



An Analysis of Land Use Change and Cultural Landscape Integrity

*Prepared for the National Park Service by
Nancy Rottle, Assistant Professor University
of Washington Department of Landscape
Architecture and Jones and Jones Architects
and Landscape Architects, Ltd.*

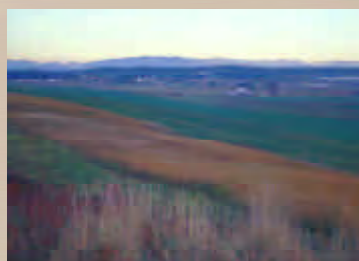
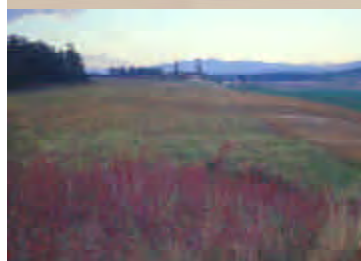
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Ebey's Landing National Historical Reserve

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Ebey's Landing
Coupeville, WA

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Prepared for the National Park Service by:

Jones & Jones Architects & Landscape Architects

105 S. Main St. Suite 300

Seattle, WA 98104

Phone: (206) 624-5702

www.jonesandjones.com

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The first part of the paper discusses the importance of understanding the cultural context of the research. It highlights how cultural differences can influence the interpretation of data and the design of the study. The author argues that researchers must be sensitive to these differences and adapt their methods accordingly. This is particularly true in cross-cultural research, where the researcher is often working in a foreign environment. The paper then moves on to discuss the challenges of conducting research in a non-Western context. It notes that many of the assumptions and methods developed in Western countries may not be applicable in other cultures. For example, the use of individualistic measures may not be appropriate in collectivist societies. The author suggests that researchers should seek to understand the local context and develop methods that are culturally appropriate. This may involve working with local researchers or using indigenous knowledge. The paper also discusses the importance of ethical considerations in cross-cultural research. It notes that researchers must be aware of the potential for harm to participants and take steps to minimize this risk. This includes obtaining informed consent and ensuring that the research is conducted in a respectful and ethical manner. Finally, the paper concludes by emphasizing the need for a more inclusive and culturally sensitive approach to research. It calls for researchers to recognize the value of all cultures and to work towards a more equitable and just world.

Project Introduction

Ebey's Landing National Historical Reserve is an evolving landscape that is at once historical and contemporary. It is a rare landscape with unbroken vistas of active open farmland, views to water and mountain ranges east and west, an impressive collection of historic buildings and farm structures, a readable spatial structure of land division dating from the 1850s, and a mosaic of landscapes that include mature second-growth woodlands, prairie remnants, wetlands, beaches, bluffs and fertile agricultural land. From traveling through this landscape, the resident or visitor can read a Puget Sound settlement story, and appreciate the continuity of land use over the last two centuries.

The Reserve is unique in the National Park System in that most of the land is in private ownership and therefore is not fully protected by unilateral control of the Department of the Interior or the multi-agency Trustee Board entrusted with the preservation of the Park's resources. Because it is a living landscape with limited controls, it is vulnerable to loss of the very qualities that define its historical, cultural, and aesthetic integrity.

Over the last 20 years a number of strategies to preserve the historic and scenic qualities of the Reserve's landscapes and buildings have been employed. For example, the National Park Service has purchased scenic easements, the Reserve has been listed on the National Register of Historic Places, and the Trust Board advises Island County on matters of historic preservation and the compatibility of new structures. An extensive survey of the landscape and buildings was conducted shortly after the Reserve's inception in 1978, and a number of excellent cultural landscape preservation guidance documents have been developed. However, the apparent changes to the land in that same time period indicate that greater protective measures will be required if the qualities that led to its establishment as a landscape of national significance are to be sustained.

This report summarizes a tripartite study that was undertaken by Jones & Jones as part of the General Management Plan process, in order to build tools and answer questions that will assist in the planning for the Reserve's next 20 years. The project contains several components and objectives, with the overarching goal of retaining

the landscape's cultural values within the parameters of primarily privately -owned land.

The goals of the project were to answer the following questions:

- 1. What patterns of landscape change have taken place since the initial cultural landscape inventory in 1983, what contemporary pressures do these patterns suggest, and what forces might compromise the future integrity of the reserve's landscape?*
- 2. What characteristics of the historic landscape (from 50 years previous and earlier) still remain and contribute to the historic integrity of the Reserve, as defined in the Department of Interior's guidelines for evaluating historic and cultural landscapes?*
- 3. What are innovative preservation strategies used in other parts of the U. S., especially as applied to agricultural and forested working landscapes, and how might lessons from these precedents be applied to the Reserve?*

In addition, a major goal of the project has been to create a digital survey of land use and landscape characteristics existing in the year 2000, to be used as a management tool for the Reserve and to serve as a baseline against which future inventories can be compared.

This report describes the methods used to investigate questions 1 and 2, includes excerpts of the graphic analyses produced, and presents a brief analysis of the contemporary land use pressures on the Reserve, informed by historical patterns. Full graphic analyses of the changes between 1983-2000, and between 1950-2000 with assessment of cultural landscape integrity, are presented on large posters in hard copy and digital format. Agricultural land preservation case studies and strategies are detailed in two separate reports.

Methodology

See Appendix C “Metadata” for a more detailed description of the methodology, assumptions, and parameters used in the spatial inventory.

