation portions of Levee Road relative to baseline conditions during 5-year flood events. These reductions would not only benefit safety and emergency access for homeowners adjacent to the Project Area, but would reduce the potential for closure of Levee Road due to excessive flooding during at least 5-year flood events. Construction of a bridge as part of the southern perimeter trail would have no more than negligible adverse impacts on flooding, because bridge footings would be placed outside of the active floodplain, and the bridge would be high enough in elevation to allow for conveyance for larger flood flows.

Alternative D

Analysis: Alternative D would have identical effects on flooding and flood risks to public health and safety as Alternative C, with minor to major beneficial effects for Levee and Bear Valley Roads and adjacent homes and moderate adverse effects during 50-year flood events for properties adjacent to the West Pasture (Table 74). Removal and replacement of the Mesa Road culvert would alleviate potential road flooding hazards in that local area.

Possible Additional Mitigation Measures: Possible mitigation measures would be the same as discussed under Alternative B.

Effectiveness of Possible Additional Mitigation Measures: The effectiveness of the possible mitigation measures would be the same as discussed under Alternative B.

Cumulative Impacts: Cumulative impacts would the same as described under Alternative A.

Conclusions: Alternative D would have identical effects on flooding and flood risks to public health and safety as Alternative C, with minor to major beneficial effects for Levee Road and adjacent homes and moderate adverse effects during 50-year flood events for properties adjacent to the West Pasture.

Public Health and Safety – Disease and Public Health

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

One of the strongest concerns currently about wetlands and public health is the rapid spread of West Nile Virus. While the reservoir host for this virus is considered to be birds, it can be transmitted by mosquitoes. Unlike malaria and dengue fever, which is carried by only one type or genus of mosquito, several genera – a total of 44 species within all genera -- can carry West Nile, many of which also carry other mosquito-borne diseases, as well, including encephalitis and malaria. California law requires that, if a problem source of mosquito production exists in waters or lands that have been artificially altered from natural conditions, the party responsible for altering conditions is liable for the cost of abatement or control of mosquitoes (California Heath and Safety Code 2000 *et seq*.). Enforcement of this law is the responsibility of local mosquito abatement districts, which are governmental organizations that are responsible for controlling specific disease vectors within their jurisdiction. As their name implies, mosquito abatement districts are primarily responsible for controlling mosquitoes as pest species and as disease vectors. Jurisdiction of mosquito abatement districts extends over private, county, and state lands, but not federal lands. Federal agencies are responsible for vector control on federal lands. Because of concerns regarding West Nile, the western portion of Marin County was annexed into the Marin-Sonoma Mosquito and Vector Control District (District) in 2005.

While vector-borne diseases are not specifically discussed in its significance criteria, DOI has established the potential for significant impacts to public health and safety as one of the triggers requiring preparation of an EIS under NEPA. The county's CEQA guidelines focus on the potential for the project to create a health hazard or the potential for a health hazard.

General Assumptions and Methodologies

- None of the mosquitos tested to date in Marin County have tested positive for West Nile, but the county has seven mosquito species present that have tested positive elsewhere in California or the United States, including mosquitos in the genera *Culex*, *Ochlerotatus*, and *Anopheles* (District, unpub. data). The western encephalitis and northern house mosquitoes represent the largest West Nile Virus threats (District 2006).
- The proposed project has the potential to affect mosquito breeding conditions through changes in tidal and freshwater hydrologic processes, as well as changes in vegetation communities.
- Areas that would tend to favor mosquito production are those that would meet most of the following criteria:
  - Areas NOT subject to daily tidal action (Collins and Resh 1989);
  - Inundated areas NOT subject to vigorous mixing through wind, current, or tide (Jones & Stokes Associates 1995);
  - Inundated areas with extended water residence times and stagnant conditions (Collins and Resh 1989);
  - Inundated areas with poor water quality (high water temperature, high organic content; Collins and Resh 1989);
  - Areas with slowly increasing or receding water levels as opposed to either stable or rapidly fluctuating water levels (Jones & Stokes Associates 1995);
  - Inundated areas with emergent marsh on perimeter or scattered throughout;
  - Areas inundated permanently, seasonally, or temporarily (even for a few days; Jones & Stokes Associates 1995).
- Analysis of potential changes in mosquito breeding conditions, relative to baseline conditions, with implementation of the proposed project focuses on change in areal extent of habitat that would meet most of the criteria listed above (Table 75).
  - Areal extent of mosquito habitat was weighted during analysis to reflect low, medium, or high potential for providing optimal conditions for mosquito breeding.
- Some of the habitats with higher potential for providing optimal breeding conditions include:

  1. **Unvegetated**: Muted Tidal Open Water-Channel and Pond/Subtidal and Intertidal
  2. **Unvegetated**: Non-Tidal Open Water-Channel and Pond/Permanently, Seasonally, and Temporarily Flooded
  3. **Vegetated**: Non-Tidal and Muted Tidal – Permanently, Seasonally, and Temporarily Flooded habitats – All
  4. **Vegetated**: Tidal – Areas not inundated daily by tides, but frequently enough to cause temporary inundation or saturation of ground conditions.

TABLE 75. DISEASE AND PUBLIC HEALTH – DISEASE VECTORS

Source: NPS Management Policies, California Public Health and Safety Code Nature: Beneficial, Adverse Context: Local Community Duration: Construction, Short-Term, Long-Term	
No Impact	There would be no potential for impact to mosquito breeding conditions associated with the proposed project.
Negligible	There would be a negligible change (≤ 5 percent) in optimal mosquito breeding conditions associated with the proposed project related to the areal extent of habitats meeting some or all of the criteria for optimal breeding conditions.
Minor	There would be a minor change (> 5 percent and ≤ 15 percent) in optimal mosquito breeding conditions associated with the proposed project related to the areal extent of habitats meeting some or all of the criteria for optimal breeding conditions.
Moderate	There would be a moderate change (> 15 percent and ≤ 25 percent) in optimal mosquito breeding conditions associated with the proposed project related to the areal extent of habitats meeting some or all of the criteria for optimal breeding conditions.
Major or Substantial	There would be a major or substantial change (>25 percent) in optimal mosquito breeding conditions associated with the proposed project related to the areal extent of habitats meeting some or all of the criteria for optimal breeding conditions.

Impact Analysis

TABLE 76. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR PUBLIC HEALTH AND SAFETY – DISEASE AND PUBLIC HEALTH – DISEASE VECTORS

All impacts would be considered Local Community and are considered Construction/Short-Term/Long-Term, unless otherwise specified.

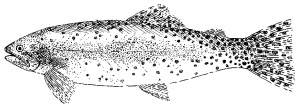
	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Public Health and Safety – Disease Vectors	Beneficial - Minor	Beneficial - Moderate	Beneficial - Moderate	Beneficial - Moderate	Beneficial - Moderate

No Action Alternative

Analysis: The No Action Alternative would have minor beneficial effects on risks to public health in the local community associated with breeding of disease vectors such as mosquitoes in the Project Area (Table 76). Under the No Action Alternative, levees, tidegates, and culverts in the Giacomini Ranch are not breached or removed, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. The Park Service is required under its existing agreement with CalTrans to restore wetlands as mitigation for impacts caused by CalTrans to aquatic habitat from a road repair on State Route 1 in Marin County in exchange for the Park Service receiving monies to purchase and restore the Giacomini Ranch. The remainder of the levee would not be deconstructed, although there would be no levee maintenance. Olema Marsh is also not restored, and there would be no new public access facilities. The largest change under the No Action Alternative comes with expiration of the Reservation of Use agreement with the Giacomini Trust in March 2007 and discontinuation of active agricultural management and management practices.

Most of the beneficial effect of the No Action Alternative on breeding of mosquitoes stems from discontinuation of agricultural management practices. Under baseline conditions, infrastructure (e.g., levees, culverts, tidegates) or management practices have increased potential mosquito breeding habitat in the Giacomini Ranch and Olema Marsh by 1) creating water impoundments that increase water residence time and decrease flow and exchange, leading to stagnant water conditions; and 2) increasing the duration and extent of inundation. As described under Vegetation Resources, the Giacomini Ranch has remained largely wetland despite being diked more than 60 years ago. Flooding from creeks, run-off, groundwater, and, to a certain degree, tides, creates areas with variable duration of inundation and saturation, lasting from a few days to year-round. While levees were constructed to prevent flooding from Lagunitas Creek and Tomasini Creek into the pastures, they also act to impound waters within the pastures, thereby prolonging the duration of inundation and saturation (KHE 2006a). Construction of extensive ditch systems to drain pastures and/or convey irrigation waters also creates stagnant standing water in areas that often become vegetated. Tidegates installed on Fish Hatchery and Tomasini Creeks do not allow waters within these creeks to fully drain during low tides, further perpetuating the extent of stagnant conditions. Most of the southern portion of the East Pasture is flood irrigated for several months during the summer, often creating standing water for several weeks. Fields in the northern portion are typically spray-irrigated. Near the dairy facility, the Giacominis also maintain several waste ponds.

Six species of mosquitoes were found in the Project Area during some limited sampling conducted in June 2005 (District, unpub. data). These species included the Western encephalitis mosquito, tule mosquito (*Culex erythrothorax*), banded foul water mosquito (*Culex stigmatosoma), Culiseta particeps, Culiseta inornata, and Ochlerotatus dorsalis* (District, unpub. data). Based on this limited sampling, the most common species were the Western encephalitis mosquito, tule mosquito, *Culiseta particeps, and Culiseta inornata*. Of the mosquito species identified on the Giacomini Ranch, three of these have tested positive in California for West Nile: the Western encephalitis mosquito, tule mosquito, and banded foul water mosquito (District, unpub. data). The western encephalitis and northern house mosquitoes represent perhaps the largest threats in terms of the West Nile Virus (District 2006). The Western encephalitis mosquito is a standing water species that lay its eggs in water. Adults can emerge continuously throughout the summer and fall in areas that have been flooded for more than 2- to 3 weeks such as rice fields, poorly drained pastures, semi-permanent and permanently flooded wetlands, sewer treatment plants, and dairy farms (Kwasny et al. 2004).



Without irrigation during the summer, many higher elevation portions of the Giacomini Ranch East Pasture would convert into upland non-native grassland that would only be inundated when floodwaters in Lagunitas Creek would be able to overtop the existing levees. The Giacomini Ranch West Pasture is not irrigated. There would also be some benefit from the small restoration/mitigation component, which restores tidal action to the very northern tip of the East Pasture and the adjacent East Pasture Old Slough. Functional tidal marshes typically do not produce significant mosquito breeding populations (R. Keith, Assistant Manager, District, *pers. comm.*). However, tidally influenced areas that are inundated on a regular, but not daily, basis or areas that do not drain completely at low tide still have some potential for supporting breeding of mosquitoes (Collins and Resh 1989). Mid-marsh intertidal elevation zones or mid-marsh marshplains in the mitigation/restoration component were still rated as having the potential to support mosquito breeding, although the potential would be lower than that of the pastures and non-tidal brackish marsh the restored area is replacing. Under this alternative, the extent of habitat with some of the highest potential for supporting breeding mosquitoes would potentially drop from approximately 410 acres under baseline conditions to approximately 350 acres.

Some elements of the No Action Alternative could lead to an enhancement of mosquito habitat. Under this alternative, the ditch system in the East Pasture would remain, but it would not be dredged, and it is likely that the ditches would become overgrown with freshwater marsh vegetation, which would potentially increase its attractiveness to breeding mosquitoes. This conversion is reflected in the acreage numbers provided above. In addition, creeks and ditches in both the East and West Pastures support populations of mosquitofish (*Gambusia affinis*) that were probably introduced by the Giacominis for mosquito control purposes. This non-native species can survive under unmanaged conditions and is expected to remain in the Project Area under the No Action Alternative.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: There would be no potential for cumulative effects with other projects under the No Action Alternative, with the possible exception of potential mosquito control efforts initiated by the District on adjacent private, local, and state lands. These lands could include private ranch lands to the south, County park lands, and CSLC lands to the north. In the past 18 months, since west Marin was annexed into the District, the District has treated many areas adjacent to the Project Area. The West Marin Mosquito Control Council (WMMCC) was formed about the time of the District annexation and has negotiated with the District in the past year to limit the type of treatments applied in West Marin relative to other parts of the district. The District has also agreed not to distribute mosquitofish in west Marin due to the potential ecological impacts of this non-native fish in the wild. Since annexation, both the District and the WMMCC have increased public awareness about reducing standing water and screening vents to limit mosquito breeding areas around homes.

Conclusions: The No Action alternative would have minor beneficial effects on risks to public health in the local community associated with decreased breeding of disease vectors such as mosquitoes in the Project Area. This would result from decreasing seasonally flooded grasslands and conversion of a small portion of the East Pasture to intertidal marsh. These beneficial effects are tempered to some degree by the fact that discontinuation of practices such as ditching would lead some unvegetated portions of ditches to become choked with freshwater marsh vegetation, which is more attractive for mosquito breeding, and there would be no active restocking of mosquitofish. Impounded conditions within Olema Marsh would continue to provide optimal breeding habitat for mosquitoes. The No Action Alternative would result in discontinuation of flood irrigation and closure of dairy facilities adjacent to populated areas. Overall, these changes would result in minor beneficial effects on public health.

Alternative A

Analysis: Alternative A would have moderate beneficial effects on risks to public health and safety associated with breeding of disease vectors such as mosquitoes in the Project Area and local community (Table 76). Under Alternative A, only the East Pasture would be restored, with new public access facilities limited to the eastern and southern perimeters of the East Pasture. There would be no restoration or

construction of new public access facilities in the West Pasture or Olema Marsh. The levees along and tidegate/culvert in the West Pasture and Tomasini Creek would be retained. In the East Pasture, restoration would involve breaching of levees in the East Pasture along Lagunitas Creek, and excavation of new tidal channels. The southwestern corner of the creek bank would be regraded to a more stabile profile. Most of the actions under this alternative focus on removal or restoration of agricultural infrastructure such as filling of ditches, ripping of compacted roads, fence removal, and removal of manure ponds, pumps, pipelines, and concrete spillways. As with the No Action Alternative, agricultural management practices such as ditching, irrigation, and spreading of manure would be discontinued.

As with the No Action Alternative, most of the beneficial effect of Alternative A on breeding of mosquitoes stems from discontinuation of agricultural management practices and deconstruction of agricultural infrastructure, including filling ditches, in the East Pasture. Under baseline conditions, infrastructure (e.g., levees, culverts, tidegates) or management practices have increased potential mosquito breeding habitat in the Giacomini Ranch and Olema Marsh by 1) creating water impoundments that increase water residence time and decrease flow and exchange, leading to stagnant water conditions; and 2) increasing the duration and extent of inundation. Flooding from creeks, run-off, groundwater, and, to a certain degree, tides, creates areas within the wetland-dominated Giacomini Ranch with highly variable periods of inundation and saturation, lasting from a few days to year-round. Levees and tidegates do not allow waters to drain fully during low tides, thereby increasing water residence time and extending the seasonal period of inundation or saturation. Construction of extensive ditch systems in the East Pasture to drain pastures and/or convey irrigation waters has also created stagnant standing water areas. Most of the East Pasture has been flood or spray-irrigated for several months during the summer, often creating standing water for at least several weeks. Near the dairy facility, the Giacominis also maintain several manure waste ponds.

A large proportion of the Wet Pasture in the East Pasture would convert to Tidal Salt Marsh, which would decrease, if not eliminate, the propensity for mosquito breeding. Under this alternative, the extent of habitat with some of the highest potential for supporting breeding mosquitoes would potentially drop from approximately 410 acres under baseline conditions to approximately 165 acres, a decrease of almost 60 percent. Functional tidal marshes typically do not produce significant mosquito breeding populations (R. Keith, Assistant Manager, District, *pers. comm*.). In San Francisco Bay, full tidal action has been shown to decrease mosquito numbers by as much as 98.7 percent relative to either pre-restoration conditions (Kramer et al. 1995) or adjacent impounded marshes (Liu 2001). Relative to unrestored areas, reintroducing tidal action decreases mosquito populations in two ways: by providing habitat for the natural predators of mosquitoes and by reducing flooding in areas that are not normally wet (IWCP 2001) At least one mosquito control agency in Massachusetts actually opted to eliminate ditching and chemical control practices in favor of restoring tidal morphology and hydrology, including ponded features such as salt pannes, and observed a 97 percent effectiveness rate (J. MacDougall, pers. comm. *in* (Dalia 1998). However, tidally influenced areas that are inundated on a regular, but not daily, basis or areas that do not drain completely on low tides still have some potential for supporting mosquito breeding (Collins and Resh 1989).

Tidal restoration would be most effective for controlling mosquitoes in tidal channels and low marsh intertidal elevations. As in the undiked marsh north of the Giacomini Ranch, portions of the mid-marsh intertidal elevations or mid-marsh marshplains that are not inundated regularly by tidal action, but that receive at least infrequent surface flooding, would most likely continue to support mosquito breeding, although numbers would drop relative to baseline conditions. The highest upland elevations would continue to have low mosquito numbers, except where emergent groundwater from the Point Reyes Mesa creates localized freshwater marsh and wet meadow habitats on the perimeter of the East Pasture. The expanded extent of riparian habitat would also support lower numbers of mosquitoes, except where prolonged ponding occurs. Existing riparian habitat with marshy conditions, where higher mosquito numbers may occur, include the portion of Tomasini Creek just upstream of Mesa Road and the riparian habitat at the south end of the West Pasture.

Species composition would shift under restored versus impounded conditions, as well. Based on limited sampling, the most common species on the Giacomini Ranch are the Western encephalitis mosquito, tule mosquito, *Culiseta particeps, and Culiseta inornata.* Two of these species have tested positive elsewhere in California for West Nile Virus -- the Western encephalitis mosquito and tule mosquito. A third species, the banded foul water mosquito, was also found in the Project Area, but does not appear to be common (District, unpub. data). The Western encephalitis and tule mosquitoes are both standing water species. The former has been linked to areas that are flooded for more than 2 to 3 weeks, such as poorly drained pastures, semi-permanent and permanently flooded wetlands, and dairy farms (Kwasny et al. 2004). Without irrigation

during the summer, many higher elevation portions of the Giacomini Ranch East Pasture would convert into upland non-native grassland that would only be infrequently inundated when floodwaters in Lagunitas Creek overtop the existing levees. Under Alternative A, flooding frequency would increase to at least every 2 years or more. The Giacomini Ranch West Pasture has not been irrigated. Reintroduction of more saline waters into lower elevation areas would likely attract higher numbers of saltmarsh mosquitoes of the genus, *Ochlerotatus*, such as *Ochlerotatus squamiger*. This mosquito breeds in prolific numbers in brackish intertidal waters and drainage ditches, laying eggs just above the high tide mark beginning each spring, as water levels recede until the following winter. *O. squamiger* is known to transmit certain strains of encephalitis, but is not a documented carrier of West Nile Virus.

Breaching of the East Pasture levee would reintroduce tidal action into the northern portion of the East Pasture Old Slough, while most of the ditch system would be eliminated through fill and grading. Drawdown would not be as pronounced in the East Pasture as in many other managed tidal units, which may limit breeding areas for *Ochlerotatus*. Portions of the East Pasture Old Slough with strong tidal velocities or that drain fully during low tide would have less potential to support mosquito breeding than areas where residual pools remain at low tide. Reintroduction of tidal influence into the East Pasture Old Slough would also increase the diversity and number of mosquito predators through increased access for native estuarine fish. During higher high tide events, overbank flooding would occur, allowing fish species access to the marshplain and mosquito larvae that may have been deposited in these areas.

Muted tidal or impounded freshwater conditions would continue to persist in the Giacomini Ranch West Pasture and Olema Marsh, respectively. There would be no restoration component in the West Pasture or Olema Marsh under Alternative A. As with the Giacomini Ranch, levees and other infrastructure have created impounded conditions within Olema Marsh that increase the potential for mosquito breeding. Sampling conducted in 2005 found five species of mosquitoes. Three of these species have tested positive for the West Nile Virus elsewhere in California (District, unpub. data).

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as discussed under the No Action Alternative.

Conclusions: Alternative A would have moderate beneficial effects on risks associated with breeding of disease vectors such as mosquitoes in the Project Area by decreasing the extent of seasonally flooded grasslands in the East Pasture. Conversion to salt marsh would be expected to reduce, if not eliminate, mosquito breeding, with the highest benefits associated with well-draining, fast-moving tidal creeks and low intertidal and very high vegetated intertidal elevation marsh “zones.” Portions of mid-marsh “zones” or marshplains that are not regularly inundated by tides, but receive infrequent tidal inundation, may continue to provide breeding habitat for mosquitoes, particularly saltmarsh mosquitoes of the genus, *Ochlerotatus*, such as *Ochlerotatus squamiger*. While *O. squamiger* is known to transmit certain strains of encephalitis, it is not a documented carrier of West Nile Virus. Reconnection of the East Pasture Old Slough to Lagunitas Creek would increase the diversity and number of estuarine mosquito predators. While this alternative would reduce habitats with the highest potential for supporting mosquito breeding by almost 60 percent, muted tidal and/or impounded conditions within the West Pasture and Olema Marsh would continue to provide optimal breeding habitat for mosquitoes. Overall, this alternative would be expected to reduce numbers of mosquitoes through reintroduction of tidal flushing and conversion to tidal salt marsh and discontinuation of agricultural management practices such as irrigation.

Alternative B

Analysis: Alternative B would have moderate beneficial effects on risks associated with breeding of disease vectors such as mosquitoes in the Project Area and local community (Table 76). Under Alternative B, the East and West Pastures would be restored, but not Olema Marsh. Restoration would involve complete removal of levees in the East Pasture along Lagunitas Creek and expanded excavation of tidal channels. Breaches would be created in the West Pasture levee. The whole southern East Pasture creek bank would be restored through removal of rip-rap bank stabilization and regraded, where needed, to a more stabile profile. The

levee adjacent to the Hunt Shack would be lowered to allow for overflow during flood events between the East Pasture and Tomasini Creek, but during regular flow conditions, Tomasini Creek would remain in its current channel with the tidegate/flashboard dam structure still in place. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, although a viewing area would replace the existing informal trail on the West Pasture north levee, which would be removed. As with Alternative A, this alternative would involve removal of agricultural infrastructure and discontinuation of agricultural management practices such as ditching, irrigation, and spreading of manure.

As with Alternative A, most of the beneficial effect of Alternative B to public safety stems from discontinuation of agricultural management practices and deconstruction of agricultural infrastructure. Under baseline conditions, infrastructure (e.g., levees, culverts, tidegates) or management practices such as flood and spray irrigation in the summer months, have increased potential mosquito breeding habitat in the Giacomini Ranch and Olema Marsh by 1) creating water impoundments that increase water residence time and decrease and exchange, leading to stagnant water conditions; and 2) increasing the duration and extent of inundation.

Under this alternative, a large proportion of the wet pasture habitat in the East Pasture and a smaller proportion of the wet and salt marsh pasture habitat in the West Pasture would convert to tidal salt marsh, which would decrease the propensity for mosquito breeding. Under this alternative, the extent of habitat with the highest potential for supporting breeding mosquitoes would decrease from approximately 410 acres under baseline conditions to approximately 96 acres, a 75 percent reduction. As described under Alternative A, functional tidal marshes typically do not produce significant mosquito breeding populations (R. Keith, Assistant Manager, District, *pers. comm*.), with reduction in of mosquitoes in areas where full tidal action has been restored of up to 98.7 percent relative to pre-restoration conditions (Kramer et al. 1995) or adjacent impounded marshes (Liu 2001). Some tidally influenced areas which may not drain completely on low tides will still have some potential for supporting breeding of mosquitoes (Collins and Resh 1989).

Tidal restoration would be most effective for controlling mosquitoes in tidal channels and low marsh intertidal elevations. Similar to the undiked marsh north of the Giacomini Ranch, portions of the mid-marsh intertidal elevations or mid-marsh marshplains that are not inundated regularly by tidal action, but that receive at least infrequent surface flooding, would be most likely to continue to support mosquito breeding, although numbers would drop relative to baseline conditions. Marsh elevations would generally be lower in the East Pasture than the West Pasture, with much of the West Pasture above Mean High Water (MHW) elevations. Higer upland elevations would have naturally low mosquito numbers, except where emergent groundwater from the Point Reyes Mesa and Inverness Ridge creates localized freshwater marsh and wet meadow habitats on the perimeter of the East Pasture. Because the creek and groundwater influence is stronger in the West Pasture, most of the western and southern perimeters of the West Pasture would remain largely unchanged, dominated by considerable expanses of freshwater marsh and wet meadow. The expanded extent of riparian habitat would also support lower numbers of mosquitoes, except where prolonged ponding occurs. Existing riparian habitat with marshy conditions, where higher mosquito numbers may occur, include the portion of Tomasini Creek just upstream of Mesa Road and the riparian habitat at the south end of the West Pasture.

As with Alternative A, species composition in restored areas would shift relative to baseline conditions. This shift would be expected to be more dramatic in the East Pasture than the West Pasture. Based on limited sampling, the most common species on the Giacomini Ranch are the Western encephalitis mosquito, tule mosquito, *Culiseta particeps, and Culiseta inornata.* . Two of these species have tested positive elsewhere in California for West Nile Virus -- the Western encephalitis mosquito and tule mosquito. A third species, the banded foul water mosquito, was also found in the Project Area, but does not appear to be common (District, unpub. data). The Western encephalitis and tule mosquitoes are both standing water species, the former linked to areas that are flooded for more than 2- to 3 weeks (Kwasny et al. 2004). Without irrigation during the summer, many higher elevation portions of the Giacomini Ranch East Pasture would convert into upland non-native grassland that would only be infrequently inundated when floodwaters in Lagunitas Creek spread onto the floodplain. The Giacomini Ranch West Pasture has not been irrigated. Reintroduction of more saline waters into lower elevation areas would likely attract higher numbers of saltmarsh mosquitoes of the genus, *Ochlerotatus*, such as *Ochlerotatus squamiger*. This mosquito breeds in prolific numbers in brackish intertidal waters and drainage ditches, laying eggs just above the high tide mark beginning each spring, as water levels recede until the following winter. *O. squamiger* is known to transmit certain strains of encephalitis, but is not a documented carrier of West Nile Virus.

As described under Alternative A, removal or breaching of the Giacomini Ranch levees would reintroduce tidal action into the northern portion of the East Pasture Old Slough, while most of the ditch system would be

eliminated through fill and grading. The tidal channel network would be expanded relative to Alternative A through additional excavation. In the West Pasture, Fish Hatchery Creek and the West Pasture Old Slough would be converted from muted tidal to fully tidal. Drawdown following heavy winter rains may be more pronounced in the West Pasture than the East Pasture, which may maintain breeding for mosquitoes such as *Ochlerotatus*. Creeks and tidal channels with strong tidal velocities or that drain fully during low tide would have less potential to support mosquito breeding than areas where residual pools remain at low tide. Reintroduction of tidal influence into the East Pasture Old Slough would also increase the diversity and number of mosquito predators through increased access for native estuarine fish. During higher high tide events, overbank flooding would occur, allowing fish species access to the marshplain and mosquito larvae that may have been deposited in these areas.

Impounded freshwater conditions would continue to persist in Olema Marsh. As with the Giacomini Ranch, levees and other infrastructure have created impounded conditions within Olema Marsh that increase the potential for mosquito breeding. Sampling conducted in 2005 found five species of mosquitoes. Three of these species have tested positive for the West Nile Virus elsewhere in California (District, unpub. data).

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as discussed under the No Action Alternative.

Conclusions: Alternative B would have moderate beneficial effects on public health in the local community by reducing availability of freshwater mosquito breeding habitat in the Project Area. Conversion to salt marsh would be expected to reduce mosquito breeding habitat, with the highest benefits coming from well-draining, fast-moving tidal creeks and low intertidal and very high vegetated intertidal elevation marsh "zones." Portions of mid-marsh "zones" or marshplains that are not regularly inundated by tides, but receive infrequent tidal inundation, may continue to provide breeding habitat for mosquitoes, particularly saltmarsh mosquitoes of the genus, *Ochlerotatus*, such as *Ochlerotatus squamiger*. While *O. squamiger* is known to transmit certain strains of encephalitis, it is not a documented carrier of West Nile Virus. Reconnection of the expanded East Pasture Old Slough and Fish Hatchery Creek to Lagunitas Creek would increase the diversity and number of estuarine fish predators. While this alternative would be expected to reduce existing mosquito breeding habitat by 75 percent, impounded conditions within Olema Marsh would persist. In addition, the restoration actions will result in expansion of potential salt marsh mosquito breeding habitat. Overall, the beneficial effects would primarily result from decreases in the extent of seasonally flooded grasslands in the East and West Pastures through reintroduction of tidal flushing and conversion to tidal salt marsh and from discontinuation of agricultural management practices such as irrigation and ditching.

Alternative C

Analysis: As with Alternative B, Alternative C would have moderate beneficial effects on risks to public health and safety associated with breeding of disease vectors such as mosquitoes in the Project Area and local community (Table 76). Under Alternative C, the East and West Pastures would be restored, along with Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, although access along the eastern perimeter would be scaled back through removal of the through-trail component. Restoration would involve complete removal of levees in the East and West Pastures along Lagunitas Creek and excavation of even more new tidal channels. A small tidal channel would be initiated off Lagunitas Creek, as well as in the interior of the East Pasture. Tomasini Creek would be realigned into one of its historic alignments midway through the East Pasture. In Olema Marsh, an adaptive restoration approach would be undertaken, with initial excavation of a shallow berm and the Bear Valley Creek channel to improve hydraulic connectivity and improve drainage of currently impounded waters. As with the other alternatives, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices such as ditching, irrigation, and spreading of manure.

As with the other alternatives, most of the beneficial effect of Alternative C on breeding of mosquitoes stems from discontinuation of agricultural management practices and conversion of seasonally flooded grasslands to

intertidal salt marsh through deconstruction of infrastructure such as levees, tidegates, and ditches in the Giacomini Ranch. Under this alternative, the extent of habitat with some of the highest potential for supporting breeding mosquitoes would potentially drop from approximately 410 acres under baseline conditions to approximately 84 acres, a decrease of nearly 80 percent. These effects are discussed in detail under Alternative B. As referenced above, one relevant change in restoration of the Giacomini Ranch under Alternative C involves rerouting of the lower two-thirds of Tomasini Creek within the Project Area into the East Pasture. This could decrease stream velocities and increase water residence time in the former Tomasini Creek channel that runs along the edge of the Point Reyes Mesa. The former channel would remain and function as a brackish slough, continuing to receive muted tidal influence from Lagunitas Creek/Tomales Bay and freshwater influence from hillside and toeslope groundwater seeps on the Point Reyes Mesa. The increase in water residence time could increase the attractiveness of the open water and emergent portions of this backwater slough channel to breeding mosquitoes.

One of the largest changes under Alternative C comes from incorporation of Olema Marsh into the restoration project. As with the Giacomini Ranch, levees and other infrastructure have created impounded conditions within the marsh that increase the potential for mosquito breeding. Sampling conducted in October 2005 found five species of mosquitoes, with the tule mosquito (*Culex erythrothorax*) by far the most prevalent (District, unpub. data). Other species observed included the banded foul water mosquito (*Culex stigmatosoma*), northern house mosquito (*Culex pipiens), Culiseta particeps,* and *Culiseta inornata,* many of the same species that occur at the Giacomini Ranch (District, unpub. data). Three of these species, northern house mosquito, tule mosquito, and banded foul water mosquito, have tested positive for West Nile Virus elsewhere in California. Like the western encephalitis mosquito, the tule mosquito is another standing water mosquito that deposits its eggs among thick vegetation on the edges or margins of lakes and inland ponds. It is also one of the few mosquitoes that feeds actively during the day (Kwasny et al. 2004).

Under this alternative, an adaptive restoration approach is undertaken to improve hydraulic connectivity and drainage through removal of berms, shallow excavation within the Bear Valley Creek channel, and possible replacement of two culverts. Over the last decade, water surface levels within the marsh appear to be rapidly increasing, possibly due to loss of one of what was once two culverts, with water surface levels increasing by as much as 6 feet since the early 1990s (KHE 2006a). This adaptive restoration approach could potentially lower the surface water level within the highly impounded marsh by as much as 4- to 6 feet over an extended period of time (KHE 2006a).

Over the short term, lowering of the water surface levels would be accompanied by some dramatic sediment, water, and vegetation changes that are described in detail in this chapter under Soil, Water Resources-Water Salinity and Water Quality, and Vegetation Resources. In summary, lowering of the water surface level would expose the upper surface layers of the organic-rich peat soils to air, causing them to decompose and compact, causing temporary pulses of nutrients and dissolved organic material into the overlying waters, as well as transient episodes of acidification. This dewatering would lead to an extensive die-back in the tall emergent freshwater marsh vegetation that currently dominates almost 39 acres of Olema Marsh. During this period, poor water quality conditions could continue to attract mosquitoes, although residence time of waters within the marsh would decrease appreciably, with the possible exception of some of the areas on the western perimeter, where small drainages and emergent groundwater would continue to create ponded conditions.

Ultimately, over the long term, freshwater marsh vegetation would be expected to recolonize at a lower marsh surface elevation throughout most of the marsh, although tall emergent brackish marsh vegetation could colonize a small (~2 acres) portion of the marsh directly near the Bear Valley Creek outlet to Lagunitas Creek. Water surface levels, in general, would be lower than under baseline conditions, but inundation and ponding would continue to persist throughout most of the marsh, due to the influence of perennial freshwater sources such as Bear Valley Creek and some of the drainages and emergent groundwater on the western perimeter. The long-term effect of these actions on mosquito populations is hard to predict, but, overall, the adaptive restoration component would be expected to have a very minor to minor beneficial effect on mosquito breeding conditions, due to the decrease in water residence time, long-term improvement expected in water quality conditions, and improved access to the marsh for estuarine fish predators. These beneficial effects would be expected to offset any increase in mosquito breeding habitat that results from creation of approximately 2 acres of seasonally flooded freshwater marsh ponds on the west side of Olema Creek as mitigation for impacts to California red-legged frog.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Same as described under the No Action Alternative.