Baseline

To establish the year 2000 baseline, theme layers of selected categories of landscape features were drawn over aerial photographs using Arcview Geographic Information System (GIS) software. Land-use interpretations and questions regarding features or areas were field-checked if they were accessible by public roads. The theme layers were drawn over 1990 orthorectified photographs to ensure proper georeferencing, but 1999 aerial photographs were used as the information base.

1983 to 2000 Cultural Landscape Changes

The 1983 theme layers were informed by two primary sources. The Building and Landscape Inventory undertaken in 1983 by the Cultural Resources Division of the former Pacific Northwest regional National Park Service office (now Columbia Cascades support office) provided information on land use, historic buildings, circulation and hedgerows, and was interpretive in nature. 1983 infrared photographs supplied more thorough and accurate spatial documentation of the entire Reserve, and these were used extensively in determining the features in existence at that time. The cultural landscape categories in the 1983 inventory and the classification system in use at that time were used as a basis of comparison with the year-2000 baseline:

- Circulation Network (vehicular only)
- Land Use
- Vegetation Related to Land Use
- Structures (Historic and Non-historic)
- Boundaries (Hedgerows, Windbreaks, Reservation)
- Cluster Arrangements

Changes between 1983 and 2000 were determined for each category of landscape feature by generating polygons representing the changes on separate theme layers.

The inability to ground-truth every element due to property access restrictions provided limitations in data mapping, especially with regard to residential properties. As a result, only housing in subdivisions was considered “residential” land use,

though the increase in number of structures across the reserve indicate a substantial growth in residential land use. New homes on as many as 8 acres per residence followed subdivision spatial patterning.

Pre-1950s to 2000 Cultural Landscape Integrity Assessment

To assess the integrity of the Reserve’s historical landscape within the parameters of the National Register for Historic Places, eight landscape “characteristics” were evaluated for their continued existence since 1950 or before. The characteristics were selected and are defined according to the most recent guidelines for evaluating cultural landscapes. Those included were:

- Vegetation
- Circulation
- Spatial Organization
- Land Use
- Views and Vistas
- Building Sites (Buildings and Structures)
- Cluster Arrangements
- Natural Systems and Features

Because sources detailing pre-1950s conditions were limited and the resolution of aerial photographs poor, most of the comparisons between the historic landscape and year-2000 are more general than the 1983-2000 comparison. A 1941 aerial photograph, published in 1944 by the Army Corps of Engineers, and a 1936 USGS topographic map were the primary spatial sources. The 1983/1995 NPS building inventory and the 1997 National Register of Historic Places nomination provided valuable documentation on historic buildings and structures. Textual sources and an extensive study of historic photographs yielded general clues as to the historic landscape patterns and some specific building and landscape information. In addition, we obtained turn-of-the-century plat maps and Government Land Ordinance survey notes for that vicinity of Whidbey Island. Gretchen Luxenberg and Susan Dolan and of the National Park Service were knowledgeable resources who assisted with the process.

As in the 1983-2000 assessment, GIS theme layers were drawn over the historic maps or photographs, and compared with year-2000

conditions. In some cases, additional year-2000 data layers were created to be compatible with the more general historic layers. Where appropriate and possible, layers indicating the changes were generated. A judgment regarding the integrity of each landscape characteristic was made, based on the guideline that at least half of the historic resource existing before 1950 must remain on the Reserve for the characteristic to retain integrity. All characteristics retained integrity based on these criteria, with some qualifications; text regarding the conclusions regarding historic integrity can be found on the posters and on Figures 7 through 14.

Farm and Forest Preservation Strategies

For the third question involving strategies and recommendations for landscape preservation, the NPS planning team determined that in order to preserve the temporal and spatial continuity of the landscape, it is important to support the viability of agricultural enterprises and small-scale forestry on the Reserve. We therefore focused our research and recommendations on strategies to preserve those land uses, to preserve historic function as well as character. The results of the study are published in a two-part linked world-wide-web document, the first which lays out a structure of cooperating organizations with the three primary goals of:

- Protecting farmland
- Supporting farmers
- Cultivating agricultural markets

Specific strategies supporting these goals are described and linked to a second document, which details case studies in other parts of the country involving federal, state and county governments and non-governmental organizations. These documents are expected to be available through the NPS website: www.nps.gov.

Findings: Analysis of Land Use Changes 1983-2000

See Appendix A "List of Figures" for the figures mentioned in this section.

It was assumed that current and future pressures that threaten to change the overall character of the Reserve would be indicated by assessing the spatial patterns of change within the past two decades. The comparisons undertaken in this study reveal some of the structuring spatial patterns that could possibly be controlled through land-use management, zoning, economic programs, education and land-protection techniques. In some cases, sufficient information from pre-1950 sources allowed observation of longer patterns of change. The following land use change analysis takes into account each category of the 1983-2000 investigation, presenting the implications findings in each category have for the current land use directions of the Reserve.