Conclusions: Alternative C would have moderate beneficial effects on risks to public health in the local community associated with breeding of disease vectors such as mosquitoes in the Project Area. Most of these benefits would result from decreasing the extent of seasonally flooded grasslands in the Giacomini Ranch through reintroduction of tidal flushing and conversion to salt marsh and from discontinuation of agricultural management practices such as irrigation and ditching. Conversion to salt marsh would be expected to reduce, if not eliminate, breeding of mosquitoes, with the highest benefits coming from well-draining, fast-moving tidal creeks and low intertidal and very high vegetated intertidal elevation marsh "zones." Portions of mid-marsh "zones" or marshplains that are not regularly inundated by tides, but receive infrequent tidal inundation, may continue to provide breeding habitat for mosquitoes, particularly saltmarsh mosquitoes of the genus, *Ochlerotatus*, such as *Ochlerotatus squamiger*. While *O. squamiger* is known to transmit certain strains of encephalitis, it is not a documented carrier of West Nile Virus. Reconnection of the expanded East Pasture Old Slough and Fish Hatchery Creek to Lagunitas Creek would increase the diversity and number of estuarine fish predators. Improved connection between Project Area creeks and restoration of natural tidal marsh conditions is expected to reduce stagnant water in the Project Area, thereby limiting potential mosquito breeding areas.

In addition, under this alternative, hydraulic connectivity and drainage within Olema Marsh would be improved through an adaptive restoration approach that would result in dramatically lower water surface levels relative to baseline conditions. Continued inflow from permanent freshwater sources would continue to create breeding conditions for mosquitoes over the long-term, leading this alternative to have only minor beneficial effects on mosquito breeding conditions in this particular portion of the Project Area. Overall, this alternative would be expected to reduce habitats with the highest potential for supporting mosquito breeding by almost 80 percent, although mosquitoes would continue to reproduce in lower numbers within both the Giacomini Ranch and Olema Marsh. These beneficial effects would be expected to offset any increase in mosquito breeding habitat that results from creation of approximately 2 acres of seasonally flooded freshwater marsh ponds in the adjacent Olema Creek watershed as mitigation for impacts to California red-legged frog.

Alternative D

Analysis: Alternative D would have very similar moderate beneficial effects on breeding of disease vectors such as mosquitoes in the Project Area as Alternative C (Table 76). Under Alternative D as with Alternative C, the East and West Pastures would be completely restored, along with Olema Marsh. Almost all of the relevant differences between Alternative D and C relate to excavation of a limited portion of the East Pasture to intertidal elevations, complete realignment of Tomasini Creek into one of its historic alignments, replacement of the Tomasini Creek Mesa Road culvert with a bridge or arch culvert, and excavation of even more new tidal channels in the East Pasture.

As with all the other alternatives, most of the beneficial effect of Alternative D on breeding of mosquitoes stems from discontinuation of agricultural management practices and conversion of seasonally flooded grasslands to intertidal salt marsh through deconstruction of infrastructure such as levees, tidegates, and ditches in the Giacomini Ranch. These effects are discussed in detail under Alternative B. Under this alternative, the extent of habitat with some of the highest potential for supporting breeding mosquitoes would potentially drop from approximately 410 acres under baseline conditions to approximately 70 acres, a decrease of almost 83 percent. The small decrease in extent of high potential habitat relative to Alternative C results from lowering of the southwestern portion of the East Pasture to elevations subject to more frequent tidal inundation. As was discussed under Alternative C, restoration of Olema Marsh would be expected to have only minor beneficial effects over the long-term on mosquito breeding conditions, with possible increases during the short-term as the marsh adjusts to dramatically lower water surface levels.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as discussed under Alternative C.

Conclusions: Alternative D would have very similar moderate beneficial effects as Alternative C on risks to public health in the local community associated with breeding of disease vectors such as mosquitoes in the Project Area. Most of these benefits would result from decreasing the extent of seasonally flooded grasslands in the Giacomini Ranch through reintroduction of tidal flushing and conversion to salt marsh and from discontinuation of agricultural management practices such as irrigation and ditching. Conversion to salt marsh would be expected to reduce, if not eliminate, breeding of mosquitoes, with the highest benefits coming from well-draining, fast-moving tidal creeks and low intertidal and very high vegetated intertidal elevation marsh "zones." Excavation of the southwestern portion of the East Pasture to lower intertidal elevations would increase the frequency of tidal inundation in this area relative to Alternative C. Portions of mid-marsh "zones" or marshplains that are not regularly inundated by tides, but receive infrequent tidal inundation, may continue to provide breeding habitat for mosquitoes, particularly saltmarsh mosquitoes of the genus, *Ochlerotatus*, such as *Ochlerotatus squamiger*. While *O. squamiger* is known to transmit certain strains of encephalitis, it is not a documented carrier of West Nile Virus. Reconnection of the expanded East Pasture Old Slough and Fish Hatchery Creek to Lagunitas Creek would increase the diversity and number of estuarine fish predators. Improved connection between Project Area creeks and restoration of natural tidal marsh conditions is expected to reduce stagnant water in the Project Area, thereby limiting potential mosquito breeding areas.

In addition, under this alternative, hydraulic connectivity and drainage within Olema Marsh would be improved through an adaptive restoration approach that would result in dramatically lower water surface levels relative to baseline conditions, although, ultimately, continued inflow from permanent freshwater sources would continue to create breeding conditions for mosquitoes over the long-term, leading this alternative to have only minor beneficial effects on mosquito breeding conditions in this particular portion of the Project Area. Overall, this alternative would be expected to reduce habitats with the highest potential for supporting mosquito breeding by almost 83 percent, although mosquitoes would continue to reproduce in lower numbers within both the Giacomini Ranch and Olema Marsh. These beneficial effects would be expected to offset any increase in mosquito breeding habitat that results from creation of approximately 2 acres of seasonally flooded freshwater marsh ponds in the adjacent Olema Creek watershed as mitigation for impacts to California red-legged frog.

Public Services – Municipal Water Supply and Distribution

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

Federal and state regulations and policies protect both the supply and quality of drinking water for the public. The Safe Drinking Water Act (SDWA) was originally passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. SDWA authorizes the USEPA to set national health-based primary standards for drinking water to protect against both naturally-occurring and man-made contaminants that may be found in drinking water. Within California, the authority for implementation of the SDWA has been delegated to the California Department of Health Services (DHS). The California Safe Drinking Water Act (CA SDWA) was passed to build on and strengthen the federal SDWA. In addition to strengthening primary standards through the CA SDWA, DHS has also set secondary drinking water standards and maximum contaminant levels for analytes or contaminants of lesser concern that affect the taste, odor, or appearance of drinking water such as chlorides.

Protection of safe drinking water supplies also occurs through the Porter-Cologne Act. Water quality control plans designate beneficial uses of water for specific water bodies, establish water quality objectives to protect those uses, and provide a program to implement the objectives: one of those beneficial uses for Lagunitas Creek is municipal and domestic water supply. Through CEQA review, Marin County also regulates activities that substantially degrade or deplete groundwater resources, interfere with groundwater recharge, substantially degrade surface or groundwater quality, or substantially reduce the amount of water otherwise available for public water supplies.

Water districts are required by law to provide safe drinking water for customers. DHS sets chloride levels in potable water as a secondary drinking water standard (NMWD 1997). DHS has set the recommended maximum contaminant level (MCL) for chloride at 250 mg/L (NMWD 1997). The upper MCL is 500 mg/L (NMWD 1997). A chloride concentration of 250 mg/L is considered the taste threshold for most people, however, often people can taste levels as low as 100 mg/L (NMWD 1997). NMWD has established 100 mg/L as its taste and odor threshold (NMWD 1997).

General Assumptions and Methodologies

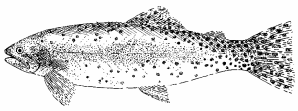
- NMWD currently obtains its water supply for the Point Reyes Station service area from two groundwater wells located along Lagunitas Creek on the U.S. Coast Guard (USCG) property in Point Reyes Station (Figure 37).
- NMWD supplies water to its customers using a network of pipelines, which are either buried belowground or suspended below bridges. There are no water collection, treatment, or storage facilities within the Project Area, but some of distribution pipeline systems are present.
- NMWD has experienced episodes of elevated chlorides in its two groundwater wells since 1976. DHS has established chloride as a secondary drinking water standard. Water districts are required by law to provide safe drinking water for customers.
- NMWD has implemented off-tide pumping practices to reduce potential for salinity intrusion into the Coast Guard Wells.
- Through increasing the extent of tidally influenced areas and replacing culverts, the proposed project has the potential to affect both distribution and supply of municipal water.

Chlorides occur in waters derived from both marine and terrestrial sources such as surface waters (fluvial or creek, run-off, etc.) and groundwater, with mineral content of terrestrial sources determined by weathering of rocks native to the area. While there has been a considerable amount of study into the salinity intrusion problem, the exact cause or mechanisms by which salinities become elevated is still not totally understood. However, it is safe to assume that the system involves both surface water-recharge of alluvial aquifers with tidally influenced and non-tidally influenced waters in Lagunitas Creek, as well as, to some degree, lateral or horizontal inflow from the terrace groundwater aquifer, which has also been shown to be elevated in chlorides (KHE 2006a; Questa 2000).

The NMWD has documented salinity intrusion events in their Coast Guard well facility dating back to 1976. With the mandated removal of the Giacomini summer dam, beginning in 1997, the potential for, and frequency of salinity intrusion events increased at the Coast Guard well facility. In response, NMWD has operated under an off-tide pumping regime, first recommended in an NMWD commissioned salinity investigation (NMWD 1997). The off-tide pumping regime avoids pumping for 6 hours around a predicted tide of 6 feet MLLW or greater (3 hours before and 3 hours after predicted peak). Continuous water level monitoring in the reach of Lagunitas Creek near the Coast Guard wells during fall 2005 showed, however, that salts are quickly flushed out of the creek once tides recede, lowering salinities down to freshwater levels (KHE 2006a). The implementation of the off-tide pumping regime is storage- and demand-dependent. Based on NMWD data, with implementation of the off-tide pumping practices, there have been a few periods since 1997 in which the salinity intrusion threshold of 100 mg/L either came very close to being exceeded (>90 mg/L; August 2001, October 2002 June 2003) or was exceeded (>100 mg/L; November – January 2003; July – September 2004; NMWD, unpub. data). There were no salinity intrusion events in 2005 or 2006 as of September 2006.

Salinity intrusion events during which NMWD experience chlorides exceeding 100 mg/L appear to correlate with predicted tide elevations exceeding 5.9 to 6.0 feet MLLW, although continuous conductivity monitoring suggests that changes in salinity occur with tides as low as 5.5 to 5.7 feet MLLW (NMWD 1997, NMWD, unpub. data). Preliminary conclusions by KHE (2006a) identify additional factors and conditions that are generally correlated with salinity spike occurrences in the Coast Guard Wells:

1) Periods of low flows less than 9-10 cfs;
2) Periods of maximum well-pumping rates (summer-time pumping rates);
3) Spring tides exceed 5.5 - to 5.7 feet MLLW (even though higher salinity waters reach the vicinity of the Coast Guard wells when predicted tides at Inverness are as low as 4.8 to 5.0 feet MLLW).
4) Spikes typically show up in the wells approximately 5- 10 days after a 5.5 to 5.7 feet MLLW spring or high tide event, typically during a neap or low tide event;



5) The spikes typically manifest as a single peak regardless of the number of days of high tide events the previous week;

While the exact location at which tidally and non-tidally influenced surface waters infiltrate into the alluvial aquifer is unknown, a review of available data and information on stratigraphy and creek bathymetry in the vicinity of the Coast Guard wells, predicted tide "thresholds" at which increases in groundwater salinity occur, and the consistent 5- to 7-day lag time between high tide- and intrusion events point to the infiltration location being some distance upstream from the Coast Guard wells (KHE 2006a). One of the possible infiltration locations could be the Downey well, which was originally constructed in the active floodplain of Lagunitas Creek in 1977, but has since become located in the middle of Lagunitas Creek due to subsequent migration or movement of the channel. This shallow well has not surprisingly had numerous operational problems during its life (NMWD 1997). Currently, this well is only being used during the summer and early fall to provide the Giacominis with irrigation water. Its location and operation suggest that the Downey well could be at least one of the major infiltration points for tidally influenced waters into the alluvial aquifer.

Ultimately, salinity intrusion appears to be controlled by a combination of factors, including tidal height, streamflow discharge, pumping rates, and possible influence from the adjacent terrace groundwater aquifer (KHE 2006a). A more detailed description of current theories regarding salinity intrusion can be found in Chapter 3 under Public Services – Municipal Water Supply and Distribution.

Effects of the Proposed Project on Municipal Water Supply: The proposed project would restore natural tidal and freshwater hydrologic processes. It has the potential of both increasing tidal prism in southern Tomales Bay by removing levees on the Giacomini Ranch and improving hydraulic connectivity with Olema Marsh and increasing freshwater flow by designating the appropriative water right purchased from the Giacomini Trust for beneficial in-stream uses. Because the exact mechanism by which salinity intrusion occurs is not understood, it is important that this document incorporate the most relevant impact indicator for analysis.

Restoring tidal hydrologic processes may affect surface water recharge of the alluvial aquifer in three ways: 1) increases in the **duration** or amount of time that saltwaters remain in the creek where infiltration into the alluvial aquifer occurs; 2) **frequency unrelated to volume of saltwater** through either decreases in streamflow (freshwater) or removal of in-stream barriers such as gravel bars or debris jams that would reduce the predicted tide elevation that tidal waters reach well recharge area (changes in salinity occur with tides as low as 5.5 to 5.7 feet MLLW (NMWD 1997, NMWD, unpub. data).); and/or 3) **frequency related to volume of saltwater** or increases in the volume of salts during spring tide events, thereby potentially increasing the frequency of salinity intrusion events by lowering the threshold tide level at which problematic volumes of salts develop. Evaluation of the monitoring data related to the NMWD Coast Guard well site indicate that the frequency of events that may affect salinity levels in the wells will not be affected as a result of proposed restoration activities. Modeling results do indicate potential change in the chloride load within the water adjacent to the Coast Guard well site in association with different restoration alternatives. It should be noted that these results did not incorporate the off-tide pumping practices employed by NMWD. As described above, these practices are generally effective at preventing occurrences of chlorides reaching the Coast Guard Wells.

For this document, analysis of the potential for the proposed project to increase the volume of salts in upstream portions of Lagunitas Creek was based on the results of computer hydrodynamic models that assessed changes in surface water salinity in Lagunitas Creek at the Coast Guard wells during peak high tides under the various alternatives (Table 77). Because most of the potential salinity intrusion events occur during the summer or fall, the model was specifically calibrated to represent a mean tidal month during the summer with characteristic high or spring tides that exceeded 5.5 feet MLLW, reaching more than 6 feet MLLW on several occasions, and mandated minimum summertime stream discharge for both 1) normal (8 cfs) and 2) dry (6 cfs) years. This particular hydrodynamic model uses a depth-averaged process for salinity results. Because the Coast Guard well location on Lagunitas Creek represented the extreme end of the modeling frame, there was some disparity during calibration runs between expected and observed salinities, however, numbers fell within the range of acceptable tolerance limits. The differences between observed and expected varied depending on the tide, but, during some of the higher tides, the model underestimated observed salinities in Lagunitas Creek by approximately 0.14 ppt (~5 mg/L) to 0.35 ppt (~12 mg/L; KHE 2006a).

The total mass of salts or chlorides occurring in Lagunitas Creek under existing conditions and the various alternatives was calculated as average salinity concentration (mg/L) by summing the mass of chlorides expected to be present on tides greater than 5.5 feet MLLW (relative to Inverness predicted tides) during the

second half of the summer Mean Tidal Month within a defined 330-foot cross-sectional area adjacent to the Coast Guard wells under both 1) dry-year (6 cfs) and 2) normal-year flows (8 cfs). The predicted average concentration of salts or chlorides during these events under baseline conditions was estimated at 700 mg/L during normal-year flows and almost 1,700 mg/L during dry-year flows (KHE 2006a). Because the correlation between changes in the volume of salts in surface waters and the volume of salts within groundwater wells is not known, increases in average chloride concentration is weighted more heavily in the impact analysis then decreases in the concentration.

TABLE 77. PUBLIC SERVICES – MUNICIPAL WATER SUPPLY AND DISTRIBUTION

Source: Safe Water Drinking Act (SDWA), CA SDWA, Porter-Cologne Act, Marin CWP Nature: Beneficial, Adverse Context: Local Community Duration: Long-Term	
No Impact	There would be no potential for impact to municipal groundwater supply associated with the proposed project.
Negligible	There would be the potential for a barely detectable effect on municipal water supply, including, but not limited to, a negligible decrease (≤ 5 percent) in the average concentration of salts or chlorides during spring or high tide conditions (>5.5 feet MLLW) in upstream areas of Lagunitas Creek adjacent to the Coast Guard wells associated with the proposed project during normal flow years.
Minor	There would be the potential for a measurable effect on municipal water supply, including, but not limited to, a minor decrease (> 5 percent and ≤ 15 percent) in the average concentration of salts or chlorides during spring or high tide conditions (>5.5 feet MLLW) in upstream areas of Lagunitas Creek adjacent to the Coast Guard wells associated with the proposed project during normal flow years *OR* There would be an increase (≤ 5 percent) in the average concentration of salts or chlorides during spring or high tide conditions (>5.5 feet MLLW in upstream areas of Lagunitas Creek adjacent to the Coast Guard wells associated with the proposed project during normal flow years.
Moderate	There would be the potential for an appreciable effect on municipal water supply, including, but not limited to, a moderate decrease (> 15 percent and ≤ 25 percent) in the average concentration of salts or chlorides during spring or high tide conditions (>5.5 feet MLLW in upstream areas of Lagunitas Creek adjacent to the Coast Guard wells associated with the proposed project during normal flow years; *OR* There would be an increase (> 5 percent and ≤ 15 percent) in the average concentration of salts or chlorides during spring or high tide conditions (>5.5 feet MLLW in upstream areas of Lagunitas Creek adjacent to the Coast Guard wells associated with the proposed project during normal flow years. There would be no change in frequency of potential intrusion events.
Major or Substantial	There would be the potential for a major effect on municipal water supply, including, but not limited to, a substantial decrease (> 25 percent) in the average concentration of salts or chlorides during spring or high tide conditions (>5.5 feet MLLW in upstream areas of Lagunitas Creek adjacent to the Coast Guard wells associated with the proposed project during normal flow years; *OR* There would be more than an increase (> 15 percent) in the average concentration of salts or chlorides during spring or high tide conditions (>5.5 feet MLLW in upstream areas of Lagunitas Creek adjacent to the Coast Guard wells associated with the proposed project during normal flow years. There would be a change in the frequency of potential salinity intrusion events.

Impact Analysis

TABLE 78. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR PUBLIC SERVICES – MUNICIPAL GROUNDWATER DISTRIBUTION AND SUPPLY

All impacts would be considered Local Community and Construction or Short-Term/Long-Term, as specified.

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Public Services – Municipal Groundwater Supply	Beneficial - Major	Beneficial - Moderate	Beneficial - Moderate	Adverse – Moderate	Adverse – Moderate

No Action Alternative

Analysis: The No Action Alternative would have major beneficial effects on reducing salinities within portions of Lagunitas Creek that could potentially affect the quality of the municipal water supply in the local community (Table 78). Under the No Action Alternative, levees, tidegates, and culverts in the Giacomini Ranch are not breached or removed, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. The remainder of the levee would not be deconstructed, although there would be no levee maintenance. Olema Marsh is also not restored, and there would be no new public access facilities. The largest relevant change under the No Action Alternative comes with expiration of the Reservation of Use agreement with the Giacomini Trust in March 2007 and discontinuation of active agricultural management and management practices, particularly irrigation.

With expiration of the Reservation of Use agreement, the Park Service would follow its stated intention at the time of purchase to re-designate the purchased appropriative water right on Lagunitas Creek, which has been used for irrigation since 1959, for beneficial in-stream uses under State Water Code 1707. Under the No Action Alternative and all the action alternatives, the Park Service as the new owner would discontinue water diversion from the Dowey Well and re-designate the 2.0 cfs of Lagunitas Creek streamflow for beneficial instream uses, including fish resources such as central California coast coho salmon (*Oncorhynchus kisutch*; FE), central California coastal steelhead (*Oncorhynchus mykiss*; FE), and California coastal chinook salmon (*Oncorhynchus tshawytscha*; FT). The remaining 0.67 cfs under this appropriative water right was purchased by NMWD for municipal water supply purposes. During the summer, NMWD has been providing the Giacomini Ranch with irrigation waters pumped from the Downey Well as part of its purchase agreement with the Giacomini Trust: this agreement would expire at roughly the same time as the Reservation of Use Agreement. Under this agreement, NMWD supplies the Giacomini Ranch up to 2 cfs per summer season, although the Giacominis sometimes pump directly from Lagunitas Creek to augment supply from the Downey Well.

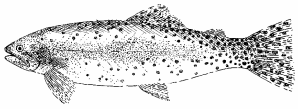
By ending irrigation and re-designating 2.0 cfs for beneficial in-stream flow, NMWD would indirectly benefit through an increase in freshwater streamflow or discharge that flows down the reach of Lagunitas Creek upstream of the Green Bridge during the summer. While the relationship between surface flows and the groundwater supply is not well understood, an increase in stream discharge directly within the well intake area could have several beneficial effects. Salts carried by some of the spring tides would be further diluted relative to baseline conditions by the greater volume of freshwater flow, thereby decreasing the volume of salts that infiltrate into the alluvial aquifer during these higher high tide events. Based on hydrodynamic modeling of both average (8-cfs) and dry (6 cfs) instream flows as mandated by the SWRCB[3], the No Action Alternative would potentially decrease average salinity or chloride concentrations during spring or high tide conditions (>5.5 feet MLLW) in Lagunitas Creek adjacent to the NMWD Coast Guard wells by as much as 37-41 percent relative to simulated average salinity concentrations during dry-year and normal-year streamflow scenarios, respectively, for baseline conditions, where average chloride concentrations ranged from approximately 700 to 1,692 mg/L (KHE 2006a). While the Giacominis only use irrigation waters during the summer and late fall, these months represent the exact period when salinity intrusion events are the most common, even though some of the highest high tides occur during the winter.

This drop in average salinity or chloride concentration during spring or high tide conditions (>5.5 feet MLLW) of Lagunitas Creek streamflows would probably reduce the frequency of salinity intrusion events, although the magnitude of this reduction cannot be predicted with the current level of information on the relationship between salinities of surface waters and groundwater. Currently, NMWD attempts to avert salinity intrusion events by conducting off-tide pumping or reduced pumping such that at least one of the two wells at the Coast Guard station is turned off when predicted tides at Inverness reach 5.9 to 6.0 feet MLLW.

Use of the Downey well would be discontinued once its contract with the Giacomini Ranch for provision of irrigation waters ends. The effect that decommissioning of the well might have cannot be predicted with available information, but it is directly correlated with the re-designation of the appropriated water right.

Over the long term, the benefits of the No Action Alternative have to be considered in the overall context of large-scale trends in climatic change, such as global warming and sea level rise. Recently published studies suggest that sea level rise rates may be much greater than originally predicted, with water levels rising as

[3] Measurement of mandated instream flows to be provided by Marin Municipal Water District (MMWD) through reservoir releases occurs at Samuel P. Taylor State Park, more than 7 miles upstream of the Coast Guard Wells.



much as 3 feet by 2100 (Overpeck et al. 2006). This rate of sea level rise could alter the frequency, duration, and chloride concentration adjacent to the Coast Guard Wells, regardless of the proposed project alternative.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: There is one proposed project that could have cumulative impacts on municipal water supply. NMWD is evaluating means of improving water supply reliability within the area. NMWD has developed a well at the Gallagher Ranch, upstream of the Coast Guard wells, that could be used during high tide periods when one of the Coast Guard wells is typically shut down to avoid salinity intrusion events. The intent of the auxiliary well is not to expand the volume of water withdrawn from the groundwater, but maintain existing withdrawal rates during high tide events. NMWD is currently seeking funds for this proposed project. In combination with management actions proposed under the No Action Alternative and all action alternatives, these projects would still be expected to have a moderate to major effect on reducing salinities within upstream portions of Lagunitas Creek that could affect the quality of municipal water supply for the local community, though potential implications of sea level rise could eliminate all potential cumulative benefits.

Conclusions: The No Action alternative would potentially have major beneficial effects on municipal water supply for the local community by reducing salinities in Lagunitas Creek upstream of the Green Bridge. Closure of the Downey Well and dedication of the 2.0 cfs of an appropriative water right on Lagunitas Creek to in stream flow would increase existing summer base flows up to 20 percent through the Coast Guard Wells and Project Area. Relative to baseline conditions, the increased volume of freshwater inflow would reduce salt concentrations in surface flows during spring tide events and may increase recharge of the alluvial aquifer during neap or low tide periods, thereby potentially decreasing the frequency of salinity intrusion events and the need for NMWD to conduct either off-tide pumping or reduced pumping during high tides.

Based on hydrodynamic modeling, the increase in instream flow during the summer months could result in anywhere from a 37 to 41 percent decrease in average salinity or chloride concentrations during spring or high tide conditions (>5.5 feet MLLW) in the portion of Lagunitas Creek directly adjacent to the Coast Guard wells during dry-year (6 cfs) and normal-year (8 cfs) mandated instream flow regimes, respectively, relative to baseline conditions (KHE 2006a). Closure of the Downey Well would also eliminate one of the potential areas in which tidally influenced waters infiltrate into the alluvial aquifer.

Alternative A

Analysis: Alternative A would have minor to moderate beneficial effects on reducing salinities within portions of Lagunitas Creek that could potentially affect the quality of the municipal water supply in the local community (Table 78). Under Alternative A, only the East Pasture would be restored. There would be no restoration in the West Pasture or Olema Marsh. The levees along and tidegate/culvert in the West Pasture and Tomasini Creek would be retained. In the East Pasture, restoration would involve breaching of levees in the East Pasture along Lagunitas Creek and excavation of new tidal channels. The southwestern corner of the creek bank would be regraded to a more stabile profile. Most of the actions under this alternative focus on removal or restoration of agricultural infrastructure such as filling of ditches, ripping of compacted roads, fence removal, and removal of pumps, pipelines, and concrete spillways in addition to discontinuation of agricultural management practices such as irrigation. Public access facilities proposed under Alternative A would not affect water supply issues associated with the project.

<u>*Municipal Water Supply*</u>: With expiration of the Reservation of Use agreement, the Park Service would follow its stated intention at the time of purchase to re-designate the purchased appropriative water right on Lagunitas Creek, which has been used for irrigation since 1959, for beneficial in-stream uses under State Water Code 1707. Under the No Action Alternative and all the action alternatives, the Park Service as the new owner would discontinue pumping from the Downey Well and re-designate the 2.0 cfs of Lagunitas Creek streamflow for beneficial instream uses, including fish resources such as central California coast coho salmon (*Oncorhynchus kisutch*; FE), central California coastal steelhead (*Oncorhynchus mykiss*; FE), and California coastal chinook salmon (*Oncorhynchus tshawytscha*; FT). Discontinuation of Downey Well operations would

increase the volume of freshwater flowing down the portion of Lagunitas Creek upstream of the Green Bridge during the summer.

Under Alternative A, the beneficial effects of increasing instream freshwater flow are tempered to some degree by an increase in tidal prism within the Project Area resulting from selective breaching of the East Pasture levee. Tidal prism – or the volume of water exchanged through tidal action on a daily basis – would increase from 8.1 acre-feet under baseline conditions to approximately 235.4 acre-feet under Alternative A (KHE 2006a). The extent of area inundated by tides on a daily basis would climb from approximately 11.0 acres under baseline conditions to approximately 200 acres under Alternative A, with all of the increase occurring in the approximately 350-acre East Pasture of the Giacomini Ranch (KHE 2006a).

This increase in the volume of saltwater moving in and out of the southern portion of Tomales Bay has implications for salinities or concentrations of salts in Lagunitas Creek upstream of the Project Area. Based on results of hydrodynamic modeling, the reintroduction of tidal action to the East Pasture would reduce the magnitude or degree of dilution in salinities or concentrations of chlorides in upstream reaches of Lagunitas Creek that transfer of the appropriative water right from irrigation to beneficial in-stream uses would have provided. Under Alternative A, concentrations of chlorides as simulated by hydrodynamic modeling would potentially drop from 14 to 15 percent within the creek during spring tides in the summer and early fall under both average (8 cfs) and dry-year (6 cfs) streamflow conditions, respectively, relative to baseline conditions (KHE 2006a). These results suggest that, even with increased volume of saltwater in the southern portion of Tomales Bay, the East Pasture is capable of absorbing most of these waters, thereby maintaining a considerable portion of the benefits to reduced creek salinities provided by re-designation of the appropriative water right.

These hydrodynamic modeling results suggest that Alternative A could have similar beneficial effects on the quality of municipal groundwater supply for the local community, although lower in magnitude than the No Action Alternative. Salt concentrations in the creek would be reduced relative to baseline conditions, thereby decreasing the volume of salts infiltrating into the alluvial aquifer. The concentration of salts could be further diluted by infiltration of higher volumes of freshwater in-stream flow into the aquifer during neap or low tide periods, particularly when pumping rates are high. Both of these factors could potentially reduce the frequency of salinity intrusion events. NMWD off-tide pumping practices would further reduce potential for salinity intrusion under Alternative A

Over the long term, the benefits of the No Action Alternative have to be considered in the overall context of large-scale trends in climatic change, such as global warming and sea level rise. Recently published studies suggest that sea level rise rates may be much greater than originally predicted, with water levels rising as much as 3 feet by 2100 (Overpeck et al. 2006). This rate of sea level rise could alter the frequency and duration of tides causing salinity intrusion into the alluvial aquifer, as well as the overall chloride concentrations adjacent to the Coast Guard Wells, regardless of the proposed project alternative.

Municipal Water Supply Distribution: There would be no effect on municipal water supply distribution.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as discussed under the No Action Alternative.

Conclusions: Alternative A would potentially have minor to moderate beneficial effects on municipal water supply for the local community by reducing predicted salinities in Lagunitas Creek upstream of the Green Bridge, although the magnitude of this change would be less than that under the No Action Alternative. Discontinuation of Downey Well pumping and dedication of the 2.0 cfs appropriative water right to in-stream beneficial use will ensure increased freshwater flow through the Coast Guard Well and Green Bridge. Under Alternative A, tidal prism would increase with breaching of the East Pasture levee, which would somewhat offset the benefits provided by increased volume of freshwater in-stream flow to some degree. Based on hydrodynamic modeling, average salinity or chloride concentrations could drop to between 14- to 15 percent during spring or high tide conditions (>5.5 feet MLLW) in the portion of Lagunitas Creek directly adjacent to the Coast Guard wells during SWRCB dry-year (6 cfs) and normal-year (8 cfs) streamflow regimes (KHE

2006a). Increased freshwater between the Downey Well and Coast Guard Wells, in conjunction with NMWD off-tide pumping practices, would reduce or dilute the volume of salts introduced into the alluvial aquifer and potentially decrease the frequency of salinity intrusion events and the need for NMWD to conduct off-tide or reduced pumping during high tide events. There would be no effect on municipal water supply distribution.

Alternative B

Analysis: As described in Alternative A, Alternative B would have minor to moderate beneficial effects on reducing salinities within portions of Lagunitas Creek that could potentially affect the quality of the municipal water supply in the local community (Table 78). Under Alternative B, the East and West Pastures would be restored, but not Olema Marsh. Restoration would involve complete removal of levees in the East Pasture along Lagunitas Creek and excavation of even more new tidal channels. Breaches would be created in the West Pasture levee. Some connection would be established between the East Pasture and Tomasini Creek through lowering of levees to allow overflow during flood events, but otherwise Tomasini Creek would remain in its current channel with tidegate/flashboard dam structure still in place. As with Alternative A, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices such as irrigation. Public access facilities proposed under Alternative B would not affect water supply issues associated with the project.

Municipal Water Supply: While tidal influence would be reintroduced to the West Pasture with breaching of the levees, the increase in tidal prism would be so minimal relative to Alternative A – approximately 6.3 acre-feet – that there would be no to only very negligible differences between Alternatives A and B in terms of average salinity concentrations in upstream portions of Lagunitas Creek (KHE 2006a). Based on hydrodynamic modeling, average salinity or chloride concentrations could be reduced 14 - 15 percent during spring or high tide conditions (>5.5 feet MLLW) in the portion of Lagunitas Creek directly adjacent to the Coast Guard wells during both dry-year (6 cfs) and normal-year (8 cfs) streamflow regimes mandated by the SWRCB, respectively, relative to baseline conditions (KHE 2006a). Modeling results suggest that due to proximity, the East Pasture has a much stronger influence on salinity dynamics and patterns in Lagunitas Creek above the Green Bridge than the West Pasture.

Over the long term, the benefits of Alternative B have be considered in the overall context of large-scale trends in climatic change, such as global warming and sea level rise, which would alter the frequency and duration of tides causing salinity intrusion into the alluvial aquifer, as well as the overall chloride concentrations in surface waters of Lagunitas Creek, regardless of the proposed project alternative.

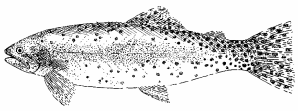
Municipal Water Supply Distribution: There would be no effect on municipal water supply distribution.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as discussed under the Alternative A.

Conclusions: As with Alternative A, Alternative B would potentially have minor to moderate beneficial effects on municipal water supply for the local community by reducing salinities in upstream reaches of Lagunitas Creek upstream of the Green Bridge. Discontinuation of Downey Well pumping and dedication of the 2.0 cfs appropriative water right to in-stream beneficial use will ensure increased freshwater flow through the Coast Guard Well and Green Bridge. Under Alternative A, tidal prism would increase with breaching of the East Pasture levee, which would somewhat offset the benefits provided by increased volume of freshwater in-stream flow to some degree. Based on hydrodynamic modeling, average salinity or chloride concentrations could drop to between 14- to 15 percent during spring or high tide conditions (>5.5 feet MLLW) in the portion of Lagunitas Creek directly adjacent to the Coast Guard wells during SWRCB dry-year (6 cfs) and normal-year (8 cfs) streamflow regimes (KHE 2006a). Increased freshwater between the Downey Well and Coast Guard Wells, in conjunction with NMWD off-tide pumping practices, would reduce or dilute the volume of salts introduced into the alluvial aquifer and potentially decrease the frequency of salinity intrusion events and the need for NMWD to conduct off-tide or reduced pumping during high tide events. There would be no effect on municipal water supply distribution.