Buildings and Structures

See Figures 1a and 1b, ***Structures: 2000; and Structures: Gains 1983-2000*** and Figure 7, ***Historic Buildings and Structures***

See Also: ***Structures Poster and Historic Buildings and Structures Poster***

Proliferating Structures

In a time period of just seventeen years, over 1000 new structures were built, an increase of 44%. These structures include residences and ancillary buildings, and have been built in Coupeville, in existing subdivisions, in new subdivisions, in woodlands and in open pastoral lands. 26% were built in Coupeville, 24% were in subdivisions, and 50% were built in other parts of the Reserve. New homes in Coupeville generally follow the traditional pattern of building in towns, affronting the public streets; likewise, addition of homes to subdivisions that were existing in 1983 has had little additional impact to the visual scene or to the loss of farmland, since the subdivision street layout has already converted the land to new uses. Structures placed in the open landscape and the addition of new subdivisions have had the most significant effect upon the cultural landscape of the Reserve, interrupting vistas of open farmland, defining the edges of hillsides with buildings instead of trees or open space against the skyline, dividing the landscape into smaller pieces, and changing the character of the ground plane from large continuous areas of vegetation to areas

dotted with large new homes. Structures concealed in woodlands have less visual impact than those in open areas; this division of parcel size and change in land use will most likely affect the viability of commercial forestry but might still allow sustainable woodlot management.

Historic Structures Lost

In this time period, fourteen historic structures were lost, despite efforts by NPS and the Trust Board to convey the value of these buildings to the historic integrity of the Reserve. Still, the majority of historic structures remain.

Land Use

See Figures 2a, 2b, and 2c, ***Land Use: Residential Subdivisions, Land Use: Woodland, and Land Use: Agriculture***, Figures 8a, 8b, and 9, ***Historic Land Use: Agriculture and Woodland, Historic Land Use: Residential/Commercial and Parks/Defense/Cemetery, and Historic Vegetation***. ***Commercial Land Use*** and ***Parks Land Use*** are shown on the full-size posters.

Methods

In the 1983 inventory, Reserve lands were categorized as Agriculture (cropland), Ranching (pasture), Natural Vegetation (grassland, forest, or wetland), Residential, Commercial, and Park. Mapping showed the location of cropland, pasture, grassland, woodland, commercial areas, and structures. For the 2000 inventory land use was assessed using aerial photographs and extensive field checks to test aerial interpretation techniques as well as to verify areas in question. Similar categories were used for the year-2000 inventory for purposes of comparison between the two inventories.

Patterns of Land Use Change - Agriculture versus Housing

In the 17-year time period, significant patterns of land use change appeared to emerge. Most notably, there was an increase in residential subdivisions of 41%, involving 233 acres and two new subdivisions. The categorization of new construction as "residential subdivisions" was estimated conservatively: to qualify as a subdivision a grouping of at least 10 new homes needed to follow suburban road layout patterns. New subdivisions that were judged as having

aesthetic, and undoubtedly functional, impacts to the landscape had parcel sizes as large as 8 acres (See Land Use, Residential Subdivisions, below). Dense housing areas that followed historic vacation cabin spatial patterning, affronting the beach, were not considered subdivisions because they did not follow suburban road layout patterns. The new housing areas that were counted as subdivisions are located on Grasser's Hill and near Fort Casey. Additionally, the visual impact of the new subdivisions is substantial as they are located in primarily open areas rather than in forested areas, although both are somewhat visually mitigated by screening and location. Approximately three-quarters of the subdivisions on the Reserve have been constructed or remain in open areas. It is important to note that several additional enclaves of residences exist that did not meet this criteria and therefore were not counted as subdivisions; additional subdivisions were in the planning or initial construction phases but did not yet meet the criteria.

It is also important to underscore that a large number of new homes were constructed outside of residential subdivisions, either in smaller groupings or spread out over the landscape of the Reserve. It was not possible to spatially delineate the land use area of each single residence on the Reserve, nor was there a 1983 baseline with which such mapping could be compared. Therefore, the Structures data, conveying a high number of new buildings since 1983, are particularly important to consider for residential land use growth.

The land area of the town of Coupeville, the County seat and only town in the Reserve, grew by 30% in this time period, totaling 63 acres of gain. This growth is represented on the maps as "Urban Growth", and spatially includes all residential and commercial areas that are inside Coupeville's city boundary. It is interesting to consider that in 1930s the town of Coupeville considered expanding its boundaries but felt that the quality of the agricultural land was too valuable to use for urban settlement. (Richard White, Land Use, Environment and Social Change, Seattle: University of Washington Press, 1980).

Concomitantly, agricultural land diminished by 4% (158 acres) and woodland by 2% (111 acres). Agricultural land tended to convert to residential and grassland uses, and it is important to note that lawns were categorized as grassland, hence overall most agricultural land loss was to subdivisions or rural residential uses. Mapping of changes from pre-1950 to present-day show conversion from "open fields" directly to housing subdivisions. A more detailed analysis of land-use conversions related to agricultural changes is described in the

Vegetation section below.

Commercial Land Use

Commercial land use grew by a total 22 acres, or 24%. Mussel beds in Penn Cove constitute a large portion of this category. Some growth in the total commercial gain was offset by a reduction in commercial area with the conversion of the landfill near Smith Prairie to a park.

Woodland

The general pattern in loss of woodland was conversion of the forest edge to residential and agricultural uses. This pattern of change was observed in the time period of pre-1950s to 2000 as well, with substantial areas of the East Woodlands having been converted to open land, including the airfield on Smith Prairie.

Parkland

The size and number of Parklands appears to have increased significantly, especially when assessing public ownership and zoning of several tracts of land in the West Woodlands near Fort Ebey State Park. However, the status of these lands in 1983 is unknown, and their current status and boundaries is unclear; it is therefore not possible to reliably quantify the amount of change in parklands. The state park at Keystone Spit has been added, and a former landfill has been converted to a small park. If the Pratt Preserve is included, which has been added since 2000, the figure is substantially increased as well.