Alternative C

Analysis: Alternative C would have moderate adverse effects on salinities within Lagunitas Creek upstream of the Green Bridge that could potentially affect the quality of the municipal water supply in the local community (Table 78). Under Alternative C, the East and West Pastures would be restored, along with Olema Marsh. Restoration would involve complete removal of levees in the East and West Pastures along Lagunitas Creek and excavation of even more new tidal channels. A small tidal channel would be initiated off Lagunitas Creek, as well as in the interior of the East Pasture. Tomasini Creek would be realigned into one of its historic alignments midway through the East Pasture. In Olema Marsh, an adaptive restoration approach would be undertaken, with initial excavation of a shallow berm and the Bear Valley Creek channel to improve hydraulic connectivity and improve drainage of currently impounded waters. As with the other alternatives, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices such as irrigation. Public access facilities proposed under Alternative B would not affect water supply issues associated with the project.

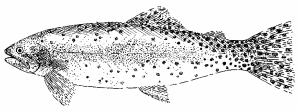
Municipal Water Supply: Unlike the other alternatives, Alternative C may cause a net increase in average salinity or chloride concentrations during high or spring tide events in the portion of Lagunitas Creek adjacent to the Coast Guard wells during both dry-year and normal-year streamflow scenarios based on results of hydrodynamic modeling (KHE 2006a). Modeling results suggest that average chloride concentrations in this reach of Lagunitas Creek would increase by 15 to 16 percent over baseline conditions during spring or high tide conditions (>5.5 feet MLLW) under normal-year and dry-year streamflow regimes, respectively (KHE 2006a).

The dramatic change in simulated salinities in upstream portions of Lagunitas Creek under Alternative C is associated with the inclusion of Olema Marsh in the restoration project. While Alternative C would involve complete removal of levees in the West Pasture, one of the primary drivers that influences the volume of saltwater that moves into upstream portions of Lagunitas Creek is tidal prism, and the volume of water exchanged with daily tidal action in the Giacomini Ranch under Alternative C would be identical to that of Alternative B (approximately 242 acre-feet; KHE 2006a). Inclusion of Olema Marsh into the restoration project only slightly increases tidal prism for the overall project. As noted above, Olema Marsh would be restored using an adaptive restoration approach that would involve removal of a sediment berm and shallow excavation of an improved flow path for Bear Valley Creek, as well as potentially replacement of one or both of the Levee Road and Bear Valley Road culverts. Combined, these restoration actions would be expected to increase the volume of water exchanged on spring or high tides to approximately 5 acre-feet depending on which actions are implemented (KHE 2006a).

The large effect that Olema Marsh has on salinity structure of upstream portions of Lagunitas Creek despite its relatively small tidal prism appears to relate to the location of its exchange point with Lagunitas Creek (KHE 2006a). The outlet of Bear Valley Creek, which flows through Olema Marsh, empties into a deep section of Lagunitas Creek upstream of White House Pool. Conversely, because the Giacomini Ranch delta is shaped like a wedge, most of the tidal exchange would occur much further north in the Project Area where elevations in the “wedge” are lowest. While the concentrations and load of chloride predicted to occur adjacent to the Coast Guard wells would increase under Alternative C, there would be no change in the frequency of such events. As they do currently, NMWD off-tide pumping would avoid some of these higher chloride concentrations during tides greater than 6.0 feet MLLW.

Municipal Water Supply Distribution: The NMWD distribution pipeline for Inverness Park, Silver Hills, and Bear Valley Road area follows State Route 1 to Levee Road, where it is buried or suspended on the north side of Levee Road until it reaches the intersection with Bear Valley Road. Potential replacement of the Levee Road culvert on Bear Valley Creek as part of the Olema Marsh restoration would likely require excavation of the pipeline and replacement or relocation. It is possible that the pipeline would be turned off during certain portions of the construction process, thereby temporarily cutting off service to NMWD customers in Inverness Park, Silver Hills, and Bear Valley Road areas. As discussed under BMPs in Chapter 2, customers in these areas would be notified of a possible disruption in service approximately one week prior to excavation near or replacement or movement of the pipeline. These construction-related distribution issues would represent a minor to moderate adverse effect on municipal water supply and distribution to the local community.

Possible Mitigation Measures: Implementation of restoration actions at the Olema Marsh would likely result in increases of chloride concentration during spring or high tide events in the portion of Lagunitas Creek



adjacent to the Coast Guard wells, but it would not increase the frequency or duration of salinity intrusion events. To mitigate the potential impacts to NMWD operations and the quality of the groundwater supply from restoration of Olema Marsh, the project has identified a staged approach to restoration. The initial stage of implementation on the Olema Marsh is the creation of a flow path through shallow excavation. Limited excavation at the lower end of the Olema Marsh would be conducted to initiate downcutting through the elevation control sill. Monitoring of salinity exiting the Olema Marsh and in Lagunitas Creek adjacent to the Coast Guard wells would be conducted to determine the level of influence associated with actions in the Olema Marsh. Future steps, including replacement of the Levee Road and Bear Valley Road culverts would be conducted after evaluation of salinity dynamics.

Additional efforts to characterize the zone of influence between the Coast Guard Wells and Downey Wells would also be evaluated. The Park Service will continue to collaborate with, and support the NMWD pursuit of water supply reliability through development of the Gallagher well or others that may provide a dependable water supply to the west Marin Service Area.

Effectiveness of Possible Mitigation Measures: Implementation of this staged approach will allow for managers to gage general response in salinity dynamics in Olema Marsh and Lagunitas Creek and changes in habitat and accessibility for salmonids in the Olema Marsh. Using these criteria, managers would be able to evaluate the advisability and timing of any potential next steps that would lead to more intensive restoration of Olema Marsh.

Cumulative Impacts: Cumulative impacts would be the same as discussed under Alternative A.

Conclusions: Alternative C would have the potential for moderate adverse effects on distribution and quality of the municipal water supply for the local community. The dramatic change in effect between Alternative C and other alternatives on salinity or chloride concentrations in upstream reaches of Lagunitas Creek appears to result from inclusion of Olema Marsh in the restoration project. While the Olema Marsh only increases the tidal prism -- one of the major factors driving the volume of saltwater in upstream reaches -- by 1.8 percent, the proximity of Olema Marsh to the Coast Guard well site likely magnifies its effect on salinity structure on upstream reaches. Based on hydrodynamic modeling, restoration of Olema Marsh could cause a potential increase in average chloride concentrations by 15- to 16 percent in upstream reaches of Lagunitas Creek during spring tide events (KHE 2006a). Because the frequency that tide water reaches the Coast Guard recharge zone would not change, and NMWD off-tide pumping avoids the peak tide period when predicted tides exceed 6.0 MLLW, the potential effects of Alternative C are considered adverse moderate. In addition, implementation of a staged approach to restoration in Olema Marsh would allow the Park Service and NMWD to better define the exact relationship between Olema Marsh and upstream reaches of Lagunitas Creek, as well as explore other options for precluding salinity intrusion events such as locating an additional well upstream of tidally influenced areas. Potential replacement of the Levee Road culvert on Bear Valley Creek as part of the Olema Marsh restoration would likely require excavation of the pipeline and replacement or relocation, which could result in a temporarily cut off of service to NMWD customers in Inverness Park, Silver Hills, and Bear Valley Road areas. This construction-related distribution issues would represent a minor to moderate adverse effect on municipal water supply and distribution to the local community.

Alternative D

Analysis: Alternative D would have the potential for identical minor to major adverse effects as Alternative C on distribution and quality of the municipal water supply to the local community (Table 78).

Proposed Mitigation Measures: Proposed mitigation measures would be the same as described under Alternative C.

Effectiveness of Proposed Mitigation Measures: The effectiveness of the proposed mitigation measures would be the same as described under Alternative C.

Cumulative Impacts: Cumulative impacts would be the same as discussed under Alternative A.

Conclusions: Similar to Alternative C, Alternative D would have the potential for moderate adverse effects on distribution and quality of the municipal water supply for the local community. The dramatic change in

effect between Alternative C and other alternatives on salinity or chloride concentrations in upstream reaches of Lagunitas Creek appears to result from inclusion of Olema Marsh in the restoration project. While the Olema Marsh only increases the tidal prism one of the major factors driving the volume of saltwater in upstream reaches, by 1.8 percent, the proximity of Olema Marsh to the Coast Guard well site likely magnifies its effect on salinity structure on upstream reaches . Based on hydrodynamic modeling, restoration of Olema Marsh could cause a potential increase in average chloride concentrations by 15- to 16 percent in upstream reaches of Lagunitas Creek during spring tide events (KHE 2006a). Because the frequency that tide water reaches the Coast Guard recharge zone would not change, and NMWD off-tide pumping avoids the peak tide period when predicted tides exceed 6.0 MLLW, the potential effects of Alternative C are considered adverse moderate. In addition, implementation of a staged approach to restoration in Olema Marsh would allow the Park Service and NMWD to better define the exact relationship between Olema Marsh and upstream reaches of Lagunitas Creek, as well as explore other options for precluding salinity intrusion events such as locating an additional well upstream of tidally influenced areas. Potential replacement of the Levee Road culvert on Bear Valley Creek could result in a temporarily cut off of water service to NMWD customers in Inverness Park, Silver Hills, and Bear Valley Road areas, which would have a minor to moderate adverse effect on municipal water supply and distribution to the local community.

Public Services - Traffic and Transportation

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

The Marin County Congestion Management Agency (CMA) creates, updates, and administers a Congestion Management Plan (CMP) for the county. The purpose is to establish Levels of Service (LOS) for designated freeways, state highways, and local arterials and to maintain those standards by increasing capacity or managing travel demand on those roads. The CMA annually monitors service levels on freeways, state highways, and routes of regional significance as part of the annual update. State Route 1 from Sir Francis Drake Boulevard to Point Reyes Station is part of the designated roadway network. Under CEQA, the County also evaluates changes in traffic conditions, with projects creating changes dropping the Level of Service (see description below) below Level D considered a substantial or “significant” impact.

Within the Coastal Zone, which incorporates the Project Area, the Local Coastal Program (LCP; Marin County Comprehensive Planning Department 1981) specifically identifies Sir Francis Drake Boulevard as providing a scenic driving experience for coastal visitors and an important access road for local residents. The LCP (Marin County Comprehensive Planning Department 1981) notes that, “in order to protect its scenic rural character, the road shall be maintained as a two-lane roadway.” The LCP (Marin County Comprehensive Planning Department 1981) concluded that “Sir Francis Drake has adequate capacity to handle increased recreational and local traffic, although traffic patterns do occasionally create hazardous conditions for pedestrians and bicyclists in the areas of Inverness and Inverness Park.”

The Point Reyes Station Community Plan (Marin County Community Development Agency 2001) focused on the lack of off-street parking as a concern, given the steady increase in numbers of visitors and area residents. All new structures and uses are required to provide off-street parking scaled to the level of use (Marin County Community Development Agency 2001). The Community Plan (2000) also supports efforts to reduce congestion through alternative transportation, including efforts to identify appropriate locations for paths that could be used for both bicycle commuting and recreation, including investigations into the feasibility of using the abandoned railroad right-of-way.

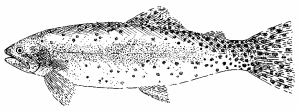
Significance criteria developed by the state and county under CEQA address: 1) substantial increases in vehicle trips or traffic congestion such that existing levels of service on affected roadways would deteriorate below acceptable county standards; 2) traffic hazards related to safety from design features (e.g., sharp curves or dangerous intersections), barriers to pedestrians or bicyclists; or incompatible uses (e.g., farm equipment); 3) inadequate emergency access or access to nearby uses; 4) insufficient parking capacity on-site or off-site; and 5) substantial impacts upon existing transportation systems, including rail, waterborne, or air traffic systems.

General Assumptions and Methodologies

- The proposed project has the potential to impact traffic and transportation through changes in vehicular and truck traffic patterns associated with construction of the proposed project, as well as through changes in traffic volume and parking demand in local communities associated with potential increases in vehicles and visitors who might come to view the restored wetland or use the public access facilities.
- Existing and projected future transportation issues are defined for roads and intersections, using Level of Service (LOS) criteria. Separate criteria are established for roads, signalized intersections, and stop sign-controlled intersections. LOS for roadways uses a Volume-to-Capacity ratio based on conditions of free flow and the amount of restriction on maintaining speed limits or safe speeds for roadway conditions within designated areas. LOS for intersections is typically based on the amount of delay measured in seconds between when a vehicle reaches an intersection, including a queue or the amount of waiting in a line of traffic, and when it passes through the intersection.
- The County has established a minimum LOS for urban and suburban arterials, including highways that serve as arterials such as State Route 1, as LOS D or better and LOS E or better for Highway 101, Highway 580, State Route 37, and rural expressways. Although standards for rural roads or portions of roads are not clearly specified, for the purposes of this evaluation, Sir Francis Drake Boulevard (including Levee Road), Bear Valley Road, and Pierce Point Road would be interpreted as needing to meet LOS standards of D or better.
- BRW and Lee Engineering (1998) analyzed trends in the San Francisco Bay region population growth and trends in visitation and concluded that visitation and traffic would increase 1 percent annually from 1998-2010. Based on projections of 1 percent annual growth rate in visitation and traffic through 2010, LOS was not predicted to change for State Route 1, Sir Francis Drake Boulevard (Olema – Pierce Point Road), or Bear Valley Road between 1998 and 2010 (BRW and Lee Engineering 1998). However, Point Reyes-Petaluma Road was projected to decrease from LOS C in the afternoon to LOS D starting in 2005 (BRW and Lee Engineering 1998).
- Since 1998, park visitation has not increased 1 percent annually. Visitation reached a peak of 2,579,949 in 1992, but by 2004, visitation actually had decreased to 1,960,055, a drop of 21 percent (NPS, unpub. data). Visitation rose slightly in 2005 to 1,988,585 (NPS, unpub. data). However, BRW and Lee Engineering had projected that visitation would total 2,750,000 in 2005 based on a 1 percent annual increase, a difference of 28 percent or 761,415 more annual visitors than actual numbers of visitors in 2005.
- Based on the fact that visitation rates have not kept pace with projected visitation trends through 2005, the proposed project may be able to serve as many as 2,504 additional daily visitors through 2010 without causing any change in LOS for state and regional roadways and/or causing a drop in LOS below LOS D. Depending on the number of people per vehicle, an increase in visitation of 2,504 people would generate approximately 656 (4 people per car) additional daily vehicle trips. For public reporting purposes, the Seashore uses a multiplier of 4 persons per vehicle for traffic counts on Sir Francis Drake Boulevard and Pierce Point Road.
- BRW and Lee Engineering (1998) did not analyze parking capacity in the Project Area and immediate vicinity. However, parking capacity was qualitatively assessed for existing and future parking needs by rating parking capacity as ranging from very high (occupancy does not exceed 90 percent of capacity during weekdays and weekends regardless of season) to very low (occupancy exceeds 90 percent of capacity during most weekdays and weekends regardless of season).
- Pedestrian and bicycle transportation will be addressed under Visitor and Resident Experience.

Described below are methodologies for impact indicators related to traffic and transportation, including specific assumptions or details on methodologies.

Traffic and Transportation – Construction-Related: Impact thresholds for construction-related traffic are based on analyses by BRW and Lee Engineering of increases in traffic related to park visitation and effects on LOS in the Point Reyes area and effects. The number of vehicles expected at Project Area during construction was based on daily round trips generated by construction personnel and the total number of round trips for dump trucks hauling excavated sediment and other materials. For the purposes of this analysis, it was assumed that approximately 30 percent of the construction personnel would car-pool or ride with at least one other employee, resulting in a multiplier of 1.3 times total number of employees expected at any one point in the construction period to derive average daily vehicle trips. Sediment excavated from the Project Area would largely be disposed of within quarries in the Seashore, most of which are located on the northern portion of the Point Reyes Peninsula off Pierce Point Road (Figure 10). Most non-soil materials would be disposed of at a



municipal or commercial landfill such as the Redwood Landfill in Petaluma, which is approximately 20-25 miles away.

Impact thresholds for project-related traffic associated with implementation of the proposed project are based on analyses by BRW and Lee Engineering of the effects of increases in park visitation on LOS of specific roadway segments in the Point Reyes area. The effects of the proposed project on traffic and LOS are evaluated using a rough estimation of the potential number of vehicle and truck trips and the duration and intensity of hauling under the various alternatives. Potential increases in traffic from construction-related vehicle and truck trips are assessed using projected traffic volume and LOS of key roadway segments generated by BRW and Lee Engineering (1998) and adjusting these projections based on current trends in visitation. As directed by Park Service NEPA guidelines, impact thresholds incorporate a broad range of potential increases in construction-related traffic under the various alternatives (Table 79). In addition, construction analyses also factor in the potential for temporary road closures that could affect transportation patterns (i.e., rerouting of traffic) and access by emergency personnel and services. The effects of temporary road closures are differentiated between sole access arterial roadways or roadways that have no alternate routes or detour capabilities and alternate access roadways or roadways that have alternate routes or detour capabilities. Construction activities on weekends would be restricted, so construction-related closures would be unlikely to affect heavier weekend traffic patterns.

TABLE 79. PUBLIC SERVICES – TRAFFIC AND TRANSPORTATION – CONSTRUCTION-RELATED IMPACTS

Source: Marin CWP, Point Reyes Station Community Plan, LCP Zone II Nature: Adverse Context: Local Community, Regional Duration: Construction	
No Impact	There would be no potential for impact to traffic or transportation in the local community associated with construction of the proposed project.
Negligible	There would be a negligible or barely detectable increase (≤ 5 percent) in traffic in the local community associated with construction of the proposed project that would not cause LOS to drop below Level D. Construction would not be anticipated to result in any temporary road closures on sole access or other types of arterial roadways during the construction period that would last longer than 5 minutes for each closure. No rerouting of traffic would be necessary.
Minor	There would be a minor or measurable increase (> 5 percent and ≤ 15 percent) in traffic in the local community associated with construction of the proposed project that would not cause LOS to drop below Level D. Construction would not be anticipated to result in any temporary road closures on sole access arterial roadways during the construction period that would last longer than 15 minutes for each closure. For roadways with alternate routes or detour potential, temporary road closures would not exceed 10 hours. On these roads, traffic, including emergency services, would be temporarily rerouted to alternative roads, when necessary.
Moderate	There would be a moderate or appreciable increase (> 15 percent and ≤ 30 percent) in traffic in the local community associated with construction of the proposed project that would not cause LOS to drop below Level D. Construction would not be anticipated to result in any temporary road closures on sole access arterial roadways during the construction period that would last longer than 30 minutes for each closure. For roadways with alternate routes or detour potential, temporary road closures would not exceed 20 hours. On these roads, traffic, including emergency services, would be temporarily rerouted to alternative roads, when necessary.
Major or Substantial	There would be a major or substantial increase (> 30 percent) in traffic in the local community associated with construction of the proposed project that might cause LOS to drop below Level D. Construction would be anticipated to result in any temporary road closures on sole access arterial roadways during the construction period that would last longer than 30 minutes for each closure. For roadways with alternate routes or detour potential, temporary road closures would exceed 20 hours. On these roads, traffic, including emergency services, would be temporarily rerouted to alternative roads.

Traffic and Transportation – Project-Related: Impacts to traffic and transportation from implementation or operation of the proposed project would result primarily from the potential increase in the number of visitors, residents, and vehicles coming to view the restored wetland or use public access facilities. Impact thresholds for project-related traffic associated with implementation of the proposed project are based on analyses by BRW and Lee Engineering of the effects of increases in park visitation on traffic volume and LOS of specific roadway segments in the Point Reyes area. Potential increases in traffic related to visitation are assessed using projected traffic volume and LOS of key roadway segments generated by BRW and Lee Engineering (1998) and adjusting these projections based on current trends in visitation. The potential effects of the proposed project on visitation are analyzed using information on the number of public access-related

structures, facilities and attractions/uses provided under each of the various alternatives. The number of potential users of public access-related facilities at each major destination point within the Project Area (i.e., southern perimeter trail, eastern perimeter trail, etc.) is then projected as low, medium, or high based on the number of public access-related structures, facilities, and attractions/uses that would be available for use, as well as the current number of users of existing facilities in the Project Area. For comparison purposes, projections took into account the recorded number of users of other structures, facilities, and attractions/uses within the Seashore at major destination points. To ensure that the analysis was conservative or cautious such it errs on the side of overestimating impacts, peak visitation for each major destination point within the Project Area was assumed to occur simultaneously. These peak visitation numbers were then converted to vehicle numbers based on the assumption that approximately 70 percent of the visitors would be driving alone, while 30 percent would be paired in vehicles. As directed by Park Service NEPA guidelines, impact thresholds incorporate a broad range of potential increases in project-related traffic under the various alternatives (Table 80).

TABLE 80. PUBLIC SERVICES – TRAFFIC AND TRANSPORTATION – PROJECT-RELATED EFFECTS

Source: Marin CWP, Point Reyes Station Community Plan, LCP Zone II Nature: Adverse Context: Local Community Duration: Long-Term	
No Impact	There would be no potential for impact to traffic or transportation in the Point Reyes area associated with implementation of the proposed project.
Negligible	There would be a negligible or barely detectable change (≤ 5 percent) in traffic associated with implementation of the proposed project that would cause no change in the LOS or cause LOS to drop below Level D.
Minor	There would be a minor or measurable change (> 5 percent and ≤ 15 percent) in traffic associated with implementation of the proposed project that would cause no change in the LOS or cause LOS to drop below Level D.
Moderate	There would be a moderate or appreciable change (> 15 percent and ≤ 30 percent) in traffic associated with implementation of the proposed project that might cause a change in the LOS, but would not cause LOS to drop below Level D.
Major or Substantial	There would be a major or substantial change (> 30 percent) in traffic associated with implementation of the proposed project or an increase in traffic of any magnitude that would cause LOS to drop below Level D.

Parking – Project-Related Effects: Impacts to parking from implementation or operation of the proposed project would result primarily from the potential increase in the potential number of visitors and residents that would be driving to the Project Area to use public access facilities and therefore require parking. Impact thresholds for project-related parking associated with implementation of the proposed project are based on analyses of increases in project-related vehicular trips and the presence or absence of parking for key destination areas or points for public access proposed under the various alternatives. To assess effects on parking, the number of spaces within each formal and informal parking lot was taken into consideration, along with estimated capacity or qualitative assessments of how heavily particular lots are currently used (e.g., low, medium, and high), with high characterized as those lots with occupancy of 90 percent of capacity or higher during weekdays or weekends (BRW and Lee Engineering 1998). Because there are no formal visitor parking lots in Point Reyes Station, parking was assumed to be at capacity on weekends and possibly some weekdays most of the year based on concerns regarding the lack of parking expressed in the Community Plan (Marin County Community Development Agency 2001) and by local residents during scoping. Using the projected increase in vehicles and qualitative assessment of parking availability and demand, impact thresholds focus qualitatively on the potential for increases in visitation associated with the proposed project to cause exceedance of the capacity of both formal and informal parking lots and areas during weekday and weekend periods and to adversely effect already congested parking conditions in Point Reyes Station (Table 81).

TABLE 81. PUBLIC SERVICES – PARKING – PROJECT-RELATED EFFECTS

Source: Marin CWP, Point Reyes Station Community Plan Nature: Adverse Context: Local Community Duration: Long-Term

TABLE 81. PUBLIC SERVICES – PARKING – PROJECT-RELATED EFFECTS

No Impact	There would be no potential for impact to parking in the Point Reyes area associated with implementation of the proposed project.
Negligible	There would be only a barely detectable change in parking demand relative to baseline conditions such that capacity of formal and informal parking lots. If parking demand increases, areas within the vicinity of the Project Area would generally be sufficient to handle parking demand even on busy weekends. There might be a negligible or barely detectable change (average daily ≤ 5 cars) relative to baseline conditions in parking demands in Point Reyes Station associated with implementation of the proposed project.
Minor	There would be a minor change in parking demand relative to baseline conditions. If parking demand increases, capacity of formal and informal parking lots within the vicinity of the Project Area would be generally sufficient to handle parking demand during the weekdays and most weekends, although parking lots would be at or near capacity on some of the very busiest weekends in the highest visitation months (President's Day weekend and weekends in May and August, BRW and Lee Engineering 1998). There might be a minor, but measurable change (average daily ≤ 10 cars) relative to baseline conditions in parking demands in Point Reyes Station associated with implementation of the proposed project.
Moderate	There would be a moderate change in parking demand relative to baseline conditions. If parking demand increases, capacity of formal and informal parking lots within the vicinity of the Project Area would be generally sufficient to handle parking demand during the weekdays and off-peak season (November through February) weekends, although parking lots would be at or near capacity on weekends during the peak visitation season (May – August). There might be a moderate and appreciable change (average daily ≤ 20 cars) relative to baseline conditions in parking demands in Point Reyes Station associated with implementation of the proposed project.
Major or Substantial	There would be a major or substantial change in parking demand relative to baseline conditions. If parking demand increases, capacity of formal and informal parking lots within the vicinity of the Project Area would only be sufficient to handle parking demand during the weekdays. Parking lots would be at or near capacity on almost all weekends. There would be a major and substantial change (average daily > 20 cars) relative to baseline conditions in parking demands in Point Reyes Station associated with implementation of the proposed project.

Alternative Transportation (Pedestrian and Bicycle Circulation) – Project-Related Effects: Impact thresholds focus on changes in alternative transportation routes or segments of routes resulting from implementation of the proposed project (Table 82). For the purposes of this analysis, alternative transportation is considered as alternative transportation routes or segments of routes that provide connectivity between communities and/or community business and residential areas and that would allow residents and visitors to walk or bicycle rather than use cars. Alternative transportation routes or segments of routes are differentiated from trails on the basis that trails do not necessarily provide connection between communities, but rather are intended to provide visitors and residents opportunities to enjoy natural resources of the region through passive and active activities (e.g., hiking, birdwatching, swimming, wildflower areas, etc.). Public access components that meet these criteria are assessed separately under Visitor and Resident Experience, although there may be overlap with facilities that serve both trail and alternative transportation needs. For this analysis, the number of alternative transportation routes and route segments under the various alternatives is totaled and compared with the existing number of routes and route segments to evaluate potential changes to alternative transportation resources. Improvements to existing alternative transportation routes or segments of routes that increase accessibility through increasing bicycle and pedestrian safety or the quality of the access -- e.g., adding guardrails, moving path away from edge of road, leveling or paving path, etc. – are incorporated, as well, although weighted lower in analysis than new routes and route segments.

TABLE 82. PUBLIC SERVICES – ALTERNATIVE TRANSPORTATION (PEDESTRIAN AND BICYCLE CIRCULATION)

Source: Park Service Management Policies, Marin CWP, Point Reyes Station Community Plan, LCP Zone II Nature: Beneficial, Adverse Context: Local Community Duration: Long-Term (Construction Effects addressed under Visitor and Resident Experience)	
No Impact	There would be no potential for impact to alternative transportation resources in the local community associated with implementation of the proposed project.
Negligible	The proposed project would result in an undetectable or barely detectable change in the number or accessibility/quality of alternative transportation routes and route segments in the local community.
Minor	The proposed project would result in a measurable change in the number or accessibility/quality of alternative transportation routes and route segments in the local community.

Moderate	The proposed project would result in an appreciable change in the number or accessibility/quality of alternative transportation routes and route segments in the local community.
Major or Substantial	The proposed project would result in a major or substantial change in the number or accessibility/quality of alternative transportation routes and route segments in the local community.

Impact Analysis

TABLE 83. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR TRAFFIC AND TRANSPORTATION

All impacts would be considered Local Community and are separately analyzed for Construction and/or Short-Term/Long-Term. Hyphenated entries refer to the range of impact intensity estimated for individual pollutants.

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Construction-Related Effects	Adverse-Negligible	Adverse-Negligible/ Minor	Adverse-Minor	Adverse-Minor/ Moderate	Adverse-Minor/ Moderate
Project-Related Effects	Adverse - Negligible	Adverse-Negligible/Minor	Adverse-Negligible/Minor	Adverse-Negligible/Minor	Adverse-Negligible
Parking	Adverse-Negligible	Adverse-Minor/ Moderate	Adverse-Minor/ Moderate	Adverse-Minor	Adverse-Minor
Alternative Transportation	No Impact	Beneficial-Moderate	Beneficial - Moderate	Beneficial - Minor	Beneficial - Negligible

No Action Alternative

Analysis: The No Action Alternative would generally have no impact to minor adverse effects on traffic and transportation in the local community during construction and after implementation (Table 83). Under the No Action Alternative, levees, tidegates, and culverts in the Giacomini Ranch are not breached or removed, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. The Park Service is required under its existing agreement with CalTrans to restore wetlands as mitigation for impacts caused by CalTrans to aquatic habitat from a road repair on State Route 1 in Marin County in exchange for the Park Service receiving monies to purchase and restore the Giacomini Ranch. The remainder of the levee would not be deconstructed, although there would be no levee maintenance. Olema Marsh is also not restored, and there would be no new public access facilities.

Negligible adverse effects on traffic in the local community would potentially occur during construction of the small wetland restoration/mitigation component in the East Pasture. Construction of this component would occur approximately over a two- to three-month period in the late summer-early fall during one construction year. Most of the impacts to transportation on state and local roadways in or near Point Reyes Station such as State Route 1 and Mesa Road during the construction period would result from increases associated with commuting of construction personnel to the Project Area, trailoring of construction equipment, and hauling of excavated sediments from the Project Area to local quarries on the Point Reyes Peninsula. A much smaller volume of non-soil material would be generated. This non-soil material would need to be hauled to a municipal landfill such as the Redwood Landfill in Petaluma, approximately 20-25 miles away, using other local roadways such as Point Reyes- Petaluma Road and Novato Boulevard: the number of truck trips would keep effects of regional hauling on traffic negligible. No construction-related temporary road closures would be anticipated. Hauling of excavated sediments would be expected to generate only approximately 44 truck trips total under the No Action Alternative. For the purposes of this analysis, the potential number of truck roundtrips per day was assumed to total up to 32, based on running of three (3) to four (4) trucks per day. Hauling would, therefore, be expected to have only very temporary, negligible adverse impacts on local arterial roadways such as Levee Road and the eastern portion of Sir Francis Drake Boulevard.

The duration of construction and particularly hauling is short enough to keep the overall impacts to the local community very negligible and to not change the LOS or decrease LOS below Level D, the county's minimum

standard for arterial roadways. Based on the fact that visitation rates have not kept pace with projected visitation trends through 2005, the proposed project may be able to have as many as 656 additional daily vehicle trips without causing a change in the LOS estimated in 1998 (BRW and Lee Engineering 1998). In fact, because of decreases in park and regional visitation, most of these roads appear to be potentially operating at a LOS of B or C currently, an improvement since 1998 when several roads such as Bear Valley had high enough traffic levels to be rated as operating at a Level D LOS (BRW and Lee Engineering 1998).

The No Action Alternative would not generate more than a very negligible increase in project-related traffic. As part of the existing purchase agreement with the Giacomini Trust, the Giacomini family received a 7-year Reservation-of-Use agreement under which the Giacomini Ranch will continue to operate as a dairy until the lease expires in spring 2007. At that time, the dairy will be closed, and there would be no potential for future operation of a dairy, because the dairy facility would be split approximately in half in terms of ownership. However, in keeping with management directives in the Seashore's GMP (1980), the Giacomini Ranch could be leased for grazing of dairy heifers or beef cattle through a separate environmental review process. Should grazing be allowed, livestock trucks would be expected to infrequently access the East and/or West Pastures for drop-off and pick-up of animals. Park Service staff would also occasionally access the Project Area for flood control maintenance, existing trail repair, and other management-related purposes. Assumption of full management of the Giacomini Ranch by the Park Service may also encourage more visitors to use existing public access facilities, but any increase would be expected to be very negligible and to not change the LOS of any of the state and local roadways or cause LOS to drop below Level D.

Because of the negligible increase in visitation, the No Action Alternative would also be expected to have very negligible effects on parking demand in the local community relative to baseline conditions. Two formal parking lots serve existing trails in the Project Area and vicinity. There is a Park Service-maintained parking lot at the trailhead for Tomales Bay Trail with approximately 14 parking spaces that generally have, based on the BRW and Lee Engineering criteria, very high parking capacity such that occupancy does not ever exceed 90 percent of capacity. Another parking lot at White House Pool County Park with approximately 43 parking spaces probably ranges in capacity from medium (occupancy does not exceed 90 percent of capacity except during weekdays and weekends in holiday and high season periods) to high (occupancy does not exceed 90 percent of capacity on weekdays and most weekends except some holiday and high season period weekends) capacity. Parking for the informal social path on the Giacomini Ranch north levee consists of one or more roadside pull-outs that can fit approximately 23 vehicles. During most of the year, parking capacity is very high, although parking often overflows onto the street during the winter high tide periods because of the high number of birdwatchers. There are no designated formal or informal parking areas for the Giacomini Ranch East Pasture and Green Bridge County Park trail network, with most people parking alongside homes on 3rd and C Street in Point Reyes Station or walking to the trail from other parts of town. Street parking is often at a premium on many, if not all, weekends in the town of Point Reyes Station, with people parking often some distance from the downtown district. Therefore, parking capacity for this trail is rated as low to possibly medium.

Alternative transportation in the form of pedestrian and bicycle routes and segments of routes in the Project Area and vicinity is restricted to limited pedestrian and bicycle use of Sir Francis Drake Boulevard near Inverness Park, with slightly higher numbers of pedestrians and bicyclists using White House Pool County Park and Levee Road to move between Silver Hills and Inverness Park areas and Point Reyes Station. Use has been limited by the lack of dedicated formal bike and pedestrian paths along arterial roadways such as Sir Francis Drake Boulevard, Levee Road, State Route 1, and Bear Valley Road. As described in Chapter 3 under Public Services – Traffic and Transportation, several studies have been conducted over the past few decades that have identified the need for or evaluated the feasibility of constructing a bike path in the Point Reyes Station, Inverness Park, and Inverness portion of Tomales Bay, including the West Marin Pathways study (Brian Wittenkeller & Associates and Copple Foreaker & Associates 1988) and an alternative transportation study contracted by Marin County (Alta Transportation Consulting 2001). Many of these proposed bike path alignments have been incorporated as objectives in county, community, and LCP plans and planning documents. The LCP (Marin County Comprehensive Planning Department 1981), *Marin County Unincorporated Area Bicycle and Pedestrian Master Plan* (Alta Transportation Consulting 2001), and the Point Reyes Station Community Plan (Marin County Community Development Agency 2001) support exploration of the feasibility of creating an East/West Greenway along the railroad-right-of-way and the concept of bike and pedestrian trail network in the West Marin area. However, implementation has seemingly been stymied by lack of funding and technical challenges and constraints of construction within or along west Marin's narrow road corridors. Although changes to alternative transportation may occur under other alternatives, no changes to alternative transportation conditions would occur under this alternative.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: There are no currently proposed or reasonably foreseeable projects that would have the potential to cause cumulative impacts should the No Action alternative be implemented. While the county has underscored the need for alternative transportation corridors in this portion of west Marin in its planning documents and has even identified some possible path locations, none of these proposals could be currently construed as reasonably foreseeable projects.

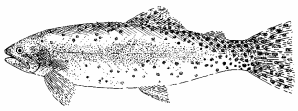
Conclusions: The No Action alternative would result in generally either no or only very negligible impacts on traffic and transportation in the local community, with most of the impacts from construction-related effects associated with the 11-acre wetland restoration/mitigation component. The most noticeable effects on traffic during the relatively short two to three-month construction period would occur on less heavily used local roadways such as C Street, Mesa Road, and Pierce Point Road, which would be subject to very temporary adverse impacts from hauling of excavated sediments to local quarries and/or commuting of construction personnel to and from the Project Area. Project-related effects on traffic and parking demands would be very negligible relative to baseline conditions and limited to vehicles and trucks associated with visitors and residents using existing public access facilities, flood control-related maintenance, and livestock transport. No changes in alternative transportation conditions would occur within the local community.

Alternative A

Analysis: Alternative A would generally have negligible to moderate effects on traffic and transportation in the local community during construction and after implementation (Table 83). Under Alternative A, only the East Pasture would be restored, with new public access facilities limited to the eastern and southern perimeters of the East Pasture. There would be no restoration or construction of new public access facilities in the West Pasture or Olema Marsh, except for the possible future extension of the southern perimeter trail to Inverness Park. In the East Pasture, restoration would involve breaching of levees in the East Pasture along Lagunitas Creek. Most of the actions under this alternative focus on removal or restoration of agricultural infrastructure such as filling of ditches, ripping of compacted roads, fence removal, and removal of pumps, pipelines, and concrete spillways.

Similar to the No Action Alternative, Alternative A would have the potential for negligible to minor adverse effects on traffic in the local community during restoration of the East Pasture and construction of public access facilities. Construction of the restoration component is estimated to take approximately five months or one construction season, while the public access component would be constructed after restoration is completed and is estimated to take an additional two construction seasons. Most of the negligible to minor impacts to transportation on state and local roadways in or near Point Reyes Station such as State Route 1, C Street, and Mesa Road during the construction period would result from increases associated with commuting of construction personnel to and from the Project Area, trailoring of construction equipment, and hauling of excavated sediments from the Project Area to local quarries on the Point Reyes Peninsula. No road closures would be anticipated unless the southern perimeter trail is extended to Inverness Park through widening of Sir Francis Drake Boulevard.

Over the life of the proposed project, hauling would generate approximately 2,000 truck trips compared to 44 truck trips under the No Action Alternative. This number does not include hauling associated with extension of the southern perimeter trail to Inverness Park: this component would be subject to further environmental compliance through a separate review process. The approach to disposal of excavated soils has not been defined yet, however, it would either involve stockpiling of excavated soils with hauling concentrated in a short time period, resulting in a high number of daily trips, or no stockpiling with fewer daily truck trips occurring over the entire construction period. For the purposes of this analysis, the potential number of daily truck roundtrips was assumed to be 32, based on use of three (3) to four (4) trucks per day for a period of approximately two months during one construction season.



Hauling would be expected to have negligible to minor adverse impacts on local arterial roadways such as Levee Road and the eastern portion of Sir Francis Drake Boulevard during those two months, with temporary increases in traffic roughly estimated at around 4 percent. Impacts to traffic from repeated haul trips would be more apparent further north on Sir Francis Drake Boulevard and Pierce Point Road, which leads to several of the high priority quarries. Truck trips would potentially cause roughly an estimated 5 to 8 percent increase in traffic on these roads, which would be characterized as a minor adverse effect. A much smaller volume of non-soil material would be generated, and this material would need to be hauled to a municipal landfill such as the Redwood Landfill in Petaluma, approximately 20-25 miles away, using other local roadways such as Point Reyes- Petaluma Road and Novato Boulevard: the number of truck trips (~32) would keep effects of regional hauling on traffic negligible.

In general, the effects of construction on traffic would be highest on smaller and more local roadways such as C Street, Mesa Road, Levee Road, and Pierce Point Road, however, under Alternative A, hauling and other construction-related traffic would generally be low enough to keep the overall impacts to the local community negligible to minor and to not change the LOS or decrease LOS below Level D, the county's minimum standard for arterial roadways. Based on the fact that visitation rates have not kept pace with projected visitation trends through 2005, the proposed project may be able to have as many as 656 additional daily vehicle trips without causing a change in the LOS estimated in 1998 (BRW and Lee Engineering 1998). In fact, because of decreases in park and regional visitation, most of these roads appear to be potentially operating at a LOS of B or C currently, an improvement since 1998 when several roads such as Bear Valley had high enough traffic levels to be rated as operating at a Level D LOS (BRW and Lee Engineering 1998).

Alternative A would also have the potential for a negligible to minor adverse effect on traffic after construction is completed due to the potential increase in use of expanded and improved public access facilities by park visitors and residents. Visitor and resident use of the newly constructed or enhanced southern and eastern perimeter trails would be expected to have minor adverse effects on roadways directly adjacent to the trail such as Levee Road, C Street, and Mesa Road, as well as some of the roads used to access these areas such as Bear Valley Road. Under this alternative, an ADA-compliant trail would originate from 3rd and C Street and follow the perimeter of the Point Reyes Mesa northwards to a viewing area located at the western edge of the former dairy facility. This trail --and increased use of existing trails such as the Olema Marsh trail due to better connectivity with other trails -- would be expected to potentially increase traffic by as much as 4- to 10 percent in the immediate vicinity of the southern perimeter trail relative to baseline conditions. Expansion of public access facilities, including conversion of the Tomales Bay Trail to a through-trail on the eastern perimeter of the Giacomini Ranch, would have only negligible effects on larger access roads such as State Route 1 south and north of Point Reyes Station, with increases in traffic roughly estimated at less than 2 percent.

Given the negligible to minor increases expected in vehicular traffic, Alternative A would also be expected to have minor to perhaps moderate effects on parking demand in the local community relative to baseline conditions. Under this alternative, capacity of formal and informal parking lots within the vicinity of the Project Area would generally be sufficient to handle parking demand during the weekdays and most weekends, although parking lots would be at or near capacity on some of the very busiest weekends in the highest visitation months (President's Day weekend and weekends in May and August). Formal parking for the western end of the southern perimeter trail would be located at White House Pool County Parking lot, which has 43 designated spaces. However, this trail would serve a considerable number of local residents who would walk, bicycle, or ride horses to the trail, thereby resulting in only a minor increase in parking demand for this lot.

As the eastern trail entrance would continue to exist at the corner of 3rd and C Streets, residents and visitors would also continue to park along adjacent streets in western Point Reyes Station. Street parking is often at a premium on many, if not all, weekends in the town of Point Reyes Station, with people parking often some distance from the downtown district. A minor to perhaps moderate increase in parking demand in western Point Reyes Station would potentially result from enhancement and expansion of the existing Giacomini Ranch East Pasture levee trail, with parking demand expected to increase by as much as three (3) to 10 cars on an average daily basis depending on the season and time of week. Parking for the eastern perimeter trail would be available at a newly created parking area off Mesa Road (approximately 5 cars), as well as the Tomales Bay Trailhead (approximately 14 cars). As with the southern perimeter trail, this enhanced through-trail would be expected to attract many local residents who would walk or ride to the trailheads.

Alternative A would have a moderate beneficial effect on alternative transportation in the local community. The southern perimeter trail would increase connectivity between Inverness Park and Point Reyes Station through construction of a through-trail from White House Pool County Park to an improved trail that would replace the existing path on the Giacomini Ranch East Pasture levee via a new bridge over Lagunitas Creek. In addition, the Park Service and CSLC would explore collaborating with the County to extend the trail northward along Sir Francis Drake Boulevard into Inverness Park at some point in the future. This trail would serve pedestrians, bicyclists, and equestrians. The eastern perimeter trail would also provide some alternative transportation benefits to the Point Reyes Station community, although opportunities to connect communities or businesses and residential areas are comparatively more limited.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Conclusions: Alternative A would generally have negligible to minor adverse effects on traffic and transportation in the local community. The most noticeable effects on traffic during the construction period would occur on less heavily used local roadways such as C Street, Mesa Road, and Pierce Point Road, which would be subject to minor adverse impacts from hauling of excavated sediments to local quarries and/or commuting of construction personnel to and from the Project Area. Expansion and improvement of public access facilities would result in negligible to minor adverse effects on traffic from increased visitation, although a lack of formal parking lots in Point Reyes Station might result in impacts on parking demands being moderate rather than minor in this part of town. This alternative would have moderate beneficial effects on alternative transportation by improving connectivity between Inverness Park and Point Reyes Station through construction of the southern perimeter through-trail, as well as, to a much lesser degree, by improving connecting connectivity between Point Reyes Station neighborhoods through construction of the eastern perimeter through-trail.

Alternative B

Analysis: Alternative B would have very similar negligible to moderate effects on traffic and transportation in the local community as Alternative A during construction and after implementation of the proposed project (Table 83). Under Alternative B, the East and West Pastures would be restored, but not Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, although a viewing area would replace the informal existing trail on the West Pasture north levee, which would be removed. There would also still be the potential for extension of the southern perimeter trail to Inverness Park.

Construction-related traffic impacts would be minor rather than negligible to minor as under Alternative A, because, under Alternative B, construction activities expand into the Giacomini Ranch West Pasture, thereby increasing traffic volume associated with construction equipment and personnel along perimeter roads such as Levee Road and the southern portion of Sir Francis Drake Boulevard near Inverness Park. The number of truck trips required to haul excavated sediments off-site to the local quarries would climb from approximately 2,000 under Alternative A to approximately 3,500 trips under Alternative B. This number does not include hauling associated with extension of the southern perimeter trail to Inverness Park: this component would be subject to further environmental compliance through a separate review process. As noted earlier, while the hauling approach has not been developed yet, analyses assume that hauling would involve continuous running of three (3) to four (4) trucks per day or 32 truck round trips per day during four months spread over two construction seasons. A much smaller volume of non-soil material would need to be hauled to a municipal landfill such as the Redwood Landfill in Petaluma, approximately 20-25 miles away, using other local roadways such as Point Reyes- Petaluma Road and Novato Boulevard: the total number of truck trips (41) would keep effects of regional hauling on traffic negligible. In addition, a small number of temporary road closures could occur on Sir Francis Drake Boulevard with movement of equipment in and out of the West Pasture, although closures would be expected to be very short-lived (< 10 minutes). A larger number may occur if the southern perimeter trail is extended to Inverness Park through widening of the Sir Francis Drake Boulevard road berm.

The effects of the new and improved public access facilities on traffic and parking volume and patterns and alternative transportation would be very similar to those described under Alternative A. With elimination of the existing informal trail on the West Pasture north levee, peak traffic and parking conditions along Sir Francis Drake Boulevard would actually improve relative to baseline conditions, as heavy visitor use during the three to four periods of extreme high tides during the winter often cause traffic and parking problems along the Inverness Park portion of this road.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

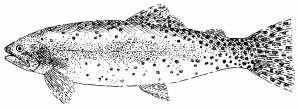
Conclusions: Alternative B would have very similar negligible to moderate impacts on traffic and transportation in the local community as Alternative A. As with Alternative A, the most noticeable effects on traffic during the construction period would occur on less heavily used local roadways such as C Street, Mesa Road, and Pierce Point Road, which would be subject to minor adverse impacts from hauling of excavated sediments to local quarries and/or commuting of construction personnel to and from the Project Area. Minor construction-related impacts would also occur under Alternative B on Levee Road and Sir Francis Drake Boulevard because of an increase of the amount of construction equipment and personnel and hauling of excavated sediments associated with expansion of restoration into the West Pasture and the potential for a small number of temporary road closures. Construction and expansion of public access facilities would result in negligible to minor adverse effects on traffic and parking demands from increased visitation, although a lack of formal parking lots in Point Reyes Station might result in the proposed project having moderate rather than minor impacts on the already low-capacity parking situation in the western portion of town. This alternative would have identical moderate beneficial effects as Alternative A on alternative transportation by improving connectivity between Inverness Park and Point Reyes Station through construction of the southern perimeter through-trail, as well as, to a much lesser degree, by improving connectivity between neighborhoods through construction of eastern perimeter through-trail.

Alternative C

Analysis: Alternative C would have negligible to moderate effects on traffic and transportation in the local community during construction and after implementation (Table 83). Under Alternative C, the East and West Pastures would be restored, along with Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, although access along the eastern perimeter would be scaled back through removal of the through-trail component. There would also still be the potential for extension of the southern perimeter trail to Inverness Park. In Olema Marsh, an adaptive restoration approach would be undertaken through fill excavation and possible culvert replacement to improve hydraulic connectivity and improve drainage of currently impounded waters.

Alternative C would have very similar minor to moderate adverse effects on traffic in the local community during construction as Alternative B. Construction of the restoration component would occur over a total of eight to 12 months broken into two construction seasons, while the public access component would be constructed after restoration is completed and would be expected to take two construction seasons. Most of the minor to moderate impacts to transportation on state and local roadways such as State Route 1, C Street, Mesa Road, Levee Road, Sir Francis Drake Boulevard, and Pierce Point Road during the construction period would result from temporary increases in traffic associated with commuting of construction personnel to the Project Area, trailoring of construction equipment, and hauling of excavated sediments from the Project Area to local quarries on the Point Reyes Peninsula. There may also be road closures associated with extension of the southern perimeter trail to Inverness Park through potential widening of the Sir Francis Drake Boulevard road berm.

In addition to the Sir Francis Drake Boulevard discussed under Alternative B, replacement of either or both the Levee Road culvert and the Bear Valley Road culvert as part of the Olema Marsh restoration component would likely require partial to full closure of Levee Road and Bear Valley Road, respectively, for a period of three days to several weeks depending upon the restoration approach (i.e., replace culvert or construct bridge).



Both Bear Valley and Levee Roads serve as important links to Sir Francis Drake Boulevard, the only road connecting the "mainland" portion of Marin County to homes, businesses, ranches, and northern portions of the Seashore that occur on the Point Reyes Peninsula. Replacement of these culverts with either improved culverts or bridges would not be undertaken simultaneously, so traffic could be rerouted onto one or the other of these two key arterial roadways. Should Levee Road be fully closed on a temporary basis, a detour or alternate route to Sir Francis Drake Boulevard using State Route 1 and Bear Valley Road would add approximately 5 minutes to the commute time. These construction-related road closures would have minor to moderate effects on local traffic depending on the duration of closure.

Over the entire life of the proposed project, hauling would be expected to generate approximately 5,700 truck trips under Alternative C from 3,500 under Alternative B and 44 under the No Action Alternative. This number does not include hauling associated with extension of the southern perimeter trail to Inverness Park: this component would be subject to further environmental compliance through a separate review process. The approach to disposal of excavated soils – stockpiling with short, intense periods of hauling versus less intense, but longer term hauling over entire construction period – has not been defined yet, but, for the purposes of this analysis, a total of up to 32 truck roundtrips per day was assumed, with running of three (3) to four (4) trucks per day during a total of approximately six (6) months spread over two construction seasons. Relative to existing traffic conditions, hauling would be expected to have minor to moderate adverse impacts on local arterial roadways, with temporary increases in traffic during those six (6) months roughly estimated as ranging from 5 to 10 percent. A much smaller volume of material would need to be hauled to a municipal landfill such as the Redwood Landfill in Petaluma, approximately 20-25 miles away, using other local roadways such as Point Reyes- Petaluma Road and Novato Boulevard: the number of truck trips (41) would keep effects of regional hauling on traffic negligible.

In general, the effects of construction-related traffic would be highest on smaller and more local roadways such as C Street, Mesa Road, Levee Road, and Pierce Point Road. Under Alternative C, hauling and other construction-related traffic would be high enough to temporarily decrease the LOS from Level B to Level C, but LOS would not decrease below Level D, the county's minimum standard for arterial roadways. Based on the fact that visitation rates have not kept pace with projected visitation trends through 2005, the proposed project may be able to have as many as 656 additional daily vehicle trips without causing a change in the LOS estimated in 1998 (BRW and Lee Engineering 1998). In fact, because of decreases in park and regional visitation, most of these roads appear to be potentially operating at a LOS of B or C currently, an improvement since 1998 when several roads such as Bear Valley had high enough traffic levels to be rated as operating at a Level D LOS (BRW and Lee Engineering 1998).

Similar to Alternative B, Alternative C would have negligible to minor adverse effect on traffic following implementation due to the projected increase in use by park visitors and residents of expanded public access facilities. Scaling back of the eastern perimeter through-trail to two spur trails would reduce effects on traffic and parking in the northern portion of Point Reyes Station somewhat, although impacts on local roadways such as Mesa Road would still be characterized as minor. Under this alternative, the ADA-compliant trail would be switched to the Mesa Road spur trail that leads out to the proposed viewing area near the Giacomini Hunt Lodge. The trail entrance at C Street in Point Reyes Station would be eliminated, with all access to the southern perimeter trail occurring through an improved entrance to the Green Bridge County Park near the Green Bridge or through White House Pool County Park. Elimination of the C Street trail entrance would reduce potential effects of the southern perimeter trail on parking demand near C Street to at least minor, if not negligible. With elimination of the existing informal trail on the West Pasture north levee, peak traffic and parking conditions along Sir Francis Drake Boulevard would actually improve relative to baseline conditions, as heavy visitor use during the three to four periods of extreme high tides during the winter often cause traffic and parking problems along the Inverness Park portion of this road.

Elimination of the C Street trail entrance for the southern perimeter trail, combined with conversion of the eastern perimeter through-trail to two spur trails, would reduce the benefits of Alternative C to alternative transportation and connectivity between communities and neighborhoods relative to the Alternatives A and B. The C Street trail entrance provides more direct access to the town of Point Reyes Station, but also has more potential for disturbance of adjacent landowners through noise, trash, and increase in on-street parking demand. Therefore, the effects of this alternative on alternative transportation would still be characterized as beneficial, but the intensity would be reduced to minor.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Conclusions: Alternative C would generally have negligible to moderate effects on traffic and transportation in the local community. The most noticeable effects on traffic during the construction period would occur on less heavily used local roadways such as C Street, Mesa Road, Levee, Sir Francis Drake Boulevard, and Pierce Point Road, which would be subject to minor to moderate adverse impacts from hauling of excavated sediments to local quarries and/or commuting of construction personnel to and from the Project Area. In addition, there is potential for temporary road closures associated with the Olema Marsh restoration component that could result in partial or full closure of Levee Road and Bear Valley Roads for anywhere from 3 days to several weeks. Over the long-term, construction and expansion of public access facilities would result in negligible to minor adverse effects on traffic and parking demand from increased visitation, with impacts on the congested parking situation in western Point Reyes Station reduced by elimination of the C Street trail entrance. Relative to the other alternatives, this alternative would have reduced benefits for alternative transportation and connectivity between communities or neighborhoods due to a change in the trail entrance for southern perimeter trail at Point Reyes Station to a slightly less direct route and conversion of the eastern perimeter through-trail to spur trails.

Alternative D

Analysis: Alternative D would have very similar negligible to moderate effects on traffic and transportation in the local community as Alternative C (Table 83). Under Alternative D as with Alternative C, the East and West Pastures would be completely restored, along with Olema Marsh. Under Alternative D, public access would be further scaled back through elimination of the bridge across Lagunitas Creek and one of the spur trails on the eastern perimeter. With elimination of the bridge, there would be no potential for extension of the southern perimeter trail to Inverness Park.

Alternative D would have minor to moderate adverse effects on traffic in the local community during construction as Alternative C. Construction of the restoration component would occur over a total of eight to 14 months broken into two to three construction seasons, while the public access component would be constructed after restoration is completed and would be expected to take two construction seasons. Most of the minor to moderate impacts to transportation on state and local roadways such as State Route 1, C Street, Mesa Road, Levee Road, Sir Francis Drake Boulevard, and Pierce Point Road during the construction period would result from temporary increases in traffic associated with commuting of construction personnel to the Project Area, trailoring of construction equipment, and hauling of excavated sediments from the Project Area to local quarries on the Point Reyes Peninsula.

Over the entire life of the proposed project, hauling would be expected to generate approximately 8,000 truck trips under Alternative D versus 5,700 truck trips under Alternative C. The approach to disposal of excavated soils – stockpiling with short, intense periods of hauling versus less intense, but longer term hauling over entire construction period – has not been defined yet, but, for this analysis, a total of up to 32 truck roundtrips per day was assumed, with running of three (3) to four (4) trucks per day for a total of approximately eight (8) months spread over two construction seasons. Relative to existing traffic conditions, hauling would be expected to have largely moderate adverse impacts on local arterial roadways, with temporary increases in traffic during those eight (8) months roughly estimated as ranging from 5 to 10 percent. A much smaller volume of material would need to be hauled to a municipal landfill such as the Redwood Landfill in Petaluma, approximately 20-25 miles away, using other local roadways such as Point Reyes- Petaluma Road and Novato Boulevard: the number of truck trips (49) would keep effects of regional hauling on traffic negligible.

In general, the effects of construction-related traffic would be highest on smaller and more local roadways such as C Street, Mesa Road, Levee Road, and Pierce Point Road. As with Alternative C, hauling and other construction-related traffic would be high enough to temporarily decrease the LOS from Level B to Level C, but LOS would not decrease below Level D. Because of decreases in park and regional visitation, most of these

roads appear to be potentially operating at a LOS of B or C currently, an improvement since 1998 when several roads such as Bear Valley had high enough traffic levels to be rated as operating at a Level D LOS (BRW and Lee Engineering 1998). As with Alternatives B and C, a small number of very temporary road closures may occur during construction on Sir Francis Drake Boulevard to allow for movement of construction equipment in and out of the West Pasture. In addition to temporary partial or full road closures required to replace Levee Road and Bear Valley Road culverts as part of the Olema Marsh restoration component, replacement of the Mesa Road culvert would also likely require partial to full closure of Mesa Road, respectively, for a period of three days to several weeks depending upon the restoration approach (i.e., replace culvert or construct bridge). Mesa Road is the main access road for several residential neighborhoods in the northern portion of Point Reyes Station. Should Mesa Road be fully closed on a temporary basis, residents would be required to access homes through the State Route 1 entrance, which would likely only have a negligible impact on detour times. These construction-related road closures would have minor to moderate effects on local traffic depending on the duration of closure.

Alternative D would have negligible to minor adverse effect on traffic and parking demands following implementation, but the intensity would be considerably reduced relative to Alternatives A, B, and C due to scaling back of expansion and improvement of public access facilities under this alternative. The bridge would be eliminated from the southern perimeter trail, resulting in Alternative D being really only an enhancement of existing public access facilities in the southern portion of the East Pasture and construction of a viewing area and improved entrance to the Green Bridge County Park. As with Alternative C, the trail entrance at C Street in Point Reyes Station would be eliminated, with all access to the southern perimeter trail occurring through an improved entrance to the Green Bridge County Park near the Green Bridge or through White House Pool County Park. Scaling back of the eastern perimeter trail would continue with elimination of the Mesa Road spur trail, which would leave only the proposed extension of the Tomales Bay Trail. These changes would be expected to reduce the increase in traffic and parking demand relative to baseline conditions to negligible or, at the very most, minor. With elimination of the existing informal trail on the West Pasture north levee, peak traffic and parking conditions along Sir Francis Drake Boulevard would actually improve relative to baseline conditions, as heavy visitor use during the three to four periods of extreme high tides during the winter often cause traffic and parking problems along the Inverness Park portion of this road.

Elimination of the “through” components of both the southern and eastern perimeter trails would considerably reduce, if not entirely eliminate, the benefits of Alternative D to alternative transportation and connectivity between communities and neighborhoods relative to the Alternatives A, B, and C. Therefore, the effects of this alternative on alternative transportation would probably be characterized as having no impact or, at the very most, a minor impact on quality of existing trail systems.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Conclusions: Alternative D would generally have negligible to moderate effects on traffic and transportation in the local community. The most noticeable effects on traffic during the construction period would occur on less heavily used local roadways such as C Street, Mesa Road, Levee, Sir Francis Drake Boulevard, and Pierce Point Road, which would be subject to largely moderate adverse impacts from hauling of excavated sediments to local quarries and/or commuting of construction personnel to and from the Project Area. In addition, there is potential for temporary road closures associated with the Olema Marsh and Tomasini Creek restoration components that could result in partial or full closure of Levee Road, Bear Valley Road, and Mesa Road for anywhere from 3 days to several weeks. Scaling back of expansion and improvement of public access facilities under this alternative would reduce the intensity of the proposed project’s effects on traffic and parking demand from increased visitation to largely negligible. Relative to the other alternatives, this alternative would have considerably reduced, if not no, benefits for alternative transportation and connectivity between communities or neighborhoods due to elimination of the “through” trail components for both the southern and eastern perimeter trails.

Visitor and Resident Experience – Public Access Resources

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

For the Park Service, "providing opportunities for appropriate public enjoyment is an important part of the Service's mission" (NPS 2006, Section 8.1). From the Park Service perspective, public education and enjoyment are integral components of the wetland restoration process: "When practicable, the Service will not simply protect, but will seek to enhance, natural wetland values by using them for educational, recreational, scientific, and similar purposes that do not disrupt wetland functions" (NPS 2006, Section 4.6.5).

Marin County, the LCP, and the Community Plan also actively support enhancement of public access and recreation. Within the Coastal Zone, the LCP (Marin County Comprehensive Planning Department 1981) encourages enhancement of public recreational opportunities and the development of visitor-serving facilities in its coastal zone, as long as it "preserves the unique qualities of Marin's coast and … is consistent with the protection of natural resources and agriculture." The LCP (Marin County Comprehensive Planning Department 1981), *Marin County Unincorporated Area Bicycle and Pedestrian Master Plan* (Alta Transportation Consulting 2001), and the Point Reyes Station Community Plan (Marin County Community Development Agency 2001) support exploration of the feasibility of creating an East/West Greenway along the railroad-right-of-way and the concept of bike and pedestrian trail network in the West Marin area. While facilitating public use, enjoyment, and appreciation of bayfront lands, projects should, however, "avoid or minimize disturbance to wetlands, necessary buffer areas, and associated important wildlife habitat" (Marin County Comprehensive Planning Department 1981). Both the LCP (Marin County Comprehensive Planning Department 1981) and the Point Reyes Station Community Plan (Marin County Community Development Agency 2001) have established policies against development of the Point Reyes Mesa bluff area above the railroad-right-of-way in the Giacomini Ranch East Pasture through setbacks.

Both the Architectural Barriers Act of 1968 (PL90-480) and the Americans with Disabilities Act (ADA) of 1990 (PL 101-336) help to ensure that buildings and other facilities meet set standards to make them accessible to all visitors, including those with disabilities. The Park Service complies with ADA standards and requires that walks or paths that connect to accessible features need to be made accessible and that key features in the park need to be made accessible. However, paths need to be kept consistent with preserving the natural and cultural resources of the park, if the same experience can be provided on some portion of the alignment or a different trail. Standards for outdoor recreational facilities are often guided by recommendations from a report issued in September 1999 by a Regulatory Negotiation Committee convened by the Architectural and Transportation Barriers Compliance Board (Access Board) to help guide development of guidelines for facilities such as trails, boating and fishing facilities, parks, and sports facilities. California has also developed handicap access standards through California Building Code, Title 24 regulations, although the Title 24 standards are intended for urban facilities and not necessarily rural and park-type trails.

Significance criteria related to public access developed by the state and county under CEQA focuses on the potential for the proposed project to: 1) substantially increase the demand for neighborhood or regional parks or other recreational facilities; 2) affect existing recreational opportunities; and 3) require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment.

General Assumptions and Methodologies

- The proposed project has the potential to affect visitor and resident experience during both construction and implementation of the proposed project.
  - Construction has the potential to adversely affect, at least temporarily, the visitor and resident experience by limiting or increasing the difficulty of access to public access facilities both in the Project Area and in other areas of the park and Point Reyes region and by disrupting the subjective quality of the visitor and resident experience in the Project Area and vicinity.
  - Implementation of the proposed project has the potential to cause both beneficial and adverse impacts to visitor and resident experience resources through potential closure of existing trails and facilities and/or construction of new trails and facilities.
- This section separately evaluates potential effects on the visitor and resident experience during the construction and project implementation phases of the proposed project. The potential for construction to affect traffic or road delays is specifically addressed under Traffic and Transportation: this impact

indicator more qualitatively evaluates how potential impacts might affect the overall visitor and resident experience.

- For this analysis, alternative transportation routes or segments of routes that connect communities or community commercial and residential areas are differentiated from public access facilities intended to allow visitors and residents to experience the natural resources of the region through attractions and uses. For this reason, alternative transportation is addressed under Public Services – Traffic and Transportation.

Described below are methodologies for impact indicators related to visitor and resident experience resources, including specific assumptions or details on methodologies.

Public Access Resources – Construction-Related Effects: Impact thresholds for construction-related impacts to visitor and resident experience focus on the potential for noise, traffic, and closures caused by construction to adversely affect the visitor and resident experience in the Project Area and in other areas of the park and Point Reyes region. To establish a broad range of intensities for potential effects, the thresholds qualitatively address a number of factors, including the projected length of time that construction might restrict access to facilities and the effects of construction noise and traffic on the subjective quality of the visitor and residence experience (Table 84). The potential for construction to increase traffic or road delays is specifically addressed under Traffic and Transportation: this impact indicator more qualitatively evaluates how potential impacts might affect the overall visitor and resident experience, although some traffic-related criteria are incorporated.

TABLE 84. PUBLIC ACCESS RESOURCES – CONSTRUCTION-RELATED EFFECTS

Source: Park Service Management Policies, Marin CWP, Point Reyes Station Community Plan, LCP Zone II Nature: Adverse Context: Project Area/Local Community, Regional (Seashore North District) Duration: Construction	
No Impact	There would be no potential for impact to visitor and resident experience in the Point Reyes area associated with construction of the proposed project.
Negligible	There would be barely detectable changes to access or enjoyment of public access facilities both inside and outside of the Project Area such that traffic or road delays caused by construction would be perceived by visitors as negligible. That is, visitors and residents using public access facilities would barely be able to detect a change in vehicle numbers or traffic patterns on arterial roadways. Temporary road closure events on sole access arterial roadways would never exceed 5 minutes, and temporary road closure events on alternate access arterial roadways that require detours would not be expected to exceed 48 hours. Visitors and residents using existing public access facilities in the Project Area and immediate vicinity would be only barely aware of construction activities, and access to facilities would be restricted during ≤ 10 percent of the year.
Minor	There would be measurable changes to access or enjoyment of public access facilities both inside and outside of the Project Area such that traffic or road delays caused by construction would be present, but relatively minor. That is, visitors and residents using public access facilities would perceive a measurable change in vehicle numbers or traffic patterns on arterial roadways, but it would not detract appreciably from visitor and resident enjoyment. Temporary road closure events on sole access arterial roadways would never exceed 15 minutes, and temporary road closure events on alternate access arterial roadways that require detours would not be expected to exceed 1 week. Visitors and residents using existing public access facilities in the Project Area and immediate vicinity would be aware of construction, but noise and activities would only result in a minor disruption to access and enjoyment such that access to facilities would be restricted, and/or construction would be apparent, but not disruptive, during ≤ 25 percent of the year.
Moderate	There would be appreciable changes to access or enjoyment of public access facilities both inside and outside of the Project Area such that traffic or road delays caused by construction would be moderate. That is, visitors and residents using public access facilities would perceive an appreciable change in vehicle numbers or traffic patterns on arterial roadways that would detract somewhat from visitor and resident enjoyment. Temporary road closure events on sole access arterial roadways would never exceed 30 minutes, and temporary road closure events on alternate access arterial roadways that would require detours would not be expected to exceed 4 weeks. Visitors and residents using existing public access facilities in the Project Area and immediate vicinity would be moderately aware of construction activities, and noise and activities would result in an appreciable disruption to access and enjoyment such that access to facilities would be restricted, and/or construction noise would be somewhat disruptive during ≤ 50 percent of the year.

TABLE 84. PUBLIC ACCESS RESOURCES – CONSTRUCTION-RELATED EFFECTS

Major	There would be striking changes to access or enjoyment of public access facilities both inside and outside of the Project Area such that traffic or road delays caused by construction would be major or substantial. That is, visitors and residents using public access facilities would perceive a striking change in vehicle numbers or traffic patterns on arterial roadways that would detract substantially from visitor and resident enjoyment. Temporary road closure events on sole access arterial roadways would exceed 30 minutes, and temporary road closure events on alternate access arterial roadways would be expected to exceed 4 weeks. Visitors and residents using existing public access facilities in the Project Area and immediate vicinity would be highly aware of construction activities, and noise and activities would result in a substantial disruption to access and enjoyment such that access to facilities would be restricted, and/or construction noise would be highly disruptive during > 50 percent of the year.

Public Access Resources – Project-Related Effects: Impact thresholds focus on changes in the number of structures, facilities, and attractions/uses that would be available as visitor and resident experience resources in the Project Area and immediate vicinity. To establish a broad range of intensities in effect, the number of potential future public access structures, facilities, and attractions/uses under the various alternatives is compared with the existing number of structures, facilities, and attractions/uses under baseline conditions (Table 85). Public access structures, facilities, and attractions/uses incorporate features such as visitor centers; bathrooms; parking; horse parking; water; trails; enhanced trails (including ADA-compatible facilities); and phones and attractions/uses such as biking; equestrians; dog walking, birdwatching; beach; fishing; swimming; wildflowers; whale watching; elephant seal observations, and trailheads for backpacking, etc. A simple weighting system is incorporated to reflect that the value to visitors and residents of structures, facilities, and attractions/uses associated with trails is often linked to some extent with its design as a loop, through-, or spur trail.