Land Use Summary

To summarize, the most obvious pattern in land use change is capitulation of agricultural and resource lands from farming to new human uses, primarily homes in residential subdivisions and on "rural residential" parcels, the growth of the town of Coupeville, and new methods of aquaculture in Penn Cove. It should be noted that while the numbers of acres do not appear large, the visual effect of these changes is significant. The public acquisition of new state park and private lands is a use change primarily from forestry and beach area to recreation and conservation.

An analysis of the current zoning could be used to predict the likely future conversion of agricultural and natural lands to housing. This would be an important component in assessing continued threats to degradation of the cultural landscape within the life of the General Management Plan.

Vegetation

See ***Vegetation Related to Land Use*** Figures 3a, 3b, 3c, 3d, 3e, 3f, 3h: ***Pasture 2000, Pasture Changes, Woodland 2000, Woodland Changes, Cropland 2000, Cropland Changes, Grassland 2000, Grassland Changes***

See also Figure 9, ***Historic Vegetation***

Changes in vegetation between 1983 and 2000 give clues to patterns of land use change as well as describe alterations to the ecology and appearance of the landscape. It is important to note that vegetation categories do not exclude residential land use; many residences are located within forest and grassland categories, with more farm-related residences located within cropland and pasture categories.

Methods

The mapped 1983 vegetation inventory categories of Cropland, Pasture, Grassland, Woodland and Wetland were used as a baseline. These same categories were used in designating current vegetation patterns. Aerial photos from 1999 were interpreted and then field-checked. Cropland included all row-crops, whether in current production or fallow and recently plowed. Tree farms were included in Cropland but drawn on a separate GIS theme layer; these had been mapped on the 1983 inventory as well. Grassland included former farm fields now fallow and gone to grassland, lawns, and native prairie patches. Pasture was differentiated from grassland by the presence of animals, fences, or appearance of support for use by cows, sheep, horses or other grazing animals. Woodland boundaries were easily identified by aerial photograph; if forests had recently been cut they were included in the woodland category but drawn on a separate GIS theme layer. Wetlands present on the 1983 cards were field-checked for presence in 2000, and 1999 aerial photographs were searched for any additional open water areas.

Vegetation Changes 1983-2000

In assessing the vegetation changes over the last two decades, most significant is the conversion of active agriculture to grassland. There was an 11% gain in grassland (143 acres), a 14% loss of pasture (190 acres) and a 1% gain in cropland (32 acres). It is surmised that these changes can primarily be attributed to the decline of active farming, especially dairy grazing, with fields becoming fallow or converting to residential lawns. Large areas where cropland or pasture have been converted to grassland are in the eastern portion of Coupeville, on the hill north of Ebey's Prairie near the cemetery, on Grasser's Hill, and on the Fort Casey uplands. In the latter two, former agricultural croplands and pasture have been replaced by lawns and unfarmed open spaces in residential areas, including subdivisions. However,

both new subdivisions shown in the Land Use analysis were primarily grassland in 1983, indicating a progression from agriculture, to fallow land, to development. This sequence is not a rule: some areas previously in grassland are now actively farmed, including patches on Libby Bluff, near Smith Prairie, and a new tree farm on Smith Prairie.

In addition to the net percentages cited above and graphed in the Figures, more extensive changes in the agricultural land use are indicated by the gains and losses of each category, which can be seen by comparing the various vegetation categories on the aerial photographs with mapped overlays. Most notably, a visual/spatial analysis of vegetation changes reveals that a substantial amount of acreage has been exchanged between pasture and cropland: numerous lands that in 1983 were planted cropland now appear to be pastureland, and conversely, previous pastureland was in planted crops in 2000. For example, pasture was plowed into crop use on Crockett and Ebey's Prairies, and on Smith Prairie, former cropland now appears to be used as pasture. It is therefore important to note that some of the changes in vegetation as related to land use may be attributed to the seasonal or annual rotation of crops, as well as to new directions that agriculture may be taking.

Crop Shifting on Whidbey Island—A Historical Practice

This phenomenon of crop rotation on the Reserve is in itself historical. In his history of Island County, Richard White observes that in the last half of the nineteenth century "abandonment of one crop and the planting of another was almost an annual occurrence" (White, p. 64). Farmers responded to national and local markets, weather, soil and labor parameters. "Island County agriculture swung from plantings of a regular annual crop to rapid shifts from one crop to another. The extremes dominated. There was rarely any middle ground" (White, 69).

Indeed, alternating uses of farmland in Island County in the past two centuries has been the dominant pattern. Salish tribes cultivated the fertile agriculture prairies of Whidbey Island to increase quantities of valued food plants such as camas and bracken fern, as well as to grow potatoes introduced to them by Europeans. Census data show that during the first 50 years of settlement by Euro-Americans, farmers in the county radically altered their farming practices between one decade and the next, responding to climate, technology, markets and the alteration of conditions precipitated by farming practices, such as loss of soil fertility. Cultivation of potatoes, oats and wheat and raising of hogs and cattle in the 1850s and early 1860s gave way to sheep farming in the late 1860s and early 1870s on both Ebey's

Prairie and San de Fuca—as competition from California saturated local vegetable and grain markets—where farmers grew timothy and clover to support their herds. However, by the turn of the century, sheep farming had declined and field crops as well as fruit orchards dominated agricultural production (White, chapters 1-3). Between 1900 and 1940 “small fruits” continued to play a significant role in the agricultural economy of Island County, and dairy and poultry products were produced in significant quantities (White, Appendix B in Land Use, Environment and Social Change). Contemporary use of Ebey’s Prairie has focused on seed production by Skagit Valley farmers, while several dairies on the Reserve have ceased operation in the last decade due to financial challenges.