TABLE 85. PUBLIC ACCESS RESOURCES – PROJECT-RELATED EFFECTS

Source: Park Service Management Policies, Marin CWP, Point Reyes Station Community Plan, LCP Zone II Nature: Beneficial, Adverse Context: Project Area/Local Community Duration: Long-Term	
No Impact	There would be no potential for impact to visitor and resident experience resources in the Project Area and immediate vicinity associated with implementation of the proposed project.
Negligible	The proposed project would generate a negligible change (<10 percent) in public access structures, facilities, ADA-compliant facilities, and attractions/uses in the Project Area and immediate vicinity.
Minor	The proposed project would generate a minor change (>10 percent and ≤ 25 percent) in public access structures, facilities, ADA-compliant facilities, and attractions/uses in the Project Area and immediate vicinity.
Moderate	The proposed project would generate a moderate or appreciable change (> 25 and ≤ 50 percent) in public access structures, facilities, ADA-compliant facilities, and attractions/uses in the Project Area and immediate vicinity.
Major or Substantial	The proposed project would generate a major or substantial change (>50 percent) in public access structures, facilities, ADA-compliant facilities, and attractions/uses in the Project Area and immediate vicinity.

Impact Analysis

TABLE 86. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR VISITOR AND RESIDENT EXPERIENCE - PUBLIC ACCESS RESOURCES

All impacts would be considered Project Area/Local Community and/or Regional (North District) and are separately analyzed for Construction and Short-Term/Long-Term.

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Construction-Related Effects	Adverse-Negligible	Adverse- Minor	Adverse-Minor	Adverse-Moderate	Adverse-Moderate
Project-Related Effects	No Impact	Beneficial - Major	Beneficial - Major	Beneficial-Moderate	Beneficial - Minor

No Action Alternative

Analysis: The No Action Alternative would generally have no impact to negligible adverse effects on public access resources in the Project Area, local community, and region during construction and after implementation (Table 86). Under the No Action Alternative, levees, tidegates, and culverts in the Giacomini Ranch are not breached or removed, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. The Park Service is required under its existing agreement with CalTrans to restore wetlands as mitigation for impacts caused by CalTrans to aquatic habitat from a road repair on State Route 1 in Marin County in exchange for the Park Service receiving monies to purchase and restore the Giacomini Ranch. The remainder of the levee would not be deconstructed, although there would be no levee maintenance. Olema Marsh is also not restored, and there would be no new public access facilities.

Construction-Related Effects: Adverse effects on public access resources in the Project Area, local community, and region during construction would be very negligible and come principally from disruption of the visitor and resident experience through factors such as noise on the Giacomini Ranch East Pasture levee trail during construction of the small wetland restoration/mitigation component in the East Pasture. Construction of this component would occur approximately over a two- to three-month period in the late summer-early fall during one construction year. Construction activity would not only potentially affect access to existing trails in the Project Area and immediate vicinity, but access to public access facilities in the Seashore's North District (e.g., Lighthouse, Chimney Rock, Tomales Point, Abbott Lagoon) and Tomales Bay State Park. Under the No Action Alternative, most of the impacts to transportation on state and local roadways during construction would occur on State Route 1, Mesa Road, Levee Road, Sir Francis Drake Boulevard, and Pierce Point Road and would not be expected to have more than more than a very negligible effect on access to other public access resources in the local community and region, specifically the north district of the Seashore and Tomales Bay State Park. No construction-related temporary road closures would be anticipated.

Project-Related Effects-General Description: There would be no project-related effects on public access resources in the Project Area and local community.

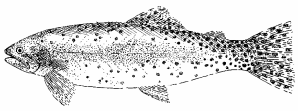
The Project Area and immediate vicinity currently incorporates approximately five (5) formal or informal trails or trail segments. Informal dirt paths have developed on the southern portion of the Giacomini Ranch East Pasture levee (0.46 mile) and the northern portion of the Giacomini Ranch West Pasture levee (0.3 mile) even before the Park Service bought the property. Formal dirt trails have been developed on the Martinelli Ranch north of Point Reyes Station (Tomales Bay Trail; Park Service – GGNRA), the White House Pool County Park (WCB lands leased by County Parks and Open Space District), and the 0.36-mile Olema Marsh Trail on the east of Olema Marsh (Park Service – Seashore). The Giacomini Ranch East Pasture trail connects with another 0.5-mile trail network in the Green Bridge County Park (WCB lands leased by County Parks and Open Space District). There are no formal overlooks, viewing areas, or platforms or areas with interpretative exhibits in the Project Area or immediate vicinity. None of the trailheads have any facilities to support visitation in terms of bathrooms, water fountains, payphones, or other structures.

Project-Related Effects-Use: Use of existing trails consists primarily of walking, dog walking, and birdwatching on the Giacomini Ranch and County park trails, with the 0.4-mile White House Pool County Park trail also being used for bicycles. The 1.37-mile Tomales Bay trail on the Martinelli Ranch primarily supports hikers. Although formal data on use of these trails do not exist, these trails are characterized as having very low, low, and low/medium number of users. All of the existing trails in the Project Area rank as very low (average of <50 people per day) in terms of use, including Tomales Bay Trail, Olema Marsh Trail, Giacomini Ranch West Pasture, Giacomini Ranch East Pasture, White House Pool county park, and Green Bridge County Park (E. Hulme, superintendent, Marin County Open Space and Park District, *pers. comm*.).

Project-Related Effects-ADA-Compliant Access: There are currently no ADA-compliant facilities within the Project Area, and there would be no construction of ADA-compliant facilities under the No Action Alternative.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable



Cumulative Impacts: There are no currently proposed or reasonably foreseeable projects that would have the potential to cause cumulative impacts should the No Action alternative be implemented. While the county has underscored the need for alternative transportation corridors in this portion of west Marin in its planning documents and has even identified some possible path locations, none of these proposals could be currently construed as reasonably foreseeable projects.

Conclusions: The No Action alternative would result generally in either no impact or negligible adverse effects on public access resources in the Project Area, local community, and region (Table 87). The most noticeable effect would come from potential disruption of the visitor and resident experience for users of the Giacomini Ranch East Pasture levee trail during the very short construction period (2-3 months) for the small wetland restoration/mitigation component in the East Pasture, largely through factors such as noise. There would be no project-related effects on public access resources, and there would be no ADA-compliant facilities, because none exist currently. Facilities would continue to serve primarily hikers and dog-walkers, with limited bicycle use.

Alternative A

Analysis: Alternative A would generally have minor adverse to major beneficial effects on public access resources in the Project Area, local community, and region during construction and after implementation (Table 86). Under Alternative A, only the East Pasture would be restored, with new public access facilities limited to the eastern and southern perimeters of the East Pasture. There would be no restoration or construction of new public access facilities in the West Pasture or Olema Marsh. In the East Pasture, restoration would involve breaching of levees in the East Pasture along Lagunitas Creek, and excavation of new tidal channels. The southwestern corner of the creek bank would be regraded to a more stabile profile. Most of the actions under this alternative focus on removal or restoration of agricultural infrastructure such as filling of ditches, ripping of compacted roads, fence removal, and removal of pumps, pipelines, and concrete spillways.

Construction-Related Effects: Adverse effects on public access resources in the Project Area, local community, and region during construction would be minor. Regrading of the southern portion of the East Pasture Lagunitas Creek bank and construction of the southern perimeter trail during two separate construction seasons would limit access to the Giacomini Ranch East Pasture levee trail, but access would be limited by construction activities during less than 25 percent of the construction year. Construction of the restoration component is estimated to take approximately five months or one construction season, while the public access component would be constructed after restoration is completed and is estimated to take an additional two construction seasons. In addition to restrictions on access, noise from restoration and construction activities in the southern portion of the East Pasture and possibly trucks on local roadways would also have the potential to disrupt the quality of the visitor and resident experience, particularly for users of the Giacomini Ranch East Pasture levee trail, Green Bridge County Park trail, and White House Pool County Park trail. Construction in the southern portion of the East Pasture would not be expected to extend beyond two months or 17 percent of the year. In addition, users of these trails are already exposed to a certain level of ambient noise from farm equipment and dairy operation; vehicles, motorcycles, and heavy trucks traveling on arterial roadways; and other ambient noise such as construction in adjacent towns.

Construction activity would not only potentially affect access to existing trails in the Project Area and immediate vicinity, but access to public access facilities in the Seashore's North District (e.g., Lighthouse, Chimney Rock, Tomales Point, Abbott Lagoon) and Tomales Bay State Park. Under Alternative A, most of the impacts to transportation on state and local roadways during construction would occur on State Route 1, C Street, Mesa Road, Levee Road, Sir Francis Drake Boulevard, and Pierce Point Road from commuting of construction personnel to and from the Project Area, trailoring of construction equipment, and hauling of excavated sediments from the Project Area to local quarries on the Point Reyes Peninsula. No construction-related temporary road closures would be anticipated. This alternative would not be expected to have more than more than a very negligible effect on access to other public access resources in the local community and region, specifically the north district of the Seashore and Tomales Bay State Park.

Project-Related Effects-General Description: Alternative A would have a major beneficial effect on public access resources in the Project Area and local community, increasing the number of structures, facilities, and attractions/uses available to visitors and residents by more than 50 percent. Two through-trails would be constructed on the southern and eastern perimeters of the East Pasture, replacing or enhancing five existing

spur or through- trails either on or adjacent to the Project Area. Public access would also continue along the existing informal dirt path on the north levee of the West Pasture. With the exception of the informal dirt path on the north levee, all of these facilities would serve hikers, equestrians, and bicyclists: the informal dirt path would be open only to hikers.

The southern perimeter path would connect Point Reyes Station with the White House Pool County Park. A decomposed granite trail that would be compliant with the Americans with Disabilities Act would be constructed from C Street in the vicinity of 3rd Street along an easement to the edge of the Dairy Mesa, where there would be a viewing area to allow the public to experience and enjoy the restoration project and views of Tomales Bay. The trail would continue along the edge of the East Pasture and Lagunitas Creek bank as does the existing informal social path. The existing dirt path in the Green Bridge County Park would be maintained and would connect to the proposed trail. The approximately 2,750-foot improved trail from the Dairy Mesa would lead to a 200-foot, 8-foot-wide bridge on Lagunitas Creek at the location of the old summer gravel dam that the Giacominis used to install for irrigation purposes (Figure 8). On the north side, the trail would connect to the existing dirt path in the White House Pool County Park. It would also connect via a crosswalk to the Olema Marsh Trail, which runs on the east side of Olema Marsh towards Limantour Road. Because of the potential for flooding during large storm events, use of this path would be weather-dependent. Length of the southern perimeter trail would total approximately 3,000 linear feet.

This through-trail would be expected to attract a medium to high number of pedestrians, bicyclists, and equestrians, particularly local residents in the towns of Inverness Park and Point Reyes Station. (Comparatively, Bear Valley Trail would be characterized as attracting a very high number of users). This trail links what is currently several disjunct trails such as the Giacomini Ranch East Pasture levee trail/Green Bridge County Park trail, White House Pool County Park trail, and the Olema Marsh trail, ultimately allowing at least indirect access between the town of Point Reyes Station and the Seashore's Bear Valley complex and trail system. Relative to baseline conditions, it would enhance existing public access resource values by offering better views of the restored wetland, Lagunitas Creek, and southern Tomales Bay and better opportunities for birdwatching through viewing areas on the Dairy Facility mesa and elevated structures such as the bridge. In addition to improving connectivity between the communities of Inverness Park and Point Reyes Station, this trail would have at least minor effects on safety for pedestrians and bicyclists commuting between the two villages.

The Park Service would collaborate with the County of Marin on a future project to extend the southern perimeter trail described above to Inverness Park by connecting to the existing informal path in the White House Pool County Park with a path along Sir Francis Drake that would either run alongside Sir Francis Drake Boulevard or move off the road at the southern end of the unrestored West Pasture onto a low-elevation boardwalk that would join back with Sir Francis Drake Boulevard in Inverness Park. This future component would improve connectivity and public safety for residents in Inverness Park. It could include a potential elevated overlook at White House Pool County Park that would connect to the existing parking lot with an ADA-compliant path. As was noted in Chapter 2, undercutting of the San Francis Drake Boulevard road berm by Lagunitas Creek at White House Pool would need to be addressed before the path could be extended to Inverness Park through construction of a cantilevered section of path or other option (LandPeople 2005). Similar to the southern perimeter trail, this portion of trail would serve primarily hikers and bicyclists, with equestrian use expected to be minimal.

A second through-trail would also be constructed on the historic railroad grade on the eastern perimeter of the East Pasture. The existing unimproved Tomales Bay Trail originates on Highway 1 and runs through GGNRA lands leased to the Martinelli family to Railroad Point. This new through-trail would be extended approximately 1,700 feet south along the historic and defunct railroad grade that runs along the eastern perimeter of the East Pasture at the base of the Point Reyes Mesa. Approximately 1,700 feet south of the existing terminus of the Tomales Bay Trail, a new improved trail, approximately 3,200 lineal feet in length, would be constructed through placement of a culverted earthen berm. At the southern end, the trail would connect to the existing informal path, which leads to Mesa Road via the paved access road that runs alongside the Giacomini Hunt Lodge, a house that was constructed by the Giacomini family and is under a 25-year Reservation of Use Agreement. Viewing areas would be constructed on the Tomales Bay Trail bluff and in the vicinity of the Giacomini Hunt Lodge. Up to five (5) parking spaces may be created at the junction of the railroad grade and Mesa Road. Length of the Eastern Perimeter Trail would total approximately 6,000 lineal feet.

This through-trail would be expected to attract a medium number of users, particularly local residents in the town of Point Reyes Station. This facility would serve hikers, equestrians, and bicyclists: the existing Tomales Bay Trail is already designated as a hiking and biking trail. This trail would enhance the quality of the public access resource experience of the existing Tomales Bay Trail by extending it and allowing direct access from the town of Point Reyes Station. Relative to baseline conditions, it would enhance existing public access resource values by offering better views of Tomasini Creek and better opportunities to observe the moderately high number of shorebirds and waterfowl that use the shallowly ponded area in the eastern portion of the East Pasture during the winter months.

Project-Related Effects-ADA-Compliant Access: This alternative would measurably increase the number of ADA-compliant facilities relative to baseline conditions through ensuring that a portion of the southern perimeter trail is consistent with accessibility guidelines for outdoor developed areas issued by a special committee convened by the Access Board. The Access Board is responsible for developing ADA guidelines. A decomposed granite trail that would be compliant with these standards would be constructed from C Street in the vicinity of 3rd Street along an easement to the edge of the Dairy Mesa, where there would be a viewing area to allow the public to experience and enjoy the restoration project and views of Tomales Bay. This portion of the trail would be constructed and maintained to improve mobility for people with disabilities, who might be using wheelchairs or other assistive devices. In addition, as part of the potential future extension of the southern perimeter trail to Inverness Park, an elevated overlook compliant with ADA standards may be constructed at White House Pool County Park that would connect to the existing parking lot with an ADA-compliant path.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Conclusions: Alternative A would generally have minor adverse to major beneficial effects on public access resources in the Project Area, local community, and region. Most of the construction-related effects would result from very temporary restriction of access on the Giacomini Ranch East Pasture levee trail, as well as temporary disruption of the quality of the visitor and residence experience on this trail and adjacent ones through noise from construction activities in the East Pasture and trucks on local roadways. Effects on regional public access resources from traffic delays or increased traffic would be very negligible.

This alternative would have major beneficial effects on enhancement and construction of public access resources in the Project Area and local community, increasing the number of structures, facilities, and attractions/uses available to visitors and residents by more than 50 percent. It would also incorporate ADA-compliant access that would allow people with disabilities to view and enjoy the restoration project. Two through-trails would be constructed on the southern and eastern perimeters of the East Pasture, replacing or enhancing five existing spur or through- trails either on or adjacent to the Project Area. Public access would also continue along the existing informal dirt path on the north levee of the West Pasture. In addition, the Park Service would collaborate with the County of Marin on a future project to extend the southern perimeter trail to Inverness Park. With the exception of the informal dirt path on the north levee, all of these facilities would serve hikers, equestrians, and bicyclists: the informal dirt path would be open only to hikers.

Alternative B

Analysis: Alternative B would have identical minor adverse to major beneficial effects as Alternative A on public access resources in the Project Area, local community, and region during construction and after implementation (Table 86). Under Alternative B, the East and West Pastures would be restored, but not Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, although a viewing area would replace the informal existing trail on the West Pasture north levee, which would be removed. Restoration would involve complete removal of levees in the East Pasture along Lagunitas Creek and excavation of even more new tidal channels. As with Alternative A, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

The primary differences between Alternatives B and A are that: 1) under this alternative, the West Pasture north levee would be removed, and the existing informal path would be replaced with a viewing area at the current trail entrance off Sir Francis Drake Boulevard; 2) the culverted berm portion of the eastern perimeter trail would be replaced with a low-elevation boardwalk; and 3) there may be a small number of temporary road closures during construction on Sir Francis Drake Boulevard.

Construction-Related Effects: Construction effects would be very similar to those described under Alternative A. During construction, a small number of very temporary road closures may occur on Sir Francis Drake Boulevard to allow for movement of construction equipment in and out of the West Pasture, however, construction activities would primarily occur during the weekdays and should, therefore, not have more than a minor effect on visitor access to portions of the park on the Point Reyes Peninsula.

Project-Related Effects-General Description: Project-related effects would be very similar to Alternative A, with a few exceptions as noted above. In general, the West Pasture levee spur trail is only infrequently used by a very low number of pedestrians. The trail is relatively short (0.3 miles) and primarily offers low-elevation views of the undiked marsh north of Giacomini Ranch, Lagunitas Creek, the West Pasture of the Giacomini Ranch, and the surrounding sloped areas of the Inverness Ridge and the Point Reyes Mesa. However, during portions of at least three to four weeks every winter, this trail receives heavy use from hundreds of bird-watchers interested in seeing California black rails (*Laterallus jamaicensis coturniculus*; ST), which are very secretive birds that are rarely visible except when they move to upland refugia areas such as the levees during extreme high tides and flooding each winter. Some of these birdwatchers come from hundreds of miles away to view these unusual and interesting birds. During high tides, birdwatchers crowd onto the narrow levee, typically stringing out in small groups along its length. Replacement of the existing levee trail with a viewing area would considerably decrease the attractiveness of this particular location for “birders” interested in viewing rails, because, relative to existing conditions, the viewing area would offer less direct viewing opportunities. There are no other areas within Tomales Bay currently that support rails, so birdwatchers would either have to settle for easily accessible, but less “direct” viewing locations such as the West Pasture viewing area or hike out to the end of the 1.37-mile Tomales Bay Trail. Over the long-term, the eastern perimeter trail may offer some viewing opportunities if the rail population moves into the restored salt marsh habitat at the northern end of the East Pasture. Even with this reduction in facilities and attractions/uses, Alternative B still rates as having major beneficial effects on public access resources.

Replacement of the culverted berm portion of the eastern perimeter trail would have only negligible effects on the quality of public access resources offered by this park facility. Boardwalks sometimes pose problems for horses, but, under this alternative, a special coating may be applied to increase traction for horses that would also muffle sound. The boardwalk would be very low to the ground, so there should be no difficulty with access.

Project-Related Effects-ADA-Compliant Access: Similar to Alternative A, this alternative would have measurably increase the number of ADA-compliant facilities relative to baseline conditions through ensuring that a portion of the southern perimeter trail is consistent with accessibility guidelines for outdoor developed areas issued by a special committee convened by the Access Board. The Access Board is responsible for developing ADA guidelines.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Conclusions: Alternative B would identical minor adverse to major beneficial effects as Alternative A on public access resources in the Project Area, local community, and region. Most of the construction-related effects would result from very temporary restriction of access on the Giacomini Ranch East Pasture levee trail, as well as temporary disruption of the quality of the visitor and residence experience on this trail and adjacent ones through noise from construction activities in the East Pasture and trucks on local roadways. Effects on regional public access resources from traffic delays or increased traffic would be very negligible.

This alternative would have major beneficial effects on enhancement and construction of public access resources in the Project Area and local community, increasing the number of structures, facilities, and attractions/uses available to visitors and residents by more than 50 percent. It would also incorporate ADA-compliant access that would allow people with disabilities to view and enjoy the restoration project. Two through-trails would be constructed on the southern and eastern perimeters of the East Pasture, replacing or enhancing five existing spur or through- trails either on or adjacent to the Project Area. In addition, the Park Service would collaborate with the County of Marin on a future project to extend the southern perimeter trail to Inverness Park. The informal dirt path on the north levee of the West Pasture would be replaced with a viewing area due to the fact that the West Pasture levee would be removed, which would adversely affect a limited number of existing users – birdwatchers who come during some portion of the three or four extreme high tide events each winter to view California black rails that are seeking refugia in upland areas such as the levees. However, even with loss of this facility and a reduction in attraction/uses in this area, Alternative B would still result in major beneficial effects on public access resources, with trail facilities serving hikers, equestrians, and bicyclists.

Alternative C

Analysis: Alternative C would generally have both moderate adverse and beneficial effects on public access resources in the Project Area, local community, and region during construction and after implementation (Table 86). Under Alternative C, the East and West Pastures would be restored, along with Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, although access along the eastern perimeter would be scaled back through removal of the through-trail component. Restoration would involve complete removal of levees in the East and West Pastures along Lagunitas Creek and excavation of even more new tidal channels. In Olema Marsh, an adaptive restoration approach would be undertaken through fill excavation and possible culvert replacement to improve hydraulic connectivity and improve drainage of currently impounded waters. As with the other alternatives, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

Construction-Related Effects: Adverse effects on public access resources in the Project Area, local community, and region during construction would be moderate. Regrading of the southern portion of the East Pasture Lagunitas Creek bank and construction of the southern perimeter trail during two separate construction seasons would limit access to the Giacomini Ranch East Pasture levee trail, but access would be limited by construction activities during less than 25 percent of the two construction years. Construction of the restoration component would occur over a total of eight to 12 months broken into two construction seasons, while the public access component would be constructed after restoration is completed and would be expected to take two construction seasons. In addition to restrictions on access, noise from restoration and construction activities in the southern portion of the East Pasture and possibly trucks on local roadways would also have the potential to disrupt the quality of the visitor and resident experience, particularly for users of the Giacomini Ranch East Pasture levee trail, Green Bridge County Park trail, and the White House Pool County Park trail. Construction in the southern portion of the East Pasture would not be expected to extend beyond four months or 30 percent of the year. In addition, users of these trails are already exposed to a certain level of ambient noise from farm equipment and dairy operation; vehicles, motorcycles, and heavy trucks traveling on arterial roadways; and other ambient noise such as construction in adjacent towns.

Construction activity would not only potentially affect access to existing trails in the Project Area and immediate vicinity, but access to public access facilities in the Seashore's North District (e.g., Lighthouse, Chimney Rock, Tomales Point, Abbott Lagoon) and Tomales Bay State Park. Under Alternative C, most of the impacts to transportation on state and local roadways during construction would occur on State Route 1, C Street, Mesa Road, Levee Road, Sir Francis Drake Boulevard, and Pierce Point Road from commuting of construction personnel to and from the Project Area, trailoring of construction equipment, and hauling of excavated sediments from the Project Area to local quarries on the Point Reyes Peninsula. As with Alternative B, a small number of very temporary road closures may occur during construction on Sir Francis Drake Boulevard to allow for movement of construction equipment in and out of the West Pasture, but most of these closures would occur on weekdays, which should minimize impacts during some of the highest visitation periods. In addition, replacement of either or both the Levee Road culvert and the Bear Valley Road culvert as part of the Olema Marsh restoration component would likely require partial to full closure of Levee Road and Bear Valley Road, respectively, for a period of three days to several weeks depending upon the restoration approach (i.e., replace culvert or construct bridge). Both Bear Valley and Levee Roads serve as important

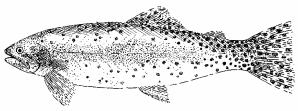
links to Sir Francis Drake Boulevard, the only road connecting the "mainland" portion of Marin County to the northern portions of the Seashore and the Tomales Bay State Park that occur on the Point Reyes Peninsula. Replacement of these culverts with either improved culverts or bridges would not be undertaken simultaneously, so traffic could be rerouted onto one or the other of these two key arterial roadways. Should Levee Road be fully closed on a temporary basis, a detour or alternate route to Sir Francis Drake Boulevard using State Route 1 and Bear Valley Road would add approximately 5 minutes to the commute time. The potential for road closures and detours increases the potential effect of this alternative relative to the other alternatives on public access resources in the vicinity of the Project Area and on the Point Reyes Peninsula from minor to moderate.

Project-Related Effects-General Description: Alternative C would have slightly less benefits for public access resources in the Project Area and local community than Alternatives A and B by increasing the number of structures, facilities, and attractions/uses available to visitors and residents by slightly less than 50 percent. The southern and eastern perimeter facilities would continue to serve hikers, equestrians, and bicyclists, but no through-trail opportunities would be offered on the eastern perimeter.

As with Alternatives A and B, a southern perimeter through-trail would be constructed on the southern perimeter of the East Pasture, replacing or enhancing at least existing spur or through- trails either on or adjacent to the Project Area. However, the Point Reyes Station entrance to the trail would be switched from 3rd and C Street, where it is located under Alternatives A and B, to an improved entrance in the Green Bridge County Park adjacent to the Green Bridge. The existing entrance at 3rd and C Street would be closed and fenced off to discourage access at this location. The trail starting at the Green Bridge would continue to connect to the eastern perimeter trail that leads either to the bridge or follows the edge of the mesa to the viewing area described under Alternative A, but the path would not be constructed as an ADA-compliant trail. The ADA-compliant trail would be constructed on the eastern perimeter of the East Pasture under this alternative. As was discussed under Traffic and Transportation, relocating the Point Reyes Station entrance would have some impacts on the value of this trail for alternative transportation purposes, although from a public access resource viewpoint, it would continue to offer many of the same attractions/uses in terms of views, birdwatching opportunities, etc. The bridge would still provide linkages with the White House Pool County Park and Olema Marsh trails, and the Park Service would collaborate with the County of Marin on a future project to extend the southern perimeter trail to Inverness Park.

In addition, under Alternative C, the eastern perimeter through-trail would be converted to two spur-trails. One spur trail would extend approximately 1,700 feet south from the terminus of the Tomales Bay Trail along the historic and defunct railroad grade that runs along the eastern perimeter of the East Pasture at the base of the Point Reyes Mesa. The other spur trail would be an ADA-compliant feature at the southern end of the railroad grade where it intersects with Mesa Road. From the small five-car parking area, an improved trail would be constructed to the viewing area in the vicinity of the Giacomini Hunt Lodge, a house that was constructed by the Giacomini family and is under a 25-year Reservation of Use Agreement. These spur trails would be expected to attract a lower number of users than a through-trail, because it decreases connectivity between neighborhoods and direct access to the Tomales Bay Trail from Point Reyes Station. However, the spur trails would still enhance existing public access resource values by offering better views and more opportunities to observe the moderately high number of shorebirds and waterfowl that use the shallowly ponded area in the eastern portion of the East Pasture during the winter months than under baseline conditions. In view of these changes, the benefits of Alternative C to public access resources are somewhat reduced relative to Alternatives A and B, with effects characterized as moderate beneficial.

Project-Related Effects-ADA-Compliant Access: This alternative would increase the number of ADA-compliant facilities relative to baseline conditions. Because the Point Reyes Station trailhead would be relocated to the Green Bridge, the ADA-compliant component of the southern perimeter trail would be eliminated. Instead, the Mesa Road spur trail would be improved so that it would be consistent with guidelines recommended under the Outdoor Recreation Standards. This portion of the trail would be constructed with decomposed granite and maintained to improve mobility for people with disabilities, who might be using wheelchairs or other assistive devices. It would connect to a viewing area near the Giacomini Hunt Lodge that would allow the public to experience and enjoy the restoration project and views of the southern portion of Tomales Bay. In addition, as part of the potential future extension of the southern perimeter trail to Inverness Park, an elevated overlook compliant with ADA standards may be constructed at White House Pool County Park that would connect to the existing parking lot with an ADA-compliant path.



Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Conclusions: Alternative C would generally have both moderate adverse and beneficial effects on public access resources in the Project Area, local community, and region. Most of the construction-related effects would result from temporary road closures and detours because of the Olema Marsh restoration component. Construction activities could temporarily restrict access to the Giacomini Ranch East Pasture levee trail, as well as temporarily disrupt the quality of the visitor and residence experience on this trail and adjacent ones through noise from construction activities in the East Pasture, West Pasture, and Olema Marsh and trucks on local roadways.

This alternative would offer slightly less benefits than Alternatives A and B in terms of enhancement and construction of public access resources in the Project Area and local community, increasing the number of structures, facilities, and attractions/uses available to visitors and residents by less than 50 percent. The southern and eastern perimeter facilities would continue to serve hikers, equestrians, and bicyclists, but no through-trail opportunities would be offered on the eastern perimeter. The southern perimeter through-trail would still be constructed, but the entrance from Point Reyes Station would be moved to a location that provides less direct access, and there would be no ADA-compliant component. The bridge would still provide linkages with the White House Pool County Park and Olema Marsh trails, and the Park Service would collaborate with the County of Marin on a future project to extend the southern perimeter trail to Inverness Park. The through-trail on the eastern perimeter would be converted to two spur trails, one of which would be ADA-compliant, and would offer the many of the same viewing and birdwatching opportunities, although there would be less connectivity between neighborhoods and no direct access to the Tomales Bay Trail from Point Reyes Station.

Alternative D

Analysis: Alternative D would generally have moderate adverse and minor beneficial effects on public access resources in the Project Area, local community, and region during construction and after implementation (Table 86). Under Alternative D as with Alternative C, the East and West Pastures would be completely restored, along with Olema Marsh. Almost all of the differences between Alternative D and C relate to excavation of a limited portion of the East Pasture to intertidal elevations, complete realignment of Tomasini Creek into one of its historic alignments, replacement of the Tomasini Creek Mesa Road culvert with a bridge or arch culvert, and further scaling back of new public access facilities through elimination of the bridge across Lagunitas Creek and one of the spur trails on the eastern perimeter. As with the other alternatives, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

Project-Related Effects-General Description: Impacts on public access resources in the Project Area, local community, and region during construction would be identical to Alternative C. However, Alternative D would offer even less benefits for public access resources in the Project Area and local community than Alternative C, increasing the number of structures, facilities, and attractions/uses available to visitors and residents by only slightly more than 15 percent and incorporating no ADA-complaint facilities. These facilities would largely serve hikers, although they would be open to use by equestrians and bicyclists.

The southern perimeter through-trail would become more of an enhancement of the existing spur trails at the Giacomini Ranch East Pasture and Green Bridge County Park, with elimination of the bridge. As with Alternative C, the Point Reyes Station entrance to the trail would be an improved entrance in the Green Bridge County Park adjacent to the Green Bridge. The existing entrance at 3rd and C Street would be closed and fenced off to discourage access at this location. The existing Giacomini Ranch East Pasture levee trail would be improved and extended along the edge of the mesa to the viewing area described under Alternative A. As was discussed under Traffic and Transportation, maintenance of a spur trail rather than construction of a through-trail would have impacts on the value of this trail for alternative transportation purposes, although from a public access resource viewpoint, it would continue to offer some of the same attractions/uses in terms of views, birdwatching opportunities, etc.

In addition, under Alternative D, only one of the two spur-trails described under Alternative C would be constructed. The Tomales Bay Trail would still be extended approximately 1,700 feet south from the terminus of the Tomales Bay Trail along the historic and defunct railroad grade that runs along the eastern perimeter of the East Pasture at the base of the Point Reyes Mesa. As with all the other action alternatives, a simple viewing area would be constructed at the top of the Tomales Bay Trail mesa. However, there would no Mesa Road spur trail, parking area, or viewing area in the vicinity of the Giacomini Hunt Lodge. Relative to Alternative C, enhancement of the Tomales Bay Trail would be expected to attract a lower number of users, although it would still enhance existing public access resource values by offering better views and more opportunities to observe the moderately high number of shorebirds and waterfowl that use the shallowly ponded area in the eastern portion of the East Pasture during the winter months than under baseline conditions. In view of these changes, the benefits of Alternative D to public access resources are even further reduced relative to the other action alternatives, with effects characterized as minor beneficial.

Project-Related Effects-ADA-Compliant Access: This alternative would have no ADA-compliant component and would therefore have no effect on ADA-compliant facilities relative to baseline conditions. This would be considered to have an adverse effect on public access resources that would counter to some degree the benefits provided by the constructed and enhanced public access facilities proposed under Alternative D.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Conclusions: Alternative D would generally have moderate adverse and minor beneficial effects on public access resources in the Project Area, local community, and region. Most of the construction-related effects would result from temporary road closures and detours because of the Olema Marsh restoration component. Construction activities could temporarily restrict access to the Giacomini Ranch East Pasture levee trail, as well as temporarily disrupt the quality of the visitor and residence experience on this trail and adjacent ones through noise from construction activities in the East Pasture, West Pasture, and Olema Marsh and trucks on local roadways.

This alternative would offer considerably less benefits than Alternatives A, B, and C in terms of enhancement and construction of public access resources in the Project Area and local community, increasing the number of structures, facilities, and attractions/uses available to visitors and residents by only slightly more than 15 percent relative to baseline conditions. No through-trails would be constructed. The Giacomini Ranch East Pasture levee spur trail would instead be improved with an extension along the edge of the mesa to the viewing area near the Dairy facility. The existing Point Reyes Station entrance at 3rd and C Street would be relocated to a location that provides less direct access. On the eastern perimeter, only one spur trail would be constructed, which would extend the Tomales Bay Trail approximately 1,700 feet. These facilities would offer many of the same viewing and birdwatching opportunities, although there would be less connectivity between communities and neighborhoods and no direct access between Inverness Park and Point Reyes Station. Because of this, they would largely serve hikers, although they would be open to use by equestrians and bicyclists. In addition, there would be no ADA-compliant facilities under Alternative D, which would counter to some degree the benefits provided under this alternative in terms of constructed and enhanced public access resources.

Visitor and Resident Experience – Visual Resources and Viewsheds

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

The Park Service Management Policies (2006) direct the agency to cause no impairment to park resources and values, including “scenery, scenic features, natural visibility, both in daytime and at night, and natural

landscapes." Furthermore, NEPA guides federal agencies to evaluate the effects of proposed actions on the quality of the visual experience of the affected environment.