Tree Farms

In keeping with this pattern of fluctuating crops, a tree farm was started on Smith Prairie in the 1970s. Since 1983 another large new tree farm has been planted on Smith Prairie. While the spatial changes in tree farm quantity or location are not especially significant, a comparison of photographs from the 1983 with the appearance of the tree farms today indicates that they have substantially altered the look of the landscape. The increased height and density due to growth of the trees creates barriers to views, especially since the tree farms in large part have not been harvested. Both tree farms are located on lands that appear to be mostly open in 1941.

Woodland

As stated above in the Land Use section, there has been a loss of 111 acres, or 2%, of woodland. Forests have been converted to pasture, grassland, residential and urban (in Coupeville) uses. There are also a small number of new forests since 1983, scattered about the Reserve.

Circulation

See Figures 4a and 4b, *Circulation Network 2000* and *Circulation Network Changes*

See also Figures 10a and 10b, *Historic Circulation: Roads Remaining from Pre-1950* and *Historic Circulation: Gains*

Methods

To assess changes in roads, a combination of 1983 infrared photos and the USGS-based maps used in the 1983 inventory were consulted to establish a GIS data base of highways, major roads, secondary roads and minor roads. Driveways longer than 100 feet were considered as minor roads. Year-2000 highways, major roads and secondary roads were field checked, however private drives were not ground-truthed. Footpaths were not included in the 1983 inventory or visible on aerial photographs so these were not mapped in 2000, however Park staff is working on the

establishment of a cross-reserve trail.

Miles of New Roads

Changes in circulation on the Reserve has been simple but dramatic; there has been an increase of approximately 24 miles of roads in the last two decades, a 20% increase. Nearly all of these were “minor roads”, a 36% increase in that category. While some of the minor roads appear to be farm roads, the vast majority serve new structures; this fact was ascertained by comparing the Circulation Change map with the Structures Gain map. These include new roads in subdivisions, and roads serving clusters of houses as well as single homes.

The proliferation of roads between pre-1950 and 2000 is even more dramatic, with the addition of many secondary and minor roads, conversion of minor roads to secondary and major roads, and the rerouting of Highway 20 through a substantial portion of the Reserve. New roads include those in the East Woodlands, along Keystone Spit, in Coupeville, at Snakelum Point, in the Western Woodlands, and in the San de Fuca Uplands; in the latter there has been a proliferation of subdivision roads and a number of conversions from minor to major and secondary roads.

Visually and ecologically, roads alter the “grain size” of the landscape. New roads in forested areas have more impact to short views, generally puncturing forest edges along existing major or secondary roads. New roads in open areas tend to be more subtle divisions in the landscape, though since they are visible from a distance and from several locations they generally have a large impact on the landscape scene overall. The proliferation of roads as land dividers may have impacts to the functioning of the agricultural landscape. In addition, the potential negative effects of roads on ecological integrity has been well-documented, as they can interrupt habitat continuity for small wildlife species and cause drainage changes and hence substantial alteration to wet and dry ecological communities.

Boundaries

See Figures 5a and 5b, *Boundaries: Hedgerows and Windbreaks, 2000* and *Boundaries: Hedgerows and Windbreaks, Changes*

Methods and Results

For this study, boundaries included only hedgerows and windbreaks. The 1983 inventory cards and 1983 IR photos were referenced to establish the 1983 baseline. The year-2000 layer was produced using aerial photos with ground-truthing. Overall, there was a slight gain in hedgerows (.2 miles) and a slightly greater gain in windbreaks (1.8 miles). In actuality almost five miles of hedgerows were lost in the 17 years

between the two surveys, however these were offset by an almost equal gain of hedgerows growing in other locations. Losses occurred primarily between farm fields, in new residential areas and in the town of Coupeville, while new hedgerows tended to be growing along roads and between agricultural patches. The addition of windbreaks occurs in two locations on Smith Prairie, one which surrounds the new tree farm. With apparent loss of hedgerows in new residential areas, implications for this land use analysis are tied with the growth in residential use of the Reserve. While it might be seen that these vegetative divisions further dissect the landscape, they also provide the scenic benefit of modulating the visual effects of building, continue a cultural landscape pattern, and provide habitat benefits.

Cluster Arrangements

See Figures 6 and 11: *Cluster Arrangements* and *Historic Cluster Arrangements*

See also full-size posters: *Cluster Arrangements*, and *Historic Cluster Arrangement*

All cluster arrangements remained between 1983 and 2000, with the addition or loss of individual structures within six farm clusters between the years of 1995 and 2000. Perhaps more importantly for land use analysis purposes, the active existence of these clusters suggests that an agricultural relationship to the land is still intact. However, it was informally observed that the majority of new structures built on the Reserve did not follow the historic pattern of clustering a residence with service buildings, indicating a direction change from the primarily agricultural relationship mode to a residential one.

Summary & Recommendations

Suburbanization—a Threat to the Cultural Landscape

While the landscape of Ebey's Landing still retains its stunning beauty, agricultural character and historic integrity, the patterns of growth since the Reserve was instituted indicate that pressure to use the land for single-family housing is a driving force in the landscape. Indeed, one could expect that it is the beauty of the landscape itself, cherished by tourists since the beginning of the 20th century, that attracts new settlers, pulling its own unraveling threads. Our analysis of past patterns of change indicates that urbanization, suburbanization, and rural residential pressures on the landscape of the Reserve are substantial. Key indicators are the dramatic rise in numbers of new structures and roads and the addition of new subdivisions. Concomitantly, there has been a subtle shift away from active agriculture, borne out by the loss of agricultural land to fallow grassland and a conversion of grasslands to residential subdivisions. The continuation of these forces lead towards a residential landscape and away from an agriculturally-based community. It is a pattern that builds on itself: residential pressures escalate land values and obstruct farming operations and economies, undermining the economic sustainability of agriculture. The pattern is classic in urbanizing areas, and without intervention will undoubtedly continue. Recent zoning changes in Island County appear to be less restrictive than they were previously, which may well accelerate the dissection and suburbanization of the Reserve's landscape.

The loss of the agricultural community will be significant in altering both the character and human relationship to the cultural landscape, and may undermine the purpose for which the Reserve was created: "to preserve and protect a rural community which provides an unbroken historic record from...19th century exploration and settlement...to the present time". This legislation recognized that a cultural landscape and the people that sustain it are interdependent. The nature of the human relationship to the land affects the land's historic significance as well as the scenes it produces; it is the basis of the cultural landscape. Pastoral and actively farmed land conveys a dramatically different message about that relationship than a "rural residential" landscape of contemporary single-family houses and subdivisions. The evolving human relationship

to the land of the Reserve is becoming less an agricultural one, moving towards one based on the views one might have from a residential domain. As the residential population expands, however, cherished public and private views of open farmland will gradually become replaced with houses and their accompanying residential appurtenances, destroying the visual resource that is so valued. Concurrently, farming will become increasingly challenged by conflicting interests, accelerating land values, and lack of support facilities.

A Shrinking "Grain Size"

While the assessment of landscape characteristics from pre-1950 indicates that the historic landscape still retains integrity, and the 4% loss of agricultural land since 1983 seems insignificant, this small percentage of change becomes alarming when considering the experience of today's suburbanizing Reserve landscape. Visually, the most striking pattern of change to the character of the Reserve is the reduction of landscape "grain size", with areas previously in large open spaces or affiliated with a single farmstead now divided into smaller perceivable units and studded with new buildings. This spatial effect is primarily effected by the proliferation of roads and the increased density of new structures, arranged in subdivisions as well as spread out over the Reserve. Historically, farmsteads and small communities were clustered, with large spaces between, creating a distinct landscape fabric. Agricultural markers such as barns, silos, crops, fences and active pastures with animals were conspicuous. The addition of new housing brings with it not only increased numbers of roads and non-historic visual elements, but also new property boundary demarcations, thereby dividing the open spaces into even smaller visual parcels (though it should be noted that photographs show that historically wooden fences were much more prevalent in the landscape than they are today). The effects are functional as well as visual; spaces that formerly could be used as large dairy, grazing or croplands may now be more suited to hobby farming, fallow pasture and lawns.

New and Old Agricultural Economies

As a corollary to these conditions, a critical question is how the changing economy of agriculture will affect the viability of the traditional resource-based relationship to the land.

As land values increase and parcels become smaller, can agriculture as a livelihood be sustained? Can new types of agriculture on smaller farms succeed? In the majority of agricultural areas across the nation, without outside support market forces often work against the vitality of traditional agriculture and the communities it supports. Proposed strategies for farm support, outlined in a separate document, and a recent trend towards small farms within market distance of major cities, may help to boost farming activities, thereby preserving the agricultural relationship to the land and community. An increasing number of people are interested in small-scale farming, and new programs such as the USDA's Community Food Security Initiative, aimed at providing food security through community farmer-to-consumer programs, can lend critical support.

Is small-farm agriculture within the local agricultural tradition, and will it significantly alter the historic appearance of the Reserve? An examination of the past reveals that early landowners, including the Ebeyes, leased their lands to tenant farmers. Chinese tenants in particular were noted for prolific potato production on small market plots in the latter part of the nineteenth century (White, 64-67). While the bucolic scene of today's large open prairie farmland might be altered by small-scale farming, if the landscape remains in agricultural production it can still vividly convey stories of the land's past. Moreover, maintenance of Reserve lands in agricultural production—as opposed to ever-infilling homes and roads—protects the fertile resource for the future, allowing the continuity of land use while retaining the historical pattern of shifting agricultural production practices.

Recommendations and Further Study

However, for the agricultural tradition to persist, the land must be protected from the obvious and relentless pressures of residential growth. Strategies are best a combination of controls such as zoning, designation of Agricultural Protection and Historic Overlay districts, and purchase of conservation easements; and “carrot” mechanisms that support and stimulate farming, such as land leasing programs, product marketing and community processing facilities.