State Route 1 in Marin County is a state scenic highway under the Caltrans Scenic Highway Program. The *Guidelines for the Official Designation of Scenic Highways* (Caltrans 1996) states that scenic byways are protected from imposition of negative visual intrusions and that permanent degradation of the quality of views from the highway may result in removal of scenic designation. The LCP (Marin County Comprehensive Planning Department 1981) identifies stretches of Sir Francis Drake Boulevard, including the segment of road boarding the West Pasture, as providing a scenic driving experience for coastal visitors and notes that, "in order to protect its **scenic rural character**, the road shall be maintained as a two-lane roadway" (emphasis added).

The LCP for Zone II (Marin County Comprehensive Planning Department 1981) refers to visual resource protection policies in the Coastal Act that address the importance of protection of views to scenic resources from public roads, beaches, trails, and vista points. The *Marin Countywide Plan* (draft Countywide Plan 2005) mandates that visual and esthetic resources, especially scenic vistas, shall be protected by review of planned projects and removal of inconsistent existing elements. The County has developed two policies to protect visual and esthetic resources: the Viewshed Protection Policy protects visual access to the bay front and scenic vistas of water and distinct shorelines through its land use and development review procedures; the View Corridor and Enhancement Policy urges that existing built elements, such as overhead utilities should be eliminated or blended into the environment.

General Assumptions and Methodologies

- The proposed project would affect visual resources through physical and management changes to the existing landscape in the Giacomini Ranch and Olema Marsh, as well as through construction and operation of public access facilities.
- Visual resources are considered within three contexts using two widely-accepted protocols used for evaluating visual impacts of proposed projects: the Federal Highway Administration (FHWA) technical document *Visual Impact Assessment for Highway Projects* (Federal Highway Administration 1983) and the US Forest Service (USFS) *Landscape Aesthetics*: *A Handbook for Scenery Management* (USDA 1995):
  - Internal esthetics, will the proposed action create or maintain internally consistent visual resources?
  - Relational esthetics, will the proposed action create or maintain visual resources that fit into the local community?
  - Environmental esthetics, will the proposed action enhance the visual quality of the environment?
- The analysis assesses effects of the proposed project on the following Visual Resource elements adopted from the FHWA (1983):
  - ***Vividness***: memorability of landscape components;
  - ***Intactness***: visual integrity of the landscape and relative absence of visually encroaching elements;
  - ***Unity***: compositional harmony of landscape components and coherence of features within a scene.
- Air quality and visibility are evaluated under Air Resources – Air Quality.
- Impacts to natural lightscapes (dark night skies) are considered under Visual Resources.
- Visual resources were evaluated for the entire Project Area from a set of eight (8) vantage points representative of the range of viewsheds available of the Project Area from homes, roads, and walking paths. Views from these vantage points are assessed only in the direction of the Project Area.
- For each of these views, the present landscape character was described according to principles defined in FHWA (1983) and USDA (1995) and incorporated natural lightscape characteristics, as required by Park Service Management Policies. Baseline conditions wee then compared to project changes to the views under all the project alternatives (Table 87).

TABLE 87. VISITOR AND RESIDENT EXPERIENCE – VISUAL RESOURCES AND VIEWSHEDS

Source: NPS Management Policies (2001) Nature: Beneficial, Adverse Context: Project Area, Community Duration: Construction, Short-Term, Long-Term	
No Impact	There would be no change in the quality of visual resources within the Project Area. The visual quality of views of the Project Area from surrounding lands within the watershed would not change.
Negligible/Minor	Changes to the quality of visual resources within the Project Area and to views of the Project Area from surrounding lands would be detectable, but the landscape would have the ability to absorb and incorporate the majority of the changes without disruption of integrity, diversity, prospect or natural lightscapes.
Moderate	Changes to the quality of visual resources within the Project Area and to views of the Project Area from surrounding lands would be readily noticeable. One or more secondary features of the site would be altered, but would not disrupt the overall integrity, diversity, prospect or natural lightscapes of the visual resources.
Major or Substantial	Changes to the quality of visual resources within the Project Area and to views of the Project Area from surrounding lands would be highly noticeable and dramatic. The visual resources would have substantial change in overall integrity, diversity, prospect or natural lightscapes.

Impact Analysis

TABLE 88. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR VISUAL RESOURCES AND VIEWSHEDS

All impacts are analyzed for the Project Area and for views of the Project Area from vantage points within the Community.

		No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator		Intensity, Nature, Type, Duration, and Context of Impact				
Visual Resources	Construction	Negligible Adverse	Minor Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse
	Short-Term	Minor Adverse	Minor Adverse	Minor Adverse	Moderate Adverse	Moderate Adverse
	Long-term	Minor Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial

No Action Alternative

Analysis: The No Action Alternative would generally have negligible to minor effects on visual resources within the Project Area (Table 88). Under the No Action Alternative, a small portion of the East Pasture (~11 acres) is converted from pasture or diked brackish marsh into tidal salt marsh. Agricultural management practices would be discontinued, but agricultural infrastructure such as levees, power poles, roads, pipes, and culverts would not be removed. There would be a potential for leased grazing through a separate environmental review and permitting process. No new public access facilities would be constructed under this alternative.

Short-Term/Long-Term: Because of these actions, the No Action Alternative would either convert a highly managed Pastoral Landscape into largely a lightly managed Pastoral or Ruderal Landscape, depending on whether leased grazing is permitted under this alternative in the future. Under the No Action Alternative, grazing would likely cease or be continued at lower densities. If grazing continues, this would preserve much of the Pastoral Landscape qualities that are currently provided under baseline conditions, although the quality of this Pastoral Landscape would continue to be low, because the unsightly intrusion of manmade elements or agricultural infrastructure such as levees, roads, pipes, power poles, and pumphouses negatively affects the visual intactness and unity of this particular landscape. However, without maintenance, unnatural linear features such as roads, levees, and irrigation ditches would eventually become less visible due to degradation and colonization by annual grasses and weedy forbs. These changes would improve the intactness and unity of visual resources,

which would be visible from vantages such as the Inverness Ridge, West Pasture North Levee, White House Pool County Park, Point Reyes Station C Street, the Hunt Lodge East Pasture, and the Tomales Bay Trail.

Within most of the Giacomini Ranch, discontinuation or a reduction in grazing pressure, along with elimination of agricultural management practices such as manure spreading, would cause a sharp, temporary increase in the areal extent or cover of weedy species such as common velvetgrass (*Holcus lantaus*), poison hemlock (*Conium maculatum*), bull thistle (*Cirsium vulgare)* and milk thistle (*Silybum marinum*). In addition, discontinuation of irrigation would convert the artificially green pastures in the East Pasture into brown grasslands during the summer. Over the short-term, these changes would negatively affect visual quality of the Project Area by converting it into a Ruderal Landscape and thereby decreasing the vividness, intactness, and unity of visual resources.

Natural Landscapes, characterized by unmanaged vegetation communities such as Tidal Salt Marsh, Tidal Brackish Marsh, Forested and Scrub-Shrub Riparian or, in some areas, Freshwater Marsh, would increase slightly under the No Action Alternative. In addition to the 11-acre restoration/mitigation component, additional acreage of natural habitats would establish or expand primarily on the Giacomini Ranch perimeters due to the lack of active agricultural management. These Natural Landscapes would introduce more visual diversity into the Giacomini Ranch portion of the Project Area, which is currently has low visual diversity due to the large extent of heavily managed pastures present. This visual diversity would result from a shift in the rather monotypic green, flat pastures to the various hues and structural types of Freshwater Marsh, Brackish Marsh, riparian, and other more natural vegetation communities. The discontinuation of agricultural management would allow passive expansion of Freshwater Marsh in portions of the Project Area such as along the perimeter of the West Pasture. In addition, Freshwater Marsh would be expected to continue to expand in Olema Marsh due to steadily increasing water levels and dieback of fringing riparian vegetation.

Over the long-term, the northern 11 acres of the East Pasture, which would be restored to undiked salt marsh habitat, would transition from pasture and Diked Brackish Marsh to Tidal Salt Marsh. During this transitional phase, the wetland restoration/mitigation area would probably become a mix of decaying vegetation with patchy establishment of opportunistic non-native and native brackish marsh species such as annual beard grass (*Polypogon monspeliensis*), brass-buttons (*Cotula coronopifolia*), and fathen (*Atriplex triangularis*). As with conversion of grasslands, this transitional phase would represent more of a Ruderal Landscape as this small area adjusts to changes in condition and would have many of the same negative impacts on visual resources over the short-term as the transitional phase in unrestored portions of the Giacomini Ranch. The restored area would not be highly visible from Project Area vantage points, but there could be some negligible adverse impacts on visual resources for people using the West Pasture north levee informal path and the Tomales Bay Trail during the transitional phase.

Riparian growth along Lagunitas Creek, Sir Francis Drake Boulevard and the existing channels in the West Pasture would be expected to expand naturally in the absence or reduction of grazing and other management practices. While riparian habitat is considered by many people to be aesthetically appealing, it also has the potential to obscure vistas or prospects of the Project Area. Any expansion of riparian habitat might conceal or shorten vistas of the Project Area in some areas, specifically the Sir Francis Drake Boulevard view corridor, West Pasture North Levee, White House Pool County Park, and Hunt Lodge East Pasture, but would also add structural and textural diversity to views. Removal of invasive plant species in riparian habitat along Sir Francis Drake Boulevard would temporarily denude the understory beneath the riparian overstory, leading to some short-term adverse impacts in terms of visual intactness to people driving along Sir Francis Drake Boulevard. Due to the dynamic growth characteristic of riparian communities, these impacts would be expected to be indiscernible after two growing seasons.

Over the long-term, some of the retained agricultural infrastructure such as the Giacomini Ranch levees would be expected to slowly degrade. This would not only break up linear features within the landscape, but it would also eventually lead to establishment of Natural Landscape over a larger percentage of the Project Area. Within the higher elevation areas that remain grassland, the sharp, immediate increase in weeds and opportunistic non-native grasses that would be expected to occur with close of the dairy would begin to taper off. Eventually, a more natural grassland community would be expected to establish, although it would continue to be dominated by non-native species. Relative to the expanse of monotypic green pasture present in the East Pasture currently, this grassland would have more visual diversity in terms of spatial variation in color and structural relief.

The No Action Alternative would be expected to have no effect on the natural lightscape of the Project Area and its environs.

Construction: While restoration is limited under the No Action Alternative, construction of the wetland restoration/mitigation component would require use of excavators, bulldozers, trucks, and other heavy equipment. Most of this equipment would be operating primarily in the northwestern corner of the East Pasture, which is only visible to residents of the Point Reyes Mesa and users of the Giacomini Ranch West Pasture informal path and the Tomales Bay Trail. Construction would take place over the dry months of one year. This equipment would disrupt visual resources in the Project Area, although impacts would be very temporary as the construction would only take a couple of months. Due to the very temporary and isolated nature of construction, impacts are characterized as only negligible or barely detectable.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: There is potentially one project that would have cumulative effects should Alternative A be implemented. The Giacomini Trust owns parcels along C Street on the eastern side of the dairy facility. These parcels are zoned Commercial-Residential (CRAB-2), with a minimum 10,000 square-foot-lot. The potential development site currently contains an unvegetated holding pen, milking barn, and manure piles. Views of the property from the C Street area are already partially obscured by a tall row of Cypress trees separating the Dairy Facility from C Street and by the existing Dairy Barns. In addition, the area is set 9 feet below street level (USGS 2003), which would reduce the extent to which structures built in this area would block the view. Structures in this area do have the potential to obscure some views of the most southern part of the pasture. In addition to shortening the prospect of the Project Area, the development would increase the human footprint of the town and degrade the visual integrity of views of the Project Area. However, relative to existing conditions and the dairy structures present, this project would be expected to have no more than a negligible effect on the overall visual resources.

Conclusions: The No Action Alternative would generally have negligible to minor effects on visual resources within the Project Area (Table 88). Under the No Action Alternative, agricultural management practices would be discontinued, but agricultural infrastructure such as levees, power poles, roads, pipes, and culverts would not be removed. Because of these actions, the No Action Alternative would either convert a highly managed Pastoral Landscape into largely a Ruderal or lightly managed Pastoral Landscape, depending on whether leased grazing is permitted under this alternative in the future.

Over the short-term, this shift would negatively affect the quality of visual resources through increasing the degree of weediness and eliminating the artificially green pastures in the East Pasture created by irrigation. Over the long-term, Natural Landscapes, characterized by unmanaged vegetation communities such as Tidal Salt Marsh, Tidal Brackish Marsh, Forested and Scrub-Shrub Riparian or, in some areas, Freshwater Marsh, would increase slightly under the No Action Alternative. In addition to the 11-acre restoration/mitigation component, more natural habitats would establish or expand primarily on the Giacomini Ranch perimeters due to the lack of active agricultural management. In other areas, the areal extent of non-native grasses and weeds that establishes with close of the dairy would eventually decline and lead over the long-term to establishment of more natural grasslands, although they would still be expected to be dominated by non-native species as are most grasslands in California. These changes would increase the visual diversity, unity, and vividness of landscapes in the Project Area by introducing more variation in the colors or hues and structural types of vegetation present.

Riparian habitat would also expand in response to the reduction in grazing pressure and discontinuation of agricultural management. This would have conflicting effects on visual resources. It would increase the extent of a habitat that many find to be visually appealing, but it would decrease the prospect or the extent of the Project Area that can be viewed from areas such as Sir Francis Drake Boulevard and White House Pool County park. There is potentially one project that would have cumulative effects should Alternative A be implemented. The Giacomini Trust owns parcels along C Street on the eastern side of the dairy facility. These parcels are zoned Commercial-Residential (CRAB-2), with a minimum 10,000 square-foot-lot. However, relative to baseline conditions and the existing dairy structures and trees already present, this reasonably foreseeable project in combination with the proposed project would be expected to have no more than a negligible adverse overall effect on visual resources.

Alternative A

Analysis: Alternative A would generally have minor adverse to moderate beneficial effects on visual resources within the Project Area (Table 88). Under Alternative A, agricultural management would be discontinued, and agricultural infrastructure would be removed. Only the East Pasture of the Giacomini Ranch would be restored, with no restoration in either the West Pasture or Olema Marsh. Public access would either be expanded or enhanced, primarily on the southern and eastern perimeters of the East Pasture.

Short-Term/Long-Term: Because of the expanded restoration in the East Pasture of the Giacomini Ranch, Alternative A would convert from a highly managed Pastoral Landscape into eventually more of a Natural Landscape, although the West Pasture and higher elevations of the East Pasture would largely remain Ruderal Landscape. This conversion would eliminate the Pastoral Landscape that exists under baseline conditions, although the quality is relatively low because the unsightly intrusion of manmade elements or agricultural infrastructure such as levees, roads, pipes, power poles, and pumphouses negatively affects the visual intactness and unity of this particular Pastoral Landscape unit. Pastoral Landscapes that perhaps have higher scenic integrity (i.e., less unsightly power poles, pumps, levees) continue to exist within the Seashore and on private lands in the local community and southern portion of the Tomales Bay watershed.

Through breaching the levee in several locations and creating tidal channels, the areal extent of Natural Landscapes within the 350-acre East Pasture would be increased from the minimal amount expected under the No Action Alternative to approximately 218 acres over the long-term. In addition, the removal of agricultural infrastructure such as roads, fences, irrigation ditches, and “hard” structures such as the loafing barn, worker housing, pumphouse, and power lines, would enhance the integrity or intactness and overall unity of these landscapes by eliminating unsightly human-made elements. The removal of southern portion of the East Pasture levee would actually increase the prospect or the ability to view the Project Area from vantages such as the White House Pool County park that are now hidden behind 8- to 12- foot-high levees.

Over the long-term, these restoration activities would increase the unity and diversity of visual resources in the East Pasture. Restoration of the northern portion of the East Pasture would lead to the establishment of landscape features created by flood and tide waters that would be characterized by greater variation in topography and vegetation such as hummocks and mounds and texturally rough, spatially patchy groupings of vegetation of different heights. As discussed under the No Action Alternative, increased tidal influence would be expected to result in a die-off of pasture grasses and herbs followed by a gradual transition to salt-tolerant species. For the first several seasons after levee removal, the northern portion of the East Pasture would be dominated by decaying pasture grasses and herbs, which would be immediately replaced by spatially patchy occurrences of opportunistic brackish marsh species such as annual beard grass (*Polypogon monspeliensis*), brass-buttons (*Cotula coronopifolia*), and other salt-tolerant native and non-native species. This would create, at least over the short-term, a more Ruderal Landscape that would have a minor adverse effect on visual resources by decreasing visual integrity or intactness, unity, and aesthetic appeal. Over time, species more characteristic of salt marshes such as saltgrass (*Distichlis spicata*), pickleweed (*Salicornia virginica*), and jaumea (*Jaumea carnosa*), would establish, with those areas closest to the tidal creek channels transitioning more quickly. This change would considerably increase the unity, diversity, and aesthetic appeal, of visual resources.

In higher elevation areas above regular tidal inundation such as the southern 30- 40 acres of the 350-acre East Pasture, the discontinuation of grazing and irrigation practices in the rest of the southern portion of the pasture would convert Wet Pasture vegetation communities in this area to an upland mix of non-native annual grasses and weedy forbs. In the first several years, the nutrient-rich soils would likely lead to a considerable increase in cover and overall height of weedy species, including non-native grasses, poison hemlock (*Conium maculatum*), bull thistle (*Cirsium vulgare),* and milk thistle (*Silybum marinum*). These species would eventually decrease in areal extent as nutrients reached levels more characteristic of lightly grazed areas or natural systems. Some of this weediness would be reduced by excavating and removing approximately 13 acres of heavily manured soils in the southern portion of the East Pasture. For a short period after the initial scraping, vegetation cover in this area would be sparse, but opportunistic salt-tolerant and salt-intolerant species would be expected to rapidly colonize depending upon exposure to at tidal action. As with the lower-elevation portions of the East Pasture, this transitional phase would create, at least over the short-term, a Ruderal Landscape that would have a minor adverse effect on visual resources by decreasing visual integrity or intactness, unity, and aesthetic appeal.

Visual resources in the West Pasture and Olema Marsh would be much as described under the No Action Alternative. The removal of grazing could cause a temporary increase in weedy communities, however, the effect is expected to be reduced in the West Pasture relative to the East Pasture, because this pasture is not as heavily managed with lower grazing pressure and no irrigation or manure spreading. Riparian growth would be expected to expand naturally on Fish Hatchery Creek and some of the other small drainages in the absence of grazing and other management practices. Similar to the No Action Alternative, the northern half of the large freshwater marsh in the West Pasture would continue to transition to a more brackish community. In the southern end of the marsh, vegetation cover in the newly excavated marsh created as part of a separate habitat enhancement project would remain relatively sparse as vegetation would take years to become fully established. Conversely, Freshwater Marsh would continue to expand in Olema Marsh, eliminating riparian habitat on the fringe of the marsh. Over the long-term, the remaining levees in the Giacomini Ranch East and West Pastures would likely degrade over time leading to further conversion of Ruderal into Natural Landscapes.

Riparian growth would be expected to expand naturally in the absence of grazing and other management practices, as well as through plantings on the south levee. This expansion would have conflicting impacts on viewshed: it would increase the areal extent of a type of natural vegetation that is often perceived by visitors and residents as aesthetically pleasing, but it would decrease prospects or opportunities for views of the restored East Pasture from the White House Pool County park trail and Levee Road residences, as well as views of Lagunitas Creek by users of the southern perimeter trail.

Several facilities are proposed to expand or enhance public access opportunities in the Project Area under Alternative A. The most prominent of the public access components proposed is the bridge spanning Lagunitas Creek for the southern perimeter trail, which would connect the town of Point Reyes Station with White House Pool County park. The path itself would follow the same alignment as the existing informal path and would not be likely to disrupt visual integrity or unity relative to baseline conditions. The new bridge, however, would likely be raised to a height equal to or exceeding the Green Bridge, but would not rise above the surrounding riparian canopy. Because it would break up the broad sweep of Lagunitas Creek as viewed from points east and west of the bridge, such as White House Pool and Inverness Ridge, it would likely have a minor to moderate adverse effect on the visual integrity or intactness and unity of visual resources in the immediate vicinity, most of which are relatively natural in appearance.

Alternative A also incorporates the eastern perimeter trail, which would follow the existing railroad grade from Mesa Road to the terminus of the Tomales Bay Trail. Construction of this trail would involve removal of wetlands and riparian vegetation. As discussed earlier, riparian vegetation has some intrinsic aesthetic value, so riparian loss could be considered adverse from a viewshed perspective, particularly as the trail would disrupt the integrity or intactness of the riparian and bluff visual resources. However, the trail would increase the number of vantage points from which the restored area can be viewed and would not be highly visible from the towns of Point Reyes Station and Inverness Park. The only potential viewshed impacts would be to residents on the Point Reyes Mesa and possibly users of the Tomales Bay Trail. Because the trail would be at the base of the Mesa, impacts to properties on the top of the mesa or bluff would be minor to moderate at most, because the trail would not be visible and would be unlikely to affect the unity of visual resources. Impacts to residents from potential noise are discussed under Air Resources – Noise and Soundscapes.

At some point, a proposed extension of the southern perimeter trail connecting White House Pool County Park to Inverness Park may be constructed in one of two locations. One proposed location is directly adjacent to Sir Francis Drake Boulevard. This alignment would potentially involve removal of riparian vegetation along Sir Francis Drake Boulevard because of the narrowness of the existing road berm along certain portions of the alignment. As discussed above, this would remove natural vegetation that is often perceived by visitors and residents as aesthetically pleasing, but it would create prospect or more opportunities for views of the unrestored West Pasture. The alternate route -- a proposed raised trail through the southern West Pasture -- would add a linear feature that might negligibly disrupt the integrity or intactness of the Natural Landscape, although it would be mostly obscured from Sir Francis Drake by the thick riparian vegetation adjacent to the road.

In addition to the trails, three constructed viewing areas would be constructed. Because they are intended to blend into the surrounding environment, these viewing areas or platforms would not be expected to detract from the scenic integrity and unity of landscapes in the Project Area.

Alternative A would be expected to have no effect on the natural lightscape of the Project Area and its environs.

Construction: Excavators, bulldozers, trucks and other heavy equipment would be temporarily visible from all sites, except along Bear Valley Road. Equipment would be visible on the East Pasture grading the levees, excavating new channels, disposing of soils with elevated nutrient content, removing infrastructure, and ripping up roads. These activities would be most visible on the eastern side of the Project Area. Construction would be expected to occur over a period of several months through the duration of one dry season. Impacts on visual quality would be moderate during actual construction activities, but of relatively limited duration.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: Cumulative impacts under Alternative A are the same as those described under the No Action Alternative.

Conclusions: The effects of Alternative A on visual resources would generally range from minor to moderate adverse impacts and minor beneficial impacts to visual resources in the Project Area. Because of the expanded restoration in the East Pasture of the Giacomini Ranch, Alternative A would convert a considerable portion of the highly managed, low-quality Pastoral Landscape into more of a Natural Landscape, although the West Pasture and higher elevations of the East Pasture would remain largely Ruderal Landscape with decreased unity, diversity, vividness, and aesthetic appeal relative to baseline conditions. Even areas expected to convert to Natural Landscapes would undergo a transitional phase that would probably be characterized as Ruderal Landscapes and of lower aesthetic value than baseline conditions. These changes, combined with construction of new public access facilities, would be expected to have minor adverse impacts on visual resources in the Project Area over the short-term, even with the removal of unsightly agricultural infrastructure. Over the long-term, establishment of salt marsh communities in more than two-thirds of the 350-acre West Pasture and gradual conversion of weedy high-elevation grassland communities towards conditions more characteristic of lightly grazed or natural systems would provide moderate benefits to the Project Area by increasing the integrity, unity, and diversity of visual resources. Removal of levees would also increase prospect or opportunities to view the restored East Pasture, however, expansion of riparian habitat with discontinuation of grazing could reduce viewing opportunities in certain areas, including the southern perimeter of the East Pasture and along Sir Francis Drake Boulevard.

There is potentially one project that would have cumulative effects should Alternative A be implemented. The Giacomini Trust owns parcels along C Street on the eastern side of the dairy facility. These parcels are zoned Commercial-Residential (CRAB-2), with a minimum 10,000 square-foot-lot. However, relative to baseline conditions and the existing dairy structures and trees already present, this reasonably foreseeable project in combination with the proposed project would be expected to have no more than a negligible adverse overall effect on visual resources.

Alternative B

Analysis: Alternative B would generally have very similar minor adverse to moderate beneficial effects on visual resources within the Project Area as Alternative A (Table 88). Under Alternative B, restoration efforts are expanded into the West Pasture, although there is still no restoration of Olema Marsh. From a viewshed perspective, the public access component is almost identical to that of Alternative A.

Short-Term/Long-Term: Because of the expanded restoration efforts in the Giacomini Ranch, Alternative B would convert a highly managed, low-quality Pastoral Landscape into more of a Natural Landscape, although higher elevations of the East and West Pastures would remain largely Ruderal Landscape with decreased visual integrity, unity, vividness, and aesthetic appeal relative to baseline conditions. This conversion would eliminate the Pastoral Landscape that exists under baseline conditions, although the quality of this landscape is relatively low because the unsightly intrusion of manmade elements or agricultural infrastructure such as levees, roads, pipes, power poles, and pumphouses decreases the integrity or intactness of this particular Pastoral Landscape unit. Pastoral landscapes that perhaps have higher scenic integrity (i.e., no or much less

unsightly power poles, pumps, levees) would continue to exist within the Seashore and on private lands in the local community and southern portion of the Tomales Bay watershed.

Most of the effects of Alternative B on visual resources would be very similar to those under Alternative A, with simply an increase in the extent of Natural Landscapes. A larger extent of pasture in the East Pasture and the West Pasture would be subject to tidal influence and would convert from pastureland to transitional habitats characterized by opportunistic brackish marsh species and eventually to salt marsh vegetation. Under Alternative B, approximately 255 acres of salt marsh would be expected to establish with complete removal of the East Pasture levees and breaching of the West Pasture levee, along with removal of the Fish Hatchery Creek and East Pasture Old Slough tidegates. This would be an 11 percent increase over the extent of salt marsh that could potentially develop under Alternative A. As with Alternative A, the higher elevation portions of the East and West Pasture would remain Ruderal Landscape or ruderal grassland dominated by non-native grasses and weeds. Despite this, overall, changes would be expected over the long-term to have a moderate beneficial effect on visual resources in the Giacomini Ranch. As discussed under Alternative A, transitional habitats would temporarily dominate the restored area, because the discontinuation of agricultural management practices such as grazing, manure spreading, and irrigation would promote establishment by weedy, opportunistic species. This would decrease visual integrity, unity, vividness, and aesthetic appeal over the short-term and result in minor adverse impacts to visual resources.

While Lagunitas Creek levees would be removed or breached under Alternative B, there would be the potential for construction of a small, low (2- to 3 vertical feet high) levee around lower elevation properties or homes on the east side of Sir Francis Drake Boulevard as a possible mitigation measure for potential flooding during larger flood events, although the extent of levee would be generally minor relative to baseline conditions. While increasing safety, these levees would decrease the prospect or vistas for these landowners, as well as at least locally detract from the visual integrity or intactness and unity of the restored pasture and Lagunitas Creek landscapes.

The public access component in Alternative B is virtually identical to that described under Alternative A. The one notable change that would affect visual resources and the ability to view the restored area would be the conversion of the informal spur path on the West Pasture north levee to an overlook at the entrance because of the deconstruction of the West Pasture north levee under Alternative B. As this, like the other overlooks would be in the form of a blind to minimize disturbance to avian species, it would be expected to have negligible adverse impact on visual resources in the Project Area and opportunities to view the Project Area.

Alternative B would be expected to have no effect on the natural lightscape of the Project Area and its environs.

Construction: The effects of construction would be similar to that of Alternative A, except that heavy equipment would be visible in both the southern and northern portions of the West Pasture. Construction of the restoration component would occur primarily during the summer and fall months over a period of two years: the public access component would be constructed separately either concurrently with restoration or after restoration is completed and would take an additional one to two construction seasons. Because the additional restoration in the West Pasture is rather minimal in terms of earthwork, Alternative B would still be expected to have a moderate adverse impact on visual quality during construction.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: Cumulative impacts under Alternative B are the same as those described under the No Action Alternative.

Conclusions: Alternative B would generally have very similar minor adverse to moderate beneficial effects on visual resources within the Project Area as Alternative A (Table 88). Under Alternative B, restoration efforts are expanded into the West Pasture, although there is still no restoration of Olema Marsh. From a viewshed perspective, the public access component and its effects on visual resources are almost identical to that of Alternative A. Because of the expanded restoration efforts in the Giacomini Ranch, Alternative B would convert a highly managed Pastoral Landscape into eventually more of a Natural Landscape, although higher

elevations of the East and West Pastures would largely remain Ruderal Landscape. Under Alternative B, approximately 255 acres of salt marsh would be expected to establish with complete removal of the East Pasture levees and breaching of the West Pasture levee, along with removal of the Fish Hatchery Creek and East Pasture Old Slough tidegates. This conversion would eliminate the Pastoral Landscape that exists under baseline conditions, although the quality of this Pastoral Landscape is relatively low because the unsightly intrusion of manmade elements or agricultural infrastructure such as levees, roads, pipes, power poles, and pumphouses. As with Alternative A, the higher-elevation portions of the East Pasture would convert into a Ruderal Landscape characterized by non-native grassland that would be lower in visual integrity, vividness, and aesthetic appeal relative to baseline conditions. Riparian vegetation would also continue to expand to some degree along Sir Francis Drake Boulevard, possibly decreasing the ability to view the restored West Pasture. Overall, these changes would have an overall moderate beneficial effect on visual resources over the long-term, however, conversion of pasture to either Natural Landscape or Ruderal Landscape would involve a transitional phase characterized by a sharp increase in weedy, opportunistic species that would detract from visual resources by decreasing intactness, unity, vividness, and aesthetic appeal, which would be a minor adverse impact over the short-term.

There is potentially one project that would have cumulative effects should Alternative A be implemented. The Giacomini Trust owns parcels along C Street on the eastern side of the dairy facility. These parcels are zoned Commercial-Residential (CRAB-2), with a minimum 10,000 square-foot-lot. However, relative to baseline conditions and the existing dairy structures and trees already present, this reasonably foreseeable project in combination with the proposed project would be expected to have no more than a negligible adverse overall effect on visual resources.

Alternative C

Analysis: Alternative C would generally have moderate adverse and beneficial effects on visual resources within the Project Area that would be very similar to those of Alternative B, at least for the Giacomini Ranch (Table 88). Alternative C includes restoration of both the East and West Pastures of the Giacomini Ranch, as well as restoration of Olema Marsh. Public access is scaled back slightly through conversion of the eastern perimeter through-trail to two spur trails that would not be aligned through the riparian/wetland habitat adjacent to Tomasini Creek and the Point Reyes Mesa bluff.

Short-Term/Long-Term: Alternative C would have very similar effects on visual resources to Alternative B for the Giacomini Ranch. As with Alternative B, Alternative C would convert a highly managed, low-quality Pastoral Landscape into more of a Natural Landscape. Additional restoration and revegetation efforts under this alternative would decrease the extent of Ruderal Landscape in the East Pasture by scraping off weed-dominated surface soils in 30 higher elevation acres in the southern portion of the pasture and conducting a limited revegetation effort with native grass and shrub species. While these restoration efforts would not result in a native-dominated grassland, they would decrease the extent of weediness expected in higher elevation areas of the East Pasture during the transitional and long-term phases of vegetation community establishment. Higher elevations of the West Pasture would still remain largely Ruderal Landscape with decreased visual integrity, unity, vividness, and aesthetic appeal relative to baseline conditions. As discussed under the other alternatives, this conversion would eliminate the Pastoral Landscape that exists currently, although the quality of this landscape is relatively low because the unsightly intrusion of manmade elements or agricultural infrastructure such as levees, roads, pipes, power poles, and pumphouses decreases the integrity or intactness of this particular Pastoral Landscape unit. Pastoral landscapes that perhaps have higher scenic integrity (i.e., no or much less unsightly power poles, pumps, levees) would continue to exist within the Seashore and on private lands in the local community and southern portion of the Tomales Bay watershed.

Most of the effects of Alternative C on visual resources in Giacomini Ranch would be very similar to those discussed under Alternatives A and B, with simply an increase in the extent of Natural Landscapes. Following restoration, transitional habitats would temporarily dominate the restored area, because the discontinuation of agricultural management practices such as grazing, manure spreading, and irrigation would promote establishment by weedy, opportunistic species. This would decrease visual integrity, unity, vividness, and aesthetic appeal over the short-term. However, over the long-term, complete removal of the Lagunitas Creek levees in both the East and West Pastures would result in establishment of more natural landscape features created by flood and tide waters, which would lead to more unity, vividness, and diversity in visual resources relative to baseline conditions through greater variation in topography and vegetation structure. Rather than the monotypic expanse of relatively flat green pasture currently present at least in the East Pasture, greater

interaction between the landscape and tidal and freshwater flooding would create more swales and hummocks, as well as a mosaic of rough, patchy vegetation groupings of various heights with a range of colors such as green, tan, and red. Establishment of more natural vegetation communities such as riparian habitat and Freshwater Marsh would also occur along the Giacomini Ranch perimeter with discontinuation of grazing and other agricultural management. These physical and biological changes, along with the more extended and sinuous nature of the tidal channels created in Alternative C relative to the straightened ditches currently present, would increase integrity and unity of visual resources, as well as the diversity of color, line, and texture. These long-term changes would have a moderate beneficial effect on visual resources in the Giacomini Ranch.

One of the largest differences in visual resources between Alternatives B and C comes from adaptive restoration of Olema Marsh. Under this alternative, some initial restoration actions would be undertaken to improve hydraulic connectivity and decrease surface water levels within the currently impunded marsh. Even these actions could cause some dramatic changes in the marsh's appearance, particularly over the short-term. With water levels expected to drop as much as 1- to 4 feet, extensive die-back of the tall emergent Freshwater Marsh vegetation such as cattails (*Typha* spp.), and bulrush (*Scirpus californicus* and *Scirpus acutus*) would occur as the marsh adjusts to lowered water levels through drops in topographic elevations and at least temporary changes in water and soil chemistry. During interim conditions, as the marsh begins adjusting to lower water surface levels, there may be some invasion of weedy, opportunistic species in response to disturbance and a pulse in concentrations of soil and water nutrients. While peak die-back would taper off within a few years, a large degree of variability in vegetation communities would be expected for at least 10- 15 years in terms of the degree of die-back, the extent of invasion by non-native species, and the rate of recolonization by marsh species until some kind of equilibrium condition is reached. This extensive vegetation die-back would be highly visible to vehicles on Bear Valley and Levee Roads and would, when combined with the minor adverse impacts expected over the short-term from restoration of the Giacomini Ranch, have moderate adverse effects on visual resources.