To most effectively use funds for land protection such as the purchase of conservation easements, it is recommended that a study be made to identify the specific lands that contain the highest visual and historic integrity, but which are least protected by current controls—those lands most valuable and most vulnerable. The data generated by this project are the essential basis for such a study. A logical next step is to use these data generated for the Reserve as a whole to focus on specific landscape units that are most valued based upon

historic and scenic integrity, and those most pressured because of their high aesthetic value or ease of development; to identify areas that are vulnerable to future development based upon current zoning; and to overlay this information with spatial documentation of existing protections, in order to designate areas of greatest need.

It has been said that the most dramatic landscape changes are usually incremental; that is, the changes are small so that they are generally imperceptible. With the spatial documentation of the landscape at specific points in time that this project provides, changes can be monitored, recognized, and most importantly, be shaped or modulated before the Reserve's cultural, aesthetic and natural resources are significantly compromised. To preserve these values so treasured at Ebey's Landing National Historical Reserve, an ongoing program of education, protection, and proactive support of desired human and natural processes will most certainly be required.

Appendix A: List of Figures

1983-2000

- 1a. Structures: 2000
- 1b. Structures: Gains 1983-2000
- 2a. Land Use: Residential Subdivisions, 2000 and Changes
- 2b. Land Use: Agriculture, 2000 and Changes
- 2c. Land Use: Woodland, 2000 and Changes
- 3a. Vegetation Related to Land Use: Cropland 2000
- 3b. Vegetation Related to Land Use: Cropland Changes
- 3c. Vegetation Related to Land Use: Pasture 2000
- 3d. Vegetation Related to Land Use: Pasture Changes
- 3e. Vegetation Related to Land Use: Woodland 2000
- 3f. Vegetation Related to Land Use: Woodland Changes
- 3g. Vegetation Related to Land Use: Grassland 2000
- 3h. Vegetation Related to Land Use: Grassland Changes
- 3i. Vegetation Related to Land Use: Wetlands 2000
- 4a. Circulation Network, 2000
- 4b. Circulation Network, Changes
- 5a. Boundaries: Hedgerows and Windbreaks, 2000
- 5b. Boundaries: Hedgerows and Windbreaks, Changes
- 6. Cluster Arrangements

PRE-1950 TO YEAR-2000

- 7. Historic Buildings and Structures
- 8a. Historic Land Use: Agriculture and Woodland
- 8b. Historic Land Use: Residential/Commercial and Parks/Defense/Cemetery
- 9. Historic Vegetation
- 10a. Historic Circulation: Roads Remaining from pre-1950
- 10b. Historic Circulation: Gains
- 11. Historic Cluster Arrangements
- 12. Spatial Organization
- 13. Natural Systems and Features: Historic and Modern Patterns
- 14. Views and Vistas

Structures
2000

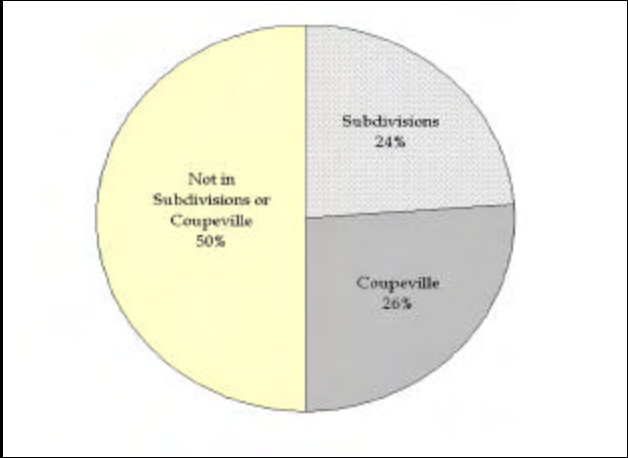
Changes from 1983 to 2000



Non-Historic Structures	3089 (90%)
Historic Structures	344 (10%)
All Structures	3433 (100%)

Spatial Distribution of Buildings in 2000

Buildings in Subdivisions	819 (24%)
Buildings in Coupeville	889 (26%)
Remaining Buildings	1725 (50%)



Three hundred and three historic buildings are not in Coupeville or in subdivisions. Three historic buildings are in subdivisions with 38 historic buildings in Coupeville.

Structures
Gains, 1983 to 2000

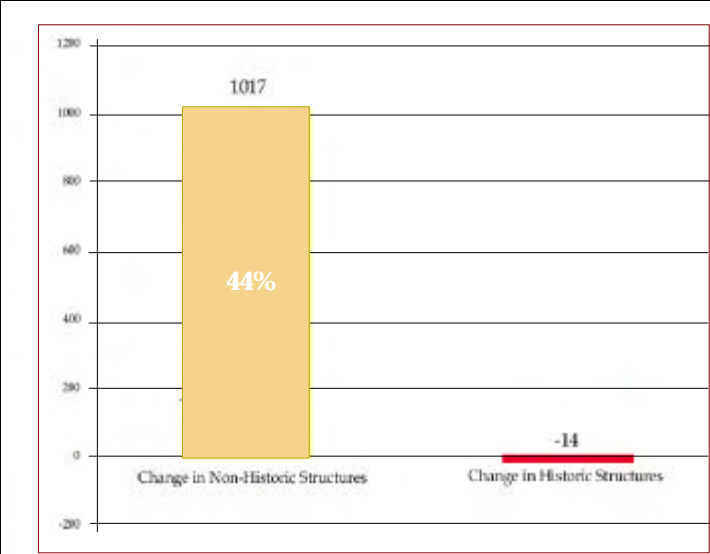
Changes from 1983 to 2000



Gains in Non-Historic Structures 1017
Total Non-Historic Structures 3089

Non-historic buildings from 1983
to 2000 increased by 44%.