Over the long-term, this dramatic response to lowered water levels would be reduced as the marsh comes into equilibrium with changed conditions. Brackish marhs vegetation communities, probably dominated by tall emergent species, would be expected to establish near the mouth of the eastern culvert and along the Bear Valley Creek flowpath on the eastern side of the marsh, which would remain the area most influenced by tides. Freshwater Marsh would reestablish throughout most of the rest of the marsh, with the extent dependent on the degree of drawdown in water surface levels. The extent of tall emergents such as cattails and bulrush may decrease as a result of the decrease in water impoundment in Olema Marsh, leading to establishment of short- and mid-sized emergent marsh species. In addition, the lower water surface levels would reverse the current trend of dieback of fringing riparian habitat in response to steadily increasing water levels, which promoted expansion of freshwater marsh. While the dynamics of the marsh will have changed, restoration actions would ultimately increase the diversity of the plant communities and, therefore, the visual diversity that would result from strong variations in the color and structure of vegetation.

The public access components proposed in Alternative C are similar in both structure and visual impacts to those of Alternatives A and B. The most significant change from the two previous action alternatives comes from the conversion of the eastern perimeter through-trail to two spur trails. These spur trails would not cause any wetland or riparian impacts and would therefore preserve the integrity or intactness of the Tomasini Creek riparian/Point Reyes Mesa bluff visual resources. This conversion at least slightly diminishes the degree of impact to visual resources, particularly over the short-term. As with Alternatives A and B, the most prominent effect of the public access component on visual resources would result form construction of a new bridge spanning Lagunitas Creek near the location of the old summer dam. This bridge would likely be raised to a height equal to or exceeding the Green Bridge, but would not rise above the surrounding riparian canopy. Because it would break up the broad sweep of Lagunitas Creek as viewed from points east and west of the bridge, such as White House Pool and Inverness Ridge, it would likely have a minor to moderate adverse effect on visual resources by decreasing the visual integrity or intactness and unity of the predominantly Natural Landscape. As the southern perimeter trail would follow the alignment of the existing informal path, enhancement of this facility would have only negligible effects on visual resources relative to baseline conditions. At some point, the southern perimeter trail may be extended from White House Pool County park to Inverness Park. As discussed under Alternative A, this would have varying degrees of adverse impacts on the intactness and integrity of visual resources in areas in and along Sir Francis Drake Boulevard, although one of the possible alignments, widening the road berm, would remove riparian vegetation along the road that currently screens what would be the restored West Pasture from vehicles.

Alternative C would be expected to have no effect on the natural lightscape of the Project Area and its environs.

Construction: As in Alternative B, heavy equipment would be visible during construction in the Giacomini Ranch and Olema Marsh. Construction would occur primarily during summer and fall months for a period of at least two years, with implementation of many of the adaptive restoration components for Olema Marsh in subsequent years. The public access component would be constructed either during or subsequent to the Giacomini Ranch restoration depending on funding. These construction activities would have, at most, a temporary moderate adverse impact on visual resources, although impacts in less visible, more remote areas could be Under

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: Cumulative impacts under Alternative C are the same as those described under the No Action Alternative.

Conclusions: Alternative C would generally have very similar minor adverse to moderate beneficial effects on visual resources within the Giacomini Ranch as Alternative B, although impacts to visual resources from restoration of Olema Marsh would elevate short-term impacts to moderate (Table 88). Under Alternative C, restoration efforts are expanded into the Olema Marsh, as well as the Giacomini Ranch. Within the Giacomini Ranch, most of the highly managed, low-quality Pastoral Landscape would be converted by complete removal of all the Lagunitas Creek levees into eventually more of a Natural Landscape, particularly with restoration and revegetation of the higher-elevation 30 acres in the southern portion of the East Pasture. Higher elevations of the West Pasture would still largely remain Ruderal Landscape. This conversion would eliminate the Pastoral Landscape that exists under baseline conditions, although the quality of this Pastoral Landscape is relatively low, because the unsightly intrusion of manmade elements or agricultural infrastructure such as levees, roads, pipes, power poles, and pumphouses detracts from the intactness or integrity of this particular type of landscape. Overall, these changes would have an overall moderate beneficial effect on visual resources over the long-term, however, conversion of pasture to either Natural Landscape or Ruderal Landscape would involve a transitional phase characterized by a sharp increase in weedy, opportunistic species that would detract from visual resources by decreasing intactness, unity, vividness, and aesthetic appeal. In addition, the inclusion of Olema Marsh in the restoration project would increase temporary impacts to visual resources through the extensive die-back of vegetation expected from improving hydraulic connectivity and decreasing surface water levels within the highly impounded marsh. This would increase short-term impacts from minor to moderate under Alternative C. However, over the long-term, restoration of the marsh would reverse some of the adverse impacts to riparian habitat that have been caused by increasing water levels and the associated increase in Freshwater Marsh. From a viewshed perspective, the public access component and its effects on visual resources are almost identical to that of Alternative B, although the eastern perimeter through-trail would be converted to two spur trails, thereby slightly decreasing impacts on the integrity of visual resources along Tomasini Creek and the Point Reyes Mesa bluff.

There is potentially one project that would have cumulative effects should Alternative A be implemented. The Giacomini Trust owns parcels along C Street on the eastern side of the dairy facility. These parcels are zoned Commercial-Residential (CRAB-2), with a minimum 10,000 square-foot-lot. However, relative to baseline conditions and the existing dairy structures and trees already present, this reasonably foreseeable project in combination with the proposed project would be expected to have no more than a negligible adverse overall effect on visual resources.

Alternative D

Analysis: Alternative D would have almost identical effects on visual resources in the Project Area as Alternative C (Table 88). Under Alternative D, the restoration components for the West Pasture and Olema Marsh would be identical to those of Alternative C, but some of the higher elevation areas in the southern portion of the East Pasture would be lowered to intertidal elevations. Tomasini Creek would also be completely realigned into one of its historic alignments, and upstream hydraulic connectivity would be

improved through replacement of the Mesa Road culvert. Public access would be scaled back considerably relative to Alternative C, with the elimination of the through-trail component for the southern perimeter trail, including the bridge spanning Lagunitas Creek.

Short-Term/Long-Term: As noted above, the effects of Alternative D on visual resources would be almost identical to those under Alternative C. The excavation of higher-elevation portions of the East Pasture to intertidal elevations could have negligible beneficial effects on visual resources over the long-term, because salt marsh would have fewer weeds than grassland and thereby increase the unity and aesthetic appeal of the Natural Landscape. The complete rerouting of Tomasini Creek could increase the visual diversity by adding a sinuous curve or line to the relatively flat landscape. These changes would provide negligible additional benefits to visual resources.

In addition, the public access component in Alternative D would slightly reduce some of the impacts from construction of public access discussed for Alternatives A-C. The southern perimeter through-trail would be converted into a spur trail with a similar alignment to the current informal path, and there would be no bridge. There would also be no potential for extension of the southern perimeter trail to Inverness Park. Public access would be further scaled back by elimination of one of the two spur trails on the eastern perimeter.

Even with these changes, the intensity of impacts on visual resources would be characterized as identical to those under Alternative C, with moderate adverse impacts over the short-term and moderate beneficial effects over the long-term relative to baseline conditions.

Alternative D would be expected to have no effect on the natural lightscape of the Project Area and its environs.

Construction: Construction impacts on visual resources would be very similar to those described under Alternative C.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable.

Cumulative Impacts: Cumulative impacts under Alternative D are the same as those described under the No Action Alternative.

Conclusions: Alternative D would have almost identical effects on visual resources in the Project Area as Alternative C (Table 88). The excavation of higher-elevation portions of the East Pasture to intertidal elevations could have negligible beneficial effects on visual resources over the long-term, because salt marsh would have fewer weeds than grassland and thereby increase the unity and aesthetic appeal of the Natural Landscape. The complete rerouting of Tomasini Creek could increase the visual diversity by adding a sinuous curve or line to the relatively flat landscape. In addition, the considerable scaling back of public access component under Alternative D would slightly reduce some of the impacts from construction of public access discussed for Alternatives A-C. Even with these changes, the intensity of impacts on visual resources would be characterized as identical to those under Alternative C, with moderate adverse impacts over the short-term and moderate beneficial effects over the long-term relative to baseline conditions.

There is potentially one project that would have cumulative effects should Alternative A be implemented. The Giacomini Trust owns parcels along C Street on the eastern side of the dairy facility. These parcels are zoned Commercial-Residential (CRAB-2), with a minimum 10,000 square-foot-lot. However, relative to baseline conditions and the existing dairy structures and trees already present, this reasonably foreseeable project in combination with the proposed project would be expected to have no more than a negligible adverse overall effect on visual resources.

Socioeconomics

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

Park Service regulations for NEPA compliance state that, "social and economic impacts are considered an integral part of the human environment in the (Park Service) and should be analyzed in any NEPA document where they are affected. Socioeconomic impacts include those to minority and low-income communities as specified in the Environmental Justice Executive Order (EO 12898; Feb. 11, 1994)." This executive order - Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations - requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities.

CEQA typically focuses on physical changes caused by a project. Economic or social effects of a project are not treated as significant effects on the environment in and of themselves (Section 15131(a)). However, if a project causes a physical change, economic or social effects may be used to determine the significance of physical changes caused by the project (Section 15131(b)). Under Section 21083(c), CEQA requires an agency to determine that a project may have a significant effect on the environment if it will cause substantial adverse effects on human beings, either directly or indirectly.

Significance criteria developed by the county under CEQA incorporate guidance from the state about addressing any social or economic impacts which can be traced through a chain of cause and effect to physical changes.

General Methodologies and Assumptions

- Marin County has a $500 million annual tourist industry. It is estimated that the Seashore contributes over $150 million to the regional economy visitor expenditures on dining, fuel, gifts, groceries, and lodging (NPS 2002). Including secondary effects, the total economic impact of the park on the local economy is $113 million in sales, $42 million in wages and salaries, and 1,800 jobs (Michigan State University 2001).
- The proposed project would potentially have an effect on the local economy through increases in visitation to the restored wetland and public access facilities.
- In addition to any possible effects on minority and low-income populations and communities, alternatives were evaluated for their potential direct impacts, such as increased visitation and tourist dollars, and indirect economic effects, such as potential increases in property value for properties bordering the Project Area due to the attractiveness of living adjacent to a restored wetland.
- During construction, the proposed project would have the potential to adversely affect socioeconomic conditions in the local community through any detrimental effects that the construction activities have on visitation to the Project Area and other portions of the Seashore, Tomales Bay State Park and other state and local parks, and private commercial businesses on the Point Reyes Peninsula.
- Impact thresholds are based on estimates of 2.5 million visitors generating $150 million in 2000 (NPS 2002; Table 89). This equates to approximately $60 per visitor contributed to the local economy.
    - Estimates of potential increases in visitation associated with implementation of the proposed project are used to evaluate the relative magnitude of potential effects on socioeconomic conditions in the local community.
    - One of the factors qualitatively taken into consideration is the number of ***new*** visitors drawn to the local community by facilities offered by the proposed project versus the number of users that are either residents or incidental users or visitors who come to the Region for other reasons, but who ended up using facilities. The former would be considered new dollars for the local economy.
    - For the construction period, the potential impacts in road delays or detours on visitation to the local community are qualitatively evaluated in terms of temporary effects on socioeconomic conditions.

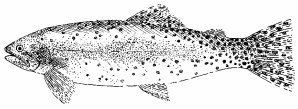


TABLE 89. SOCIOECONOMIC RESOURCES

Source: CEQ. Park Service regulations, California and County CEQA policies Nature: Beneficial, Adverse Context: Local Community Duration: Construction, Short-Term, Long-Term	
No Impact	There would be no potential for impact to socioeconomic conditions in the local community associated with the proposed project.
Negligible	The proposed project would generate an undetectable or barely detectable change (≤ 1 percent) in socioeconomic conditions in the local community as based on 2000 estimates of park-generated spending in the local economy.
Minor	The proposed project would generate a small, but measurable change (> 1 percent and ≤ 10 percent) in socioeconomic conditions in the local community as based on 2000 estimates of park-generated spending in the local economy.
Moderate	The proposed project would generate an apparent or appreciable change (> 10 percent and ≤ 25 percent) in socioeconomic conditions in the local community as based on 2000 estimates of park-generated spending in the local economy.
Major or Substantial	The proposed project would generate a major or substantial change (>25 percent) in socioeconomic conditions in the local community as based on 2000 estimates of park-generated spending in the local economy.

Impact Analysis

TABLE 90. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR SOCIOECONOMIC RESOURCES

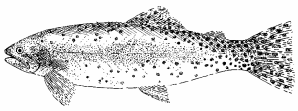
All impacts would be considered Local Community and Construction and Short-Term/Long-Term.

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Construction-Related Effects	Adverse - Negligible	Adverse - Negligible	Adverse - Negligible	Adverse - Negligible	Adverse - Negligible
Project-Related Effects	Beneficial - Negligible	Beneficial - Minor	Beneficial - Minor	Beneficial - Minor	Beneficial - Minor

No Action Alternative

Analysis: The No Action Alternative would generally have negligible effects on socioeconomic resources in the local community during construction and after implementation (Table 90). Under the No Action Alternative, levees, tidegates, and culverts in the Giacomini Ranch are not breached or removed, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. The Park Service is required under its existing agreement with CalTrans to restore wetlands as mitigation for impacts caused by CalTrans to aquatic habitat from a road repair on State Route 1 in Marin County in exchange for the Park Service receiving monies to purchase and restore the Giacomini Ranch. The remainder of the levee would not be deconstructed, although there would be no levee maintenance. Olema Marsh is also not restored, and there would be no new public access facilities.

As discussed in detail under Public Services – Traffic and Transportation and Visitor and Resident Experience – Public Access Resources, the effects of construction on traffic and the quality of the visitor and resident experience are not large enough to have more than a very negligible impact, if any impact at all, on the local economy. Project construction would be expected to have effects on the local economy if traffic delays were considerable; facilities were closed for a long period of time; and noise and other construction-related factors disrupted the visitor and resident experience sufficiently to keep visitors from returning to the region. This alternative would have no more than a negligible effect on any of these factors. Conversely, construction can generate income through purchases in local communities, although these beneficial would be expected to be very negligible overall.



For this alternative, project-related effects would arise principally from any income generated through increased visitation to the Project Area. This alternative would have only very negligible effects on visitation, so project-related effects on the local economy would be very negligible, as well.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Other currently proposed or reasonably foreseeable projects that could have the potential to cause cumulative impacts should the No Action alternative be implemented would be residential development on private lands along C Street and the Pacific Artisans Housing Development, both of which are in Point Reyes Station. These projects cumulatively have the potential to result in development of perhaps as many as 11 to 14 new homes in the town based on zoning, although the final number of allowable homes would depend on site factors such as results of percolation tests. While it is difficult to predict the intensity of effects of projects that have not been proposed, much less fully designed, these projects would probably have negligible to at most very minor effects on the local economy, considering that the Point Reyes Affordable Home project, which resulted in construction of a much larger number of housing units (36) was characterized as having only "small" effects on economic growth in the local economy (EDAW 2001). Cumulatively, the proposed projects would be expected to have negligible to minor effects on this largely tourism- and ranching-driven local economy.

Conclusions: The No Action alternative would generally result in negligible effects on the socioeconomic resources in the local community during construction and following implementation (Table 91). Construction would cause very negligible adverse impacts to the local economy, although the project would likely not affect the economy during construction. Over the long-term, the very negligible change in visitation following implementation of this alternative would result in at the most very negligible beneficial effects on local socioeconomic resources. Cumulative effects on the local economy from small proposed and reasonably foreseeable small residential development projects would still have only negligible to minor effects on this largely tourism- and ranching-driven economy.

Alternative A

Analysis: Alternative A would generally have negligible to minor effects on socioeconomic resources in the local community during construction and after implementation (Table 90). Under Alternative A, only the East Pasture would be restored, with new public access facilities limited to the eastern and southern perimeters of the East Pasture. There would be no restoration or construction of new public access facilities in the West Pasture or Olema Marsh. In the East Pasture, restoration would involve breaching of levees in the East Pasture along Lagunitas Creek, and excavation of new tidal channels. The southwestern corner of the creek bank would be regraded to a more stabile profile. Most of the actions under this alternative focus on removal or restoration of agricultural infrastructure such as filling of ditches, ripping of compacted roads, fence removal, and removal of pumps, pipelines, and concrete spillways.

As with the No Action Alternative, the effects of construction on traffic and the quality of the visitor and resident experience under Alternative A would have no more than a negligible effect to have more than a very negligible impact, if any impact at all, on the local economy. Project construction would be expected to have effects on the local economy if traffic delays were considerable; facilities were closed for a long period of time; and noise and other construction-related factors disrupted the visitor and resident experience sufficiently to keep visitors from returning to the region. This alternative would have no more than a negligible to minor effect on any of these factors. Conversely, construction can generate income through purchases in local communities, although these beneficial would be expected to be very negligible overall.

For this alternative, project-related effects would arise principally from any income generated through increased visitation to the Project Area. This alternative would have a major beneficial effect on public access resources available to visitors and residents, however, most of the people that would use these resources are either already local residents or, to a lesser degree, visitors whose use of facilities would be expected to largely incidental to the proposed project, that is, they would come to the Point Reyes region for other reasons (e.g., visit Bear Valley Visitor Center, shop in Point Reyes Station, drive out to the Point Reyes Peninsula), but

use some of the proposed facilities while they were out here. These two types of users would not be considered to bring "new" dollars to the local economy. Some visitors would potentially come specifically to view the restored wetland or to do bird-watching, but these users would represent a small proportion of the overall user group. Based on this, the overall expected effect of this alternative would be characterized as minor and beneficial.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Conclusions: Alternative A would generally result in negligible to minor effects on the socioeconomic resources in the local community during construction and following implementation (Table 91). Construction would cause at the most negligible adverse impacts to the local economy, although the project would likely not affect the economy during construction.
Over the long-term, this alternative would potentially have minor beneficial effects on the local economy. While this alternative would increase the number of public access resources within the Project Area and local community dramatically, most of the users of these resources would be local residents and visitors who come to the Point Reyes region for other purposes and end up incidentally using public access facilities. The proportion of visitors drawn specifically to facilities in the Project Area and vicinity would be smaller, and, therefore, the number of "new" dollars for the local economy would be relatively small, as well, resulting in this alternative having at most minor beneficial effects on socioeconomic resources in the local community.

Alternative B

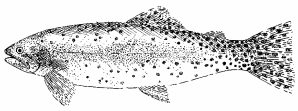
Analysis: Alternative B would generally have identical negligible to minor effects as Alternative A on socioeconomic resources in the local community during construction and after implementation (Table 90). Under Alternative B, the East and West Pastures would be restored, but not Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, although a viewing area would replace the informal existing trail on the West Pasture north levee, which would be removed. Restoration would involve complete removal of levees in the East Pasture along Lagunitas Creek and excavation of even more new tidal channels. As with Alternative A, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Conclusions: Alternative B would generally result in identical negligible to minor effects as Alternative A on the socioeconomic resources in the local community during construction and following implementation (Table 91). Construction would cause at the most negligible adverse impacts to the local economy, although the project would likely not affect the economy during construction. Over the long-term, this alternative would potentially have minor beneficial effects on the local economy. While this alternative would increase the number of public access resources within the Project Area and local community dramatically, most of the users of these resources would be local residents and visitors who come to the Point Reyes region for other purposes and end up incidentally using public access facilities. The proportion of visitors drawn specifically to facilities in the Project Area and vicinity would be smaller, and, therefore, the number of "new" dollars for the local economy would be relatively small, as well, resulting in this alternative having at most minor beneficial effects on socioeconomic resources in the local community.



Alternative C

Analysis: Alternative C would generally have identical negligible to minor effects as Alternatives A and B on socioeconomic resources in the local community during construction and after implementation (Table 90). Under Alternative C, the East and West Pastures would be restored, along with Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, although access along the eastern perimeter would be scaled back through removal of the through-trail component. Restoration would involve complete removal of levees in the East and West Pastures along Lagunitas Creek and excavation of even more new tidal channels. In Olema Marsh, an adaptive restoration approach would be undertaken through fill excavation and possible culvert replacement to improve hydraulic connectivity and improve drainage of currently impounded waters. As with the other alternatives, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

Under Alternative C, effects on traffic during construction would be slightly greater than under Alternatives A and B, because of temporary road closures and detours associated with replacement of culverts on two local arterial roadways, Levee Road and Bear Valley Road, that are important connecting routes to Inverness Park, Inverness, and the rest of the businesses, ranches, and portions of the Seashore and Tomales Bay State Park on the Point Reyes Peninsula. However, these temporary road closures are not expected to have any additional adverse effects on visitation that would impact the local economy more than the other alternatives. Conversely, construction can generate income through purchases in local communities, although these beneficial would be expected to be very negligible overall. In general, this alternative would still be expected to have only negligible, if any impacts, during construction on socioeconomic resources in the local community.

In addition, a slight scaling back of public access facilities under this alternative would be expected to have some effect on visitation, although effects of this alternative on the local economy, should it be implemented, would still be expected to be minor, at most.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

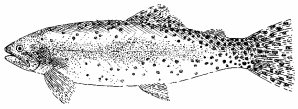
Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Conclusions: Alternative C would generally result in identical negligible to minor effects as Alternatives A and B on the socioeconomic resources in the local community during construction and following implementation (Table 91). Even with temporary road closures and detours on some of the local arterial roadways serving the Point Reyes Peninsula, construction would cause only negligible, if any, adverse impacts to the local economy. Over the long-term, this alternative would potentially have minor beneficial effects on the local economy. While this alternative would increase the number of public access resources within the Project Area and local community dramatically, most of the users of these resources would be local residents and visitors who come to the Point Reyes region for other purposes and end up incidentally using public access facilities. The proportion of visitors drawn specifically to facilities in the Project Area and vicinity would be smaller, and, therefore, the number of “new” dollars for the local economy would be relatively small, as well, resulting in this alternative having at most minor beneficial effects on socioeconomic resources in the local community.

Alternative D

Analysis: Alternative D would generally have identical negligible to minor effects as Alternative C on socioeconomic resources in the local community during construction and after implementation (Table 90). Under Alternative D as with Alternative C, the East and West Pastures would be completely restored, along with Olema Marsh. Almost all of the differences between Alternative D and C relate to excavation of a limited portion of the East Pasture to intertidal elevations, complete realignment of Tomasini Creek into one of its historic alignments, replacement of the Tomasini Creek Mesa Road culvert with a bridge or arch culvert, and further scaling back of new public access facilities through elimination of the bridge across Lagunitas Creek



and one of the spur trails on the eastern perimeter. As with the other alternatives, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

Scaling back of public access facilities under this alternative would be expected to result in more minor increases in visitation relative to baseline conditions, although effects of this alternative on the local economy, should it be implemented, would still be expected to be very minor, if not negligible.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described under the No Action Alternative.

Conclusions: Alternative D would generally result in identical negligible to minor effects as Alternative C on the socioeconomic resources in the local community during construction and following implementation (Table 91). Even with temporary road closures and detours on some of the local arterial roadways serving the Point Reyes Peninsula, construction would cause only negligible, if any, adverse impacts to the local economy. Over the long-term, this alternative would potentially have minor beneficial effects on the local economy. While this alternative would increase the number of public access resources within the Project Area and local community dramatically, most of the users of these resources would be local residents and visitors who come to the Point Reyes region for other purposes and end up incidentally using public access facilities. The proportion of visitors drawn specifically to facilities in the Project Area and vicinity would be smaller, and, therefore, the number of "new" dollars for the local economy would be relatively small, as well, resulting in this alternative having at most very minor, if not negligible, beneficial effects on socioeconomic resources in the local community.

Park Management and Operations

Laws, Regulations, Policies, and Criteria Guiding Impact Analysis

To fulfill its mission, the Park Service receives funding from both the federal appropriations process and other federal revenue sources. Like most federal agencies, the Park Service relies on Federal appropriations to fund its core activities through base funding, although there is increasing use of alternative revenue sources, such as private monies and grants, to fund specific projects. In addition to base funding, certain parks receive monies from fees generated through park admissions, and parks can also apply for one-time funding through certain appropriation programs that cover cyclic maintenance, construction, etc. The Park Service requests direct Congressional funding and reports on the other federal revenue sources through an annual budget document submitted to Congress entitled "Budget Justifications," or more popularly called, the "Green Book." Because of the limited amount of base funding available to support the 389 park units, the Park Service directs its units to consider the effects of proposed projects on base funding, including any increases in operations and maintenance expenses.

General Methodologies and Assumptions

- The proposed project has the potential to affect park management and operations after implementation through administrative and long-term operations and maintenance or life-cycle costs.
- Potential effects of the proposed project on park operations were analyzed by assessing potential or anticipated administrative, operations, and maintenance costs that would not be covered by private funding under the various alternatives or those such as cyclic repair or rehabilitation, which is covered by a separate federal funding source other than base funding (Table 91). Cost estimates were generated, using estimates of administrative costs, as well as maintenance or repair and costs generated during preparation of Level B Cost Estimates.
- It should be noted that staffing and funding levels associated with actions in the alternatives are difficult to project until final plans are completed. The estimates were intended to facilitate the impact analysis,

- and to allow a general assessment of potential effects. The discussions of impacts focus on projects that would create a need for new operations or that would result in major changes in existing operations.

TABLE 91. PARK MANAGEMENT AND OPERATIONS

Source: Park Service Management Policies Nature: Beneficial, Adverse Context: Regional (Seashore and North District of the GGNRA) Duration: *Construction, Short-Term/Long-Term*	
No Impact	There would be no potential for impact to park management and operations associated with the proposed project.
Negligible	The proposed project would generate an undetectable or barely detectable change (<1 percent) in park management and operations spending as projected by estimates of administrative and operations and maintenance costs.
Minor	The proposed project would generate a small, but measurable change (≥ 1 percent and < 15 percent) in park management and operations spending as projected by estimates of administrative and operations and maintenance costs.
Moderate	The proposed project would generate an apparent or appreciable change (≥15 percent and ≤ 30 percent) in park management and operations spending as projected by estimates of administrative and operations and maintenance costs.
Major	The proposed project would generate a major or substantial change (>30 percent) in park management and operations spending as projected by estimates administrative and operations and maintenance costs.

Impact Analysis

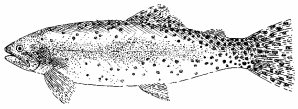
TABLE 92. INTENSITY, NATURE, TYPE, DURATION, AND CONTEXT OF IMPACTS FOR PARK OPERATIONS AND MANAGEMENT
All impacts would be considered Regional (Seashore and North District of the GGNRA) and are separately analyzed for Construction and Short-Term/Long-Term.

	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Impact Indicator	Intensity, Nature, Type, Duration, and Context of Impact				
Construction-Related Effects	Adverse-Negligible	Adverse-Negligible	Adverse-Negligible	Adverse-Negligible	Adverse-Negligible
Project-Related Effects	Adverse-Negligible	Adverse-Negligible	Adverse-Negligible	Adverse-Negligible	Adverse-Negligible

No Action Alternative

Analysis: The No Action Alternative would generally have negligible adverse effects on park operations and management during construction and following implementation, largely related to incidental administrative support and periodic maintenance requirements (Table 92). Under the No Action Alternative, intensive agricultural management practices associated with dairy operation would be discontinued, although, under the No Action Alternative, there would be the potential for leased grazing through a separate environmental review process. All levees, tidegates, and culverts in the Giacomini Ranch would remain, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. The Park Service is required under its existing agreement with CalTrans to restore wetlands as mitigation for impacts caused by CalTrans to aquatic habitat from a road repair on State Route 1 in Marin County in exchange for the Park Service receiving monies to purchase and restore the Giacomini Ranch. While the remainder of the levee would not be deconstructed, there would be no formal levee maintenance program, although there may occasionally be some repair performed on select portions for maintenance of the limited existing public access facilities or other reasons. No new public access facilities would be constructed, and Olema Marsh would not be restored.

This alternative would have the potential to affect park operations and management through construction of the wetland restoration component, management of any future leased grazing activities, staff oversight and



management of the property (e.g., administrative staff, law enforcement, etc.), and general operations and maintenance, including management activities needed to reduce impacts to adjacent private landowners from flooding or to maintain and repair the limited number of existing public access facilities. For FY2006, the Seashore has about 75 permanent staff, 10 term employees, and 25-30 temporary staff working on a variety of projects and programs. During the peak summer months, the park staff increases to about 150 staff members. This work force is supplemented by 20,000 hours of Volunteers-in-Parks service, Student Conservation Assistants, and AmeriCorps.

The Seashore has an annual base operating budget of approximately $5,581,000. The Seashore also receives fee revenues and special Park Service funding for specific projects. For example, the park receives about $1.5 – $2.0 million annually for cyclic maintenance of historic structures and other natural resources projects. As part of the San Francisco Bay Network, the Seashore benefits from monitoring information gathered as part of the $800,000 Inventory and Monitoring (I&M) Network. The park receives about $625,000 in fee revenues for maintenance projects and operation of the whale shuttle and campground reservation systems, and approximately $1 million for fire management activities.

The No Action Alternative would have only negligible adverse impacts on park operations and management during construction, because construction and management of the wetland mitigation/restoration component would be funded exclusively out of non-Park Service monies. CalTrans funding paid for not only most of the purchase of the Giacomini Ranch, but planning, oversight, and implementation of the wetland mitigation/restoration component. Federal monies obtained to date include $1.55 million in Congressional appropriations used to purchase the Giacomini Ranch and two competitive grant programs (Conservation Challenge Initiative and Park Service-USGS). In addition, permanent base-funded Seashore staff has assisted with administration of the project, such as contracting, payroll, benefits administration, personnel, and maintenance associated with immediate operations and maintenance needs. On an annual basis, it is estimated that, on average, permanent, base-funded staff contribute less than 25 FTE days each year to the proposed project. This level of support from base-funded staff would be expected to continue during construction.

Once construction is completed, most of the recurring costs associated with this alternative would come from incidental administrative and staff support and periodic maintenance requirements. The Giacomini Ranch currently has no park facilities. Maintenance has not been performed by Park staff, as most of the maintenance with the exception of the 2003 West Pasture levee repair and sediment removal from the 1906 Drainage downstream of the Lucchesi residence has been conducted by the Giacominis as part of their on-going operation of the ranch under a Reservation of Use agreement until spring 2007. With closure of the dairy, Park staff would be required for general oversight of the facility, including administration and law enforcement, and management of future leased grazing activities, should grazing be approved through a separate review process. Because levees would not be formally maintained under this alternative, operations and maintenance expenses would be expected to be relatively minimal and limited to management activities needed to reduce impacts to adjacent private landowners from flooding or to maintain and repair the very limited number of existing public access facilities present in the Project Area. Some levee maintenance may be infrequently performed after large flood events to improve condition of the levee or creek bank in areas adjacent to the existing public access trails. Annual or periodic dredging may be required of the 1906 Drainage and Fish Hatchery Creek to continue to reduce the potential for flooding of adjacent private residences. Maintenance would either be performed in-house by park staff or by contractors through park-administered contracts.

Overall, base-funded support during construction and following implementation would be expected to total less than 1 percent or $50,000 annually and, therefore, represent a negligible adverse impact on park operations and management.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: There are no currently proposed or reasonably foreseeable projects that would have the potential to cause cumulative impacts should the No Action alternative be implemented.

Conclusions: The No Action alternative would result generally in negligible adverse effects during construction and following implementation on park operations and management, largely related to incidental administrative support and periodic maintenance requirements (Table 92).

Alternative A

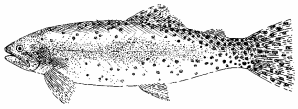
Analysis: Alternative A would generally have negligible adverse effects on park operations and management during construction and following implementation, largely related to incidental administrative and staff support and public access-related operations and maintenance requirements (Table 92). Under Alternative A, only the East Pasture would be restored, with new public access facilities limited to the eastern and southern perimeters of the East Pasture. There would be no restoration or construction of new public access facilities in the West Pasture or Olema Marsh. The levees along and tidegate/culvert in the West Pasture and Tomasini Creek would remain. In the East Pasture, restoration would involve breaching of levees in the East Pasture along Lagunitas Creek, and excavation of new tidal channels. The southwestern corner of the creek bank would be regraded to a more stabile profile. Most of the actions under this alternative focus on removal or restoration of agricultural infrastructure such as filling of ditches, ripping of compacted roads, fence removal, and removal of pumps, pipelines, and concrete spillways.

This alternative would have the potential to affect park operations and management through construction of the wetland restoration and public access components, staff oversight and management of the property (e.g., administrative staff, law enforcement, etc.), and general operations and maintenance, including management activities needed to reduce impacts to adjacent private landowners from flooding or to maintain, operate, and repair constructed or enhanced public access facilities.

Alternative A would have only negligible adverse impacts on park operations and management during construction, because construction and management of the wetland restoration component would be handled by a non-profit organization, the Point Reyes National Seashore Association (PRNSA), and funded exclusively out of non-Park Service monies. The wetland restoration component has received funding from a Caltrans mitigation, SS Cape Mohican oil spill settlement funds and at least two private grant sources (Gordon and Betty Moore Foundation, National Fish and Wildlife Foundation). PRNSA is seeking additional funding for management and implementation of the wetland restoration component from other private and federal grant sources. It is anticipated that private and federal grant source monies would entirely pay for any further planning needs (i.e., permitting) and implementation or construction of the wetland restoration component. However, the Park Service may pursue federal funding for the public access component, which would be funded, managed, and constructed separately from wetland restoration. Federal monies used obtained to date include $1.55 million in Congressional appropriations used to purchase the Giacomini Ranch and two competitive grant programs (Conservation Challenge Initiative and Park Service-USGS). In addition, permanent base-funded Seashore staff has assisted with administration of the project, such as contracting, payroll, benefits administration, personnel, and maintenance associated with immediate operations and maintenance needs. On an annual basis, it is estimated that, on average, permanent, base-funded staff contribute less than 15 FTE days each year to the proposed project. This level of support from base-funded staff would be expected to continue during construction.

Once construction is completed, most of the recurring costs associated with this alternative would come from incidental administrative and staff support and periodic maintenance requirements. Park staff would be required for general oversight of the facility, including administration and law enforcement. Because levees would not be formally maintained under this alternative, operations and maintenance expenses would be expected to be relatively minimal and limited to management activities needed to reduce impacts to adjacent private landowners from flooding or to maintain and repair the very limited number of existing public access facilities present in the Project Area. Some levee maintenance may be infrequently performed after large flood events to improve condition of the levee or creek bank in areas adjacent to the existing public access trails. Annual or periodic dredging may be required of the 1906 Drainage and Fish Hatchery Creek to continue to reduce the potential for flooding of adjacent private residences. Maintenance would either be performed in-house by park staff or by contractors through park-administered contracts.

In general, focusing on restoration of natural hydrologic processes through removal of levees, tidegates, and culverts rather than on creation of particular habitat types through intensive construction and post-construction management practices would reduce the need for long-term maintenance within the Giacomini Ranch portion of the Project Area relative to baseline conditions. Most of the maintenance needs would be



associated with public access facilities such as the southern and eastern perimeter trails, including maintenance of the trail surfaces; maintenance of the footings for the southern perimeter trail bridge; minor creek bank stabilization utilizing biological creek bank stabilization techniques; cleaning of culverts and maintenance of berm for eastern perimeter trail adjacent to Point Reyes Mesa; and upkeep and maintenance of viewing areas and interpretative exhibits. Should Lagunitas or Tomasini Creek dramatically change course or direction in the future, public access facilities would be realigned accordingly to ensure that natural hydrologic and ecological processes and functions are not impacted. This type of approach to wetland restoration and management of the public access component creates a more sustainable approach to ecosystem restoration that deemphasizes intensive annual or periodic operations and management requirements and thereby decreases associated demands on existing base funding.

Overall, base-funded support (described under the No Action Alternative) during construction and following implementation would be expected to total less than 1 percent or $50,000 annually and, therefore, represent only a negligible adverse impact on park operations and management.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

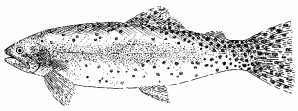
Cumulative Impacts: Cumulative impacts would be the same as described for the No Action Alternative.

Conclusions: Alternative A would result generally in negligible adverse effects during construction and following implementation on park operations and management, largely related to incidental administrative support and periodic maintenance requirements (Table 92). Monies needed for implementation of the wetland restoration component would come entirely from mitigation and private and federal grant sources, although federal funding may be pursued for the public access component, which would be funded and conducted separately. Following construction, base funds would be required for incidental administrative support and periodic maintenance requirements, including flood control maintenance on two creeks adjacent to private residences. However, the focus on restoration of natural hydrologic processes would create a more sustainable project and reduce the need for long-term maintenance needs, with the exception of the public access components. Overall, base-funded support during construction and following implementation would be expected to total less than 1 percent or $50,000 annually and, therefore, represent only a negligible adverse impact on park operations and management.

Alternative B

Analysis: Alternative B would generally have identical negligible adverse effects on park operations and management during construction and following implementation as Alternative A (Table 93). Under Alternative B, the East and West Pastures would be restored, but not Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, although a viewing area would replace the informal existing trail on the West Pasture north levee, which would be removed. The culverted berm portion of the eastern perimeter trail would be replaced with a low boardwalk. Restoration would involve complete removal of levees in the East Pasture along Lagunitas Creek and excavation of even more new tidal channels. Breaches would be created in the West Pasture levee. Some connection would be established between the East Pasture and Tomasini Creek through lowering of levees to allow overflow during flood events, but otherwise Tomasini Creek would remain in its current channel with tidegate/flashboard dam structure still in place. As with Alternative A, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

From a Park Operations and Management perspective, the primary differences would relate to replacement of the culverted berm portion of the eastern perimeter trail with a low boardwalk and the West Pasture north levee trail with a viewing area. In general, both of these changes would result in a reduction in the need for maintenance, although the low boardwalk would also require regular maintenance to maintain its structural integrity. Relative to Alternative A, the need for frequent culvert cleaning and berm repair of the eastern perimeter trail would be considerably reduced, if not eliminated. Also, removal of the West Pasture levee would also decrease the need for minor repairs of this feature to maintain trail functionality.



Overall, base-funded support (as described under the No Action Alternative) during construction and following implementation would be expected to total less than 1 percent or $50,000 annually and, therefore, represent only a negligible adverse impact on park operations and management.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described for the No Action Alternative.

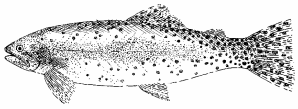
Conclusions: Alternative B would result generally in identical negligible adverse effects during construction and following implementation on park operations and management as Alternative A, largely related to incidental administrative support and periodic maintenance requirements (Table 92). Monies needed for implementation of the wetland restoration component would come entirely from mitigation and private and federal grant sources, although federal funding may be pursued for the public access component, which would be funded and conducted separately. Following construction, base funds would be required for incidental administrative support and periodic maintenance requirements, including flood control maintenance on two creeks adjacent to private residences and operations and maintenance of public access facilities. Relative to Alternative A, less maintenance related to public access facilities would be required due to replacement of the culverted berm component on the eastern perimeter trail with a low boardwalk and the West Pasture levee trail with a viewing area. The focus on restoration of natural hydrologic processes would create a more sustainable project and reduce the need for long-term maintenance needs, with the exception of the public access components. Overall, base-funded support during construction and following implementation would be expected to total less than 1 percent or $50,000 annually and, therefore, represent only a negligible adverse impact on park operations and management.

Alternative C

Analysis: Alternative C would generally have very similar negligible adverse effects on park operations and management during construction and following implementation as Alternative A, largely related to incidental administrative and staff support and public access-related operations and maintenance requirements (Table 92). Under Alternative C, the East and West Pastures would be restored, along with Olema Marsh. Most of the new public access facilities would continue to be limited to the eastern and southern perimeters of the East Pasture, although access along the eastern perimeter would be scaled back through removal of the through-trail component. Restoration would involve complete removal of levees in the East and West Pastures along Lagunitas Creek and excavation of even more new tidal channels. Tomasini Creek would be realigned into one of its historic alignments midway through the East Pasture. In Olema Marsh, an adaptive restoration approach would be undertaken, with initial excavation of a shallow berm and the Bear Valley Creek channel to improve hydraulic connectivity and improve drainage of currently impounded waters. As with the other alternatives, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

This alternative would have the potential to affect park operations and management through construction of the wetland restoration and public access components, staff oversight and management of the property (e.g., administrative staff, law enforcement, etc.), and general operations and maintenance, including management activities needed to reduce impacts to adjacent private landowners from flooding or to maintain, operate, and repair constructed or enhanced public access facilities. For FY2006, the Seashore has about 75 permanent staff, 10 term employees, and 25-30 temporary staff working on a variety of projects and programs. During the peak summer months, the park staff increases to about 150 staff members. This work force is supplemented by 20,000 hours of Volunteers-in-Parks service, Student Conservation Assistants, and AmeriCorps.

The Seashore has an annual base operating budget of approximately $5,581,000. The Seashore also receives fee revenues and special Park Service funding for specific projects. For example, the park receives about $1.5 – $2.0 million annually for cyclic maintenance of historic structures and other natural resources projects. As part of the San Francisco Bay Network, the Seashore benefits from monitoring information gathered as part of the $800,000 Inventory and Monitoring (I&M) Network. The park receives about $625,000 in fee revenues for



maintenance projects and operation of the whale shuttle and campground reservation systems, and approximately $1 million for fire management activities.

Alternative C would have only negligible adverse impacts on park operations and management during construction, because construction and management of the wetland restoration component would be handled by a non-profit organization, the Point Reyes National Seashore Association (PRNSA), and funded exclusively out of non-Park Service monies. The wetland restoration component has received funding from a Caltrans mitigation, SS Cape Mohican oil spill settlement funds and at least two private grant sources (Gordon and Betty Moore Foundation, National Fish and Wildlife Foundation). PRNSA is seeking additional funding for management and implementation of the wetland restoration component from other private and federal grant sources. It is anticipated that private and federal grant source monies would entirely pay for any further planning needs (i.e., permitting) and implementation or construction of the wetland restoration component. However, the Park Service may pursue federal funding for the public access component, which would be funded, managed, and constructed separately from wetland restoration. Federal monies used obtained to date include $1.55 million in Congressional appropriations used to purchase the Giacomini Ranch and two competitive grant programs (Conservation Challenge Initiative and Park Service-USGS). In addition, permanent base-funded Seashore staff has assisted with administration of the project, such as contracting, payroll, benefits administration, personnel, and maintenance associated with immediate operations and maintenance needs. On an annual basis, it is estimated that, on average, permanent, base-funded staff contribute less than 25 FTE days each year to the proposed project. This level of support from base-funded staff would be expected to continue during construction.

Once construction is completed, most of the recurring costs associated with this alternative would come from incidental administrative and staff support and periodic maintenance requirements. Park staff would be required for general oversight of the facility, including administration and law enforcement. Because levees would not be formally maintained under this alternative, operations and maintenance expenses would be expected to be relatively minimal and limited to management activities needed to reduce impacts to adjacent private landowners from flooding or to maintain and repair the very limited number of existing public access facilities present in the Project Area. Some levee maintenance may be infrequently performed after large flood events to improve condition of the levee or creek bank in areas adjacent to the existing public access trails. Annual or periodic dredging may be required of the 1906 Drainage and Fish Hatchery Creek to continue to reduce the potential for flooding of adjacent private residences. Maintenance would either be performed in-house by park staff or by contractors through park-administered contracts.

In general, focusing on restoration of natural hydrologic processes through removal of levees, tidegates, and culverts rather than on creation of particular habitat types through intensive construction and post-construction management practices would reduce the need for long-term maintenance within the Giacomini Ranch portion of the Project Area relative to baseline conditions. Most of the maintenance needs would be associated with public access facilities such as the southern and eastern perimeter trails, including maintenance of the trail surfaces where present; maintenance of the footings for the southern perimeter trail bridge; minor creek bank stabilization utilizing biological creek bank stabilization techniques; and upkeep and maintenance of viewing areas and interpretative exhibits. Maintenance needs for trails would be slightly reduced relative to Alternatives A and B through removal of the “through-trail” component of the eastern perimeter trail. As discussed under Alternative A, should Lagunitas or Tomasini Creek dramatically change course or direction in the future, public access facilities would be realigned accordingly to ensure that natural hydrologic and ecological processes and functions are not adversely affected. While the adaptive restoration of Olema Marsh would not necessarily eliminate the need for maintenance of this highly managed system, it could reduce the need for certain types of maintenance through potential replacement of culverts with bridges and a reduction in the frequency of flooding of Levee and Bear Valley Roads.

This type of approach to wetland restoration and management of the public access component creates a more sustainable approach to ecosystem restoration that deemphasizes intensive annual or periodic operations and management requirements and thereby decreases associated demands on existing base funding. Overall, base-funded support during construction and following implementation would be expected to total less than 1 percent or $50,000 annually and, therefore, represent only a negligible adverse impact on park operations and management.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described for the No Action Alternative.

Conclusions: Alternative C would result generally in very similar negligible adverse effects during construction and following implementation on park operations and management as Alternative A, largely related to incidental administrative support and periodic maintenance requirements (Table 92). Monies needed for implementation of the wetland restoration component would come entirely from mitigation and private and federal grant sources, although federal funding may be pursued for the public access component, which would be funded and conducted separately. Following construction, base funds would be required for incidental administrative support and periodic maintenance requirements, including flood control maintenance on two creeks adjacent to private residences and operations and maintenance of public access facilities. Relative to Alternative B, less maintenance related to public access facilities would be required due to the through-trail component of the eastern perimeter trail. The focus on restoration of natural hydrologic processes would create a more sustainable project and reduce the need for long-term maintenance needs, with the exception of the public access components. Overall, base-funded support during construction and following implementation would be expected to total less than 1 percent or $50,000 annually and, therefore, represent only a negligible adverse impact on park operations and management.

Alternative D

Analysis: Alternative D would generally have very similar negligible adverse effects on park operations and management during construction and following implementation as Alternative C, largely related to incidental administrative and staff support and public access-related operations and maintenance requirements (Table 92). Under Alternative D as with Alternative C, the East and West Pastures would be completely restored, along with Olema Marsh. Almost all of the differences between Alternative D and C relate to excavation of a limited portion of the East Pasture to intertidal elevations, complete realignment of Tomasini Creek into one of its historic alignments, replacement of the Tomasini Creek Mesa Road culvert with a bridge or arch culvert, and further scaling back of new public access facilities through elimination of the bridge across Lagunitas Creek and one of the spur trails on the eastern perimeter. Tomasini Creek would be realigned into one of its historic alignments just downstream of Mesa Road and would run through the constructed freshwater marsh area just north of the Giacomini Ranch dairy facility. There would be no change in restoration approach in the West Pasture from Alternative C, and the same adaptive management approach would be undertaken in Olema Marsh, with initial excavation of a shallow berm and the Bear Valley Creek channel to improve hydraulic connectivity and improve drainage of currently impounded waters. As with the other alternatives, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

From a Park Operations and Management perspective, the primary differences would relate to elimination of the bridge in the southern perimeter trail and the Mesa Road spur trail. There would also be no ADA-complaint trail component, which requires more frequent and intensive maintenance than other trails.

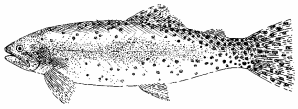
Overall, base-funded support during construction and following implementation would still be expected to total less than 1 percent or $50,000 annually and, therefore, represent only a negligible adverse impact on park operations and management.

Possible Additional Mitigation Measures: No mitigation measures would be proposed under this alternative.

Effectiveness of Possible Additional Mitigation Measures: Not applicable

Cumulative Impacts: Cumulative impacts would be the same as described for the No Action Alternative.

Conclusions: Alternative D would result generally in very similar negligible adverse effects during construction and following implementation on park operations and management as Alternative C, largely related to incidental administrative support and periodic maintenance requirements (Table 93). Monies needed for implementation of the wetland restoration component would come entirely from mitigation and



private and federal grant sources, although federal funding may be pursued for the public access component, which would be funded and conducted separately. Following construction, base funds would be required for incidental administrative support and periodic maintenance requirements, including flood control maintenance on two creeks adjacent to private residences and operations and maintenance of public access facilities. Relative to Alternative C, less maintenance related to public access facilities would be required due to elimination of the bridge, the Mesa Road spur trail, and the ADA-compliant trail component. The focus on restoration of natural hydrologic processes would create a more sustainable project and reduce the need for long-term maintenance needs, with the exception of the public access components. Overall, base-funded support during construction and following implementation would be expected to total less than 1 percent or $50,000 annually and, therefore, represent only a negligible adverse impact on park operations and management.

Other Impact Analyses Mandated by DO-12 and CEQA

Relationship between Short-Term Uses of the Environment and Maintenance and Enhancement of Long-Term Productivity

No Action Alternative

Under the terms of the purchase agreement with the Giacomini Trust, the 7-year Reservation of Use Agreement that has allowed the Giacomini family to continue to operate the dairy since its purchase by the Park Service in 2000 will expire in March 2007, and the dairy will close. Closure of the dairy will occur under all alternatives, including the No Action Alternative. Under the No Action Alternative, there is no wetland restoration or construction of public access facilities, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. The Park Service is required under its existing agreement with CalTrans to restore wetlands as mitigation for impacts caused by CalTrans to aquatic habitat from a road repair on State Route 1 in Marin County in exchange for the Park Service receiving monies to purchase and restore the Giacomini Ranch. The Park Service may potentially allow leased grazing of beef cattle or dairy heifers on other portions of the Giacomini Ranch subject to a separate environmental review process. The intensity of grazing relative to baseline conditions would be expected to be much lower due to the fact that the Park Service would be likely to institute resource setbacks and limits on the duration and timing of grazing.

Because closure of the dairy under terms of an existing agreement will occur under all alternatives, the No Action Alternative would not necessarily represent a loss in long-term agricultural productivity of west Marin County, although the Waldo Giacomini Ranch has been one of the largest dairies in this region. As was discussed under Land Use and Planning – Agricultural Land Use, the Giacomini Ranch was established through diking of a historic salt marsh in 1946. Running of a viable dairy in this location has required substantial investments in terms of maintenance of levees, tidegates, culverts, ditches, and irrigation that would have made continued operation of this dairy in the future economically tenuous, if not infeasible, particularly in view of the current market dynamics in California, in which large Central Valley dairies are threatening the viability of smaller operations such as those in west Marin. While dairy operation has not eliminated wetlands from the Giacomini Ranch, it has reduced functionality of these wetlands by disconnecting them from hydrologic sources such as Lagunitas and Tomasini Creek through levees, tidegates, and culverts and introducing new sources of contamination from intensive grazing, manure spreading, and other agricultural management practices. Viewed from this perspective, the dairy represents a short-term use of the environment that has impacted long-term productivity of natural resources within the Tomales Bay watershed. The No Action Alternative would have only negligible effects on enhancing long-term productivity of natural resources, because the wetland mitigation/restoration component is relatively small, and most of the remainder of the ranch would become either fallow open space grasslands or grazed lands, albeit less intensely grazed lands.

Alternative A

Alternative A would enhance long-term productivity of natural resources in the Tomales Bay watershed. As was discussed under the No Action Alternative, closure of the dairy will occur under all alternatives in March

2007 under terms of an existing agreement with the Giacomini Trust. Therefore, Alternative A and the other alternatives, including the No Action Alternative, would not necessarily represent a loss in long-term agricultural productivity of west Marin County, although the Waldo Giacomini Ranch has been one of the largest dairies in this region.

The Giacomini Ranch was established through diking of a historic salt marsh in 1946. Running of a viable dairy in this location has required substantial investments in terms of maintenance of levees, tidegates, culverts, ditches, and irrigation that would have made continued operation of this dairy in the future economically tenuous, if not infeasible, particularly in view of the current market dynamics in California, in which large Central Valley dairies are threatening the viability of smaller operations such as those in west Marin. While dairy operation has not eliminated wetlands from the Giacomini Ranch, it has reduced functionality of these wetlands by disconnecting them from hydrologic sources such as Lagunitas and Tomasini Creek through levees, tidegates, and culverts and introducing new sources of contamination from intensive grazing, manure spreading, and other agricultural management practices. Viewed from this perspective, the dairy represents a short-term use of the environment that has impacted long-term productivity of natural resources within the Tomales Bay watershed.

Relative to the No Action Alternative, Alternative A would have much more effect on enhancing long-term productivity of natural resources in the Tomales Bay watershed because of the increase in the scale of restoration proposed. Under Alternative A, the entire 350-acre East Pasture would be restored through selected breaching of the levees. There would be no restoration or construction of new public access facilities in the West Pasture or Olema Marsh. Most of the actions under this alternative focus on removal or restoration of agricultural infrastructure such as filling of ditches, ripping of compacted roads, fence removal, and removal of pumps, pipelines, and concrete spillways, although there is some limited tidal channel creation or regrading of creek banks to more stable topographic profiles.

Alternative B

Alternative B would have very similar effects on enhancement of long-term productivity of natural resources in the Tomales Bay watershed as Alternative A, although the scale of restoration would be expanded to include the approximately 200-acre West Pasture, as well as the 350-acre East Pasture. Restoration would involve complete removal of levees in the East Pasture along Lagunitas Creek and excavation of even more new tidal channels. Breaches would be created in the West Pasture levee. The whole southern East Pasture creek bank would be restored through removal of rip-rap bank stabilization and regraded, where needed, to a more stabile profile. Some connection would be established between the East Pasture and Tomasini Creek through lowering of levees to allow overflow during flood events, but otherwise Tomasini Creek would remain in its current channel with tidegate/flashboard dam structure still in place. As with Alternative A, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

Alternative C

Alternative C would have very similar effects on enhancement of long-term productivity of natural resources as Alternative B, although the degree and scale of restoration would be expanded to include the 63-acre Olema Marsh, as well as the 350-acre East Pasture and 200-acre West Pasture of the Giacomini Ranch.

As was discussed under Alternative A, closure of the dairy will occur under all alternatives in March 2007 under terms of an existing agreement with the Giacomini Trust. Therefore, Alternative C and the other alternatives, including the No Action Alternative, would not necessarily represent a loss in long-term agricultural productivity of west Marin County, although the Waldo Giacomini Ranch has been one of the largest dairies in this region. Running of a viable dairy in what was once a tidal marsh system has required substantial investments in terms of maintenance that would have made continued operation of this dairy in the future economically tenuous, if not infeasible. While dairy operation has not eliminated wetlands, it has reduced functionality by disconnecting them from hydrologic sources such as Lagunitas and Tomasini Creek and introducing new sources of contamination from intensive grazing, manure spreading, and other agricultural management practices. Viewed from this perspective, the dairy represents a short-term use of the environment that has impacted long-term productivity of natural resources within the Tomales Bay watershed.

Relative to Alternative B, Alternative C would have much more effect on enhancing long-term productivity of natural resources in the Tomales Bay watershed because of the increase in the scale of restoration proposed. Under Alternative C, the East and West Pastures would be restored, along with Olema Marsh. Restoration would involve complete removal of levees in the East and West Pastures along Lagunitas Creek and excavation of even more new tidal channels. A small tidal channel would be initiated off Lagunitas Creek, as well as in the interior of the East Pasture. Tomasini Creek would be realigned into one of its historic alignments midway through the East Pasture. In Olema Marsh, an adaptive restoration approach would be undertaken, with initial excavation of a shallow berm and the Bear Valley Creek channel to improve hydraulic connectivity and improve drainage of currently impounded waters. As with the other alternatives, this alternative would involve removal or restoration of agricultural infrastructure and discontinuation of agricultural management practices.

Alternative D

Alternative D would have very similar effects on enhancement of long-term productivity of natural resources in the Tomales Bay watershed as Alternative C. The scale of restoration would be expanded slightly relative to Alternative C. Under Alternative D as with Alternative C, the East and West Pastures would be completely restored, along with Olema Marsh. Almost all of the differences between Alternative D and C relate to excavation of a limited portion of the East Pasture to intertidal elevations, complete realignment of Tomasini Creek into one of its historic alignments, replacement of the Tomasini Creek Mesa Road culvert with a bridge or arch culvert, and further scaling back of new public access facilities through elimination of the bridge across Lagunitas Creek and one of the spur trails on the eastern perimeter. There would be no change in restoration approach in the West Pasture from Alternative C, and the same adaptive management approach would be undertaken in Olema Marsh.

Irreversible or Irretrievable Commitment of Natural or Depletable Resources

No Action Alternative

Under the No Action Alternative, the only construction component would be the wetland mitigation/restoration component. There would be no other restoration or construction or enhancement of public access facilities. This alternative would not cause irreversible changes to the environment relative to baseline conditions, as the wetland mitigation/restoration component could easily be leveed and returned to conditions similar to those currently existing. Such an action would violate the terms of the Park Service's mitigation agreement with CalTrans, however, and require the Park Service to repay funds that it received to purchase the ranch and conduct planning and implementation of the wetland mitigation/restoration component.

The construction of the 11-acre wetland restoration/mitigation component would involve irretrievable use of depletable petroleum resources, although the overall effect on this increasingly scarce resource would be expected to be extremely negligible. The amount of fuel that would be used is not known, but construction would be expected to take 6- to 8 weeks and involve use of three to five pieces of construction equipment, which would be unlikely to be operating simultaneously. Relative to baseline conditions, implementation of the No Action Alternative would not incur any additional irreversible or irretrievable commitment of natural or depletable resources through use of vehicles for travel to and from existing public access facilities and operation of construction equipment for maintenance activities or trucks for hauling livestock to and from the Giacomini Ranch should leased grazing be approved through a future environmental review process.

Alternative A

Alternative A would expand restoration actions to incorporate the entire 350-acre Giacomini Ranch East Pasture through selected breaching of levees and would construct new and enhance existing public access facilities on the southern and eastern perimeters of the East Pasture. This alternative would not cause irreversible changes to the environment relative to baseline conditions, as the wetland restoration component in the East Pasture could easily be leveed and returned to conditions somewhat similar to those currently existing, although there would be changes in the vegetation communities present without agricultural management practices such as irrigation. Unless some restored wetland remained, however, such an action

would violate the terms of the Park Service's mitigation agreement with CalTrans and require the Park Service to repay funds that it received to purchase the ranch and conduct planning and implementation of the wetland mitigation/restoration. The Park Service has also received monies from other private and public entities that were awarded on the basis of the Park Service restoring a significant portion of the Giacomini Ranch.

Construction of the wetland restoration and public access components would involve irretrievable use of depletable petroleum resources, although the overall effect on this increasingly scarce resource would be expected to be negligible. The amount of fuel that would be used is not known, but construction would be expected to take five to six months over a period of three years and involve use of three to five pieces of construction equipment, which would be unlikely to be operating simultaneously. Relative to baseline conditions, implementation of the Alternative A would incur no to extremely negligible irreversible or irretrievable commitment of natural or depletable resources. While use of vehicles for travel to and from the new and enhanced existing public access facilities would increase to some degree, use of construction equipment for maintenance would decrease, and truck trips to the Giacomini Ranch associated with twice daily milk pick-ups and hauling of livestock would be eliminated, thereby offsetting any increase in the number of personal vehicles in terms of use of depletable or non-renewable resources.

Alternative B

Alternative B would be very similar to Alternative A in terms of irreversible or irretrievable commitments of natural or depletable resources, although it would expand restoration actions to incorporate the 200-acre Giacomini Ranch West Pasture, as well as the 350-acre Giacomini Ranch East Pasture.

Alternative C

Alternative C would expand restoration and public access actions to incorporate the 63-acre Olema Marsh, as well as the 550-acre Giacomini Ranch. This alternative would not cause irreversible changes to the environment relative to baseline conditions, as the Giacomini Ranch could easily be leveed and returned to conditions somewhat similar to those currently existing, although there would be changes in the vegetation communities present without agricultural management practices such as irrigation. Unless some restored wetland remained, however, such an action would violate the terms of the Park Service's mitigation agreement with CalTrans and require the Park Service to repay funds that it received to purchase the ranch and conduct planning and implementation of the wetland mitigation/restoration. The Park Service has also received monies from other private and public entities that were awarded on the basis of the Park Service restoring a significant portion of the Giacomini Ranch. Proposed changes to Olema Marsh could also be reversed through replacement of larger arch culverts or bridges with smaller culverts or placement of fill that would encourage impoundment of waters.

Construction of the wetland restoration and public access components would involve irretrievable use of depletable petroleum resources, although the overall effect on this increasingly scarce resource would be expected to be negligible. The amount of fuel that would be used is not known, but construction would be expected to take three to six months over a period of three to six years and involve use of three to five pieces of construction equipment, which would be unlikely to be operating simultaneously. Relative to baseline conditions, implementation of the Alternative C would incur no to extremely negligible irreversible or irretrievable commitment of natural or depletable resources. While use of vehicles for travel to and from the new and enhanced existing public access facilities would increase to some degree, use of construction equipment for maintenance would decrease, and truck trips to the Giacomini Ranch associated with twice daily milk pick-ups and hauling of livestock would be eliminated, thereby offsetting any increase in the number of personal vehicles in terms of use of depletable or non-renewable resources.

Alternative D

Alternative D would be very similar to Alternative C in terms of irreversible or irretrievable commitments of natural or depletable resources, although it would expand the scale and degree of restoration actions slightly, at least in the East Pasture and Tomasini Creek, and decrease the scale of public access.

Avoidable and Unavoidable Major or Significant Adverse Impacts

No Action Alternative

There would be no avoidable or unavoidable major or significant adverse impacts from construction or implementation of the No Action Alternative.

Alternative A

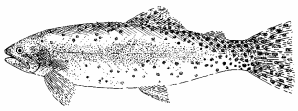
There would be no unavoidable significant adverse impacts from construction or implementation of Alternative A. Alternative A would have only one potentially major adverse impact that would be considered substantial and significant under CEQA and major under NEPA – 1) exceedance of maximum noise levels for certain sensitive receptors that are directly adjacent to the Project Area during construction. This impact would be mitigated to less than significant under CEQA and moderate under NEPA using mitigation measures that are considered standard construction Best Management Practices (BMPs) for reducing impacts of construction noise to sensitive receptors. Potential impacts to ambient noise conditions were analyzed using a conservative or worse-case-scenario approach of having three to five pieces of construction equipment operating simultaneously, which would be unlikely to occur. While these mitigation measures are believed to be effective enough to reduce these impacts to less than significant, if their effectiveness is reduced, these impacts could become unavoidable significant adverse impacts. Over the long-term, however, this impact is very temporary and related only to construction, which lessens its severity relative to short-term or long-term permanent impacts.

Alternative B

There would be no unavoidable significant adverse impacts from construction or implementation of Alternative B. Alternative B would have only two potentially major adverse impacts that would be considered substantial and significant under CEQA and major under NEPA – 1) exceedance of BAAQMD air quality criteria for NOx emissions during construction and 2) exceedance of maximum noise levels for certain sensitive receptors that are directly adjacent to the Project Area during construction. Both of these were mitigated to less than significant under CEQA and moderate under NEPA using mitigation measures that were either recommended by BAAQMD to reduce NOx emissions or that are considered standard construction Best Management Practices (BMPs) for reducing impacts of construction noise to sensitive receptors. While these mitigation measures are believed to be effective enough to reduce these impacts to less than significant, if their effectiveness is reduced, these impacts could become unavoidable significant adverse impacts. Over the long-term, however, both of these impacts are very temporary and related only to construction, which lessens their severity relative to short-term or long-term permanent impacts.

Alternative C

There would no unavoidable significant adverse impacts from construction or over the long-term from implementation of Alternative C. As with Alternative B, Alternative C would have two potentially major adverse impacts that would be considered substantial and significant under CEQA and major under NEPA – 1) exceedance of NOx emissions for a short period during construction; and 2) exceedance of maximum noise levels for certain sensitive receptors that are directly adjacent to the Project Area for a very short period during construction. Both of these were mitigated to less than significant under CEQA and moderate under NEPA using mitigation measures that were either recommended by BAAQMD to reduce NOx emissions or that are considered standard construction Best Management Practices (BMPs) for reducing impacts of construction noise to sensitive receptors. As discussed under Alternative A, potential impacts to ambient noise conditions were analyzed using a conservative or worse-case-scenario approach of having three to five pieces of construction equipment operating simultaneously, which would be unlikely to occur. Mitigation measures for both NOx emissions and noise would include restrictions on the number of pieces of simultaneously operating construction equipment.



While these mitigation measures are believed to be effective enough to reduce these impacts to less than significant, if their effectiveness is reduced, these impacts could become unavoidable significant adverse impacts. In terms of NOx emissions and noise, both of these impacts are very temporary and related only to construction, which lessens their severity relative to short-term or long-term permanent impacts.

Alternative D

There would no unavoidable significant adverse impacts from construction or over the long-term from implementation of Alternative D, and the two potentially major adverse temporary impacts that may occur during construction and their proposed mitigation measures would be the identical to those discussed under Alternative C.

Growth-Inducing Impacts

No Action Alternative

The No Action Alternative would not be expected to have growth-inducing impacts. The No Action Alternative would not affect any public services such as power, water, sewer, roads, schools, hospitals, and other facilities and services or would not affect them in such a way that would induce growth in the local community or west Marin region. Under the terms of the purchase agreement with the Giacomini Trust, the 7-year Reservation of Use Agreement that has allowed the Giacomini family to continue to operate the dairy since its purchase by the Park Service in 2000 will expire in March 2007, and the dairy will close. Closure of the dairy will occur under all alternatives, including the No Action Alternative. Discontinuation of intensive dairying operations could increase the attractiveness for future development of parcels that are already zoned for commercial or residential development along C Street in Point Reyes Station or along Sir Francis Drake Boulevard in Point Reyes Station, however, this factor would be common to all alternatives and would not necessarily be related to the proposed project.

Under the No Action Alternative, there is no wetland restoration or construction of public access facilities, except for the 11-acre wetland restoration area in the northeastern corner of the East Pasture. The Park Service is required under its existing agreement with CalTrans to restore wetlands as mitigation for impacts caused by CalTrans to aquatic habitat from a road repair on State Route 1 in Marin County in exchange for the Park Service receiving monies to purchase and restore the Giacomini Ranch. The Park Service may potentially allow leased grazing of beef cattle or dairy heifers on other portions of the Giacomini Ranch subject to a separate environmental review process. The intensity of grazing relative to baseline conditions would be expected to be much lower due to the fact that the Park Service would be likely to institute resource setbacks and limits on the duration and timing of grazing. Because the Giacomini Ranch may continue to be grazed to some degree or, if grazing is not authorized, allowed to become fallow grasslands, the No Action Alternative might result in slightly less desirable conditions adjacent to parcels zoned for commercial and residential development relative to the other alternatives, but these parcels would be likely to be developed regardless due to the high property values and quality of life present in the Point Reyes region, as well as the overall attractiveness and scenic value of the area regardless of restoration.

Alternative A

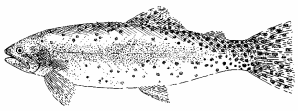
Alternative A would not be expected to have growth-inducing impacts. The proposed project does not involve construction of homes, and Alternative A would not affect any public services such as power, water, sewer, roads, schools, hospitals, and other facilities and services or would not affect them in such a way that would induce growth in the local community or west Marin region. As was discussed under the No Action Alternative, discontinuation of intensive dairying operations could increase the attractiveness for future development of parcels that are already zoned for commercial or residential development along C Street in Point Reyes Station or along Sir Francis Drake Boulevard in Point Reyes Station, however, this factor would be common to all alternatives and would not necessarily be related to the proposed project. Relative to the No Action Alternative, Alternative A might result in slightly more desirable conditions adjacent to parcels zoned for commercial and residential development, but these parcels would be likely to be developed regardless due to the high property values and quality of life present in the Point Reyes region, as well as the overall attractiveness and scenic value of the area regardless of restoration.

Alternative B

As with Alternative A, Alternative B would not be expected to have growth-inducing impacts. See Alternative A for more detailed description.

Alternative C

As with Alternatives A and B, Alternative C would not be expected to have growth-inducing impacts. See Alternative A for more detailed description.

Alternative D

As with Alternatives A, B, and C, Alternative D would not be expected to have growth-inducing impacts. See Alternative A for more detailed description.