Net Gain / Loss of the Number of Structures from 1983 to 2000

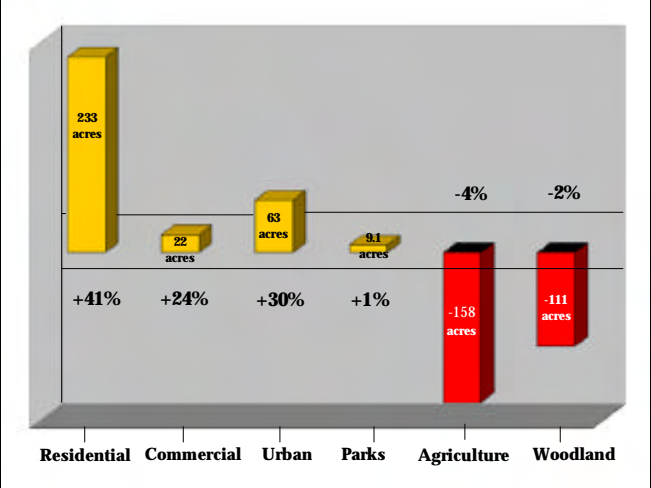


Land Use
Residential Subdivisions

Changes from 1983 to 2000



Net Change of Land Use between 1983 and 2000



The category "Residential Subdivisions" on this poster is conservatively estimated as only the areas showing characteristics indicative of subdivisions. Much of the Reserve has experienced residential growth in cropland, pasture, grassland, and woodland areas. This growth can be better understood by referring to the structures poster.

The "Urban" category contains both residential and commercial land use. Thus, it was included in both the residential and commercial categories.

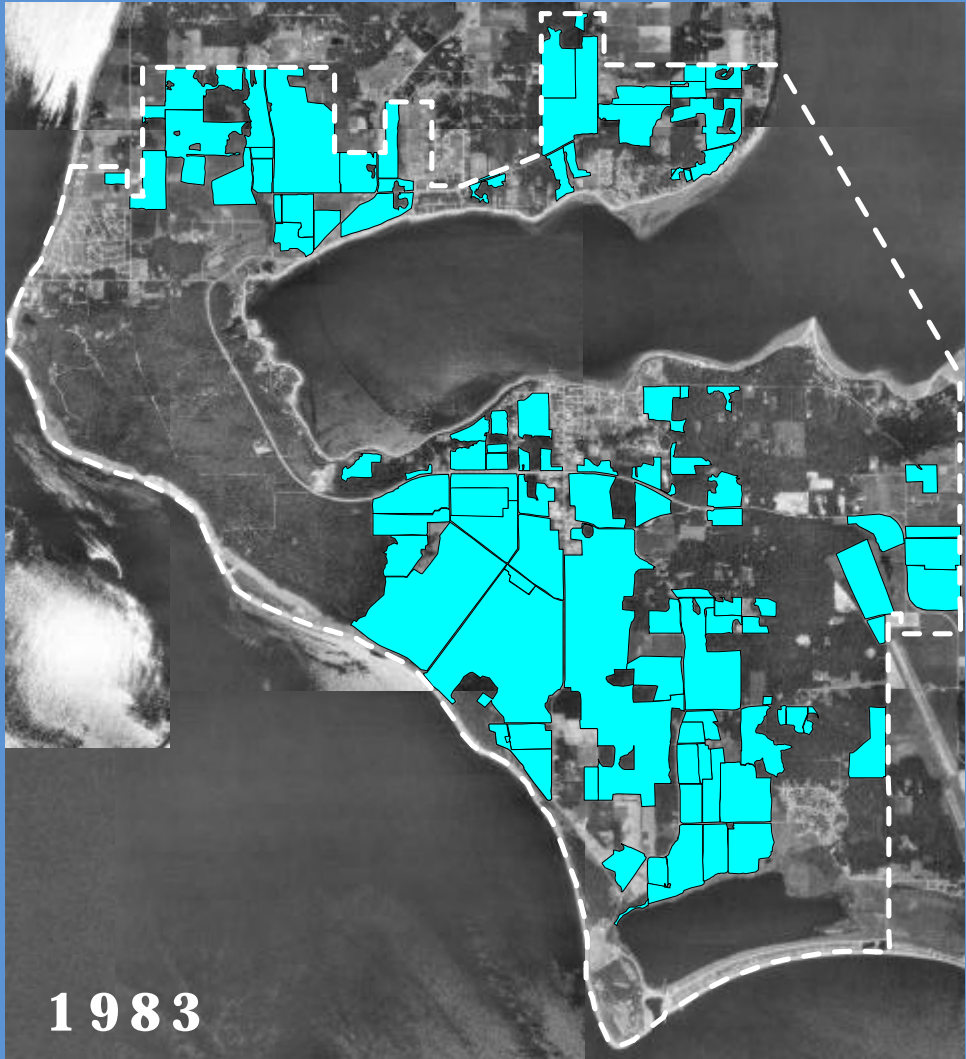
LEGEND

- 1983
- 2000
- GAINS
- LOSSES
- MUSSEL FLATS 1983
- MUSSEL FLATS 2000
- MUSSEL FLATS GAIN
- MUSSEL FLATS LOSS
- URBAN
- URBAN GAIN
- URBAN LOSS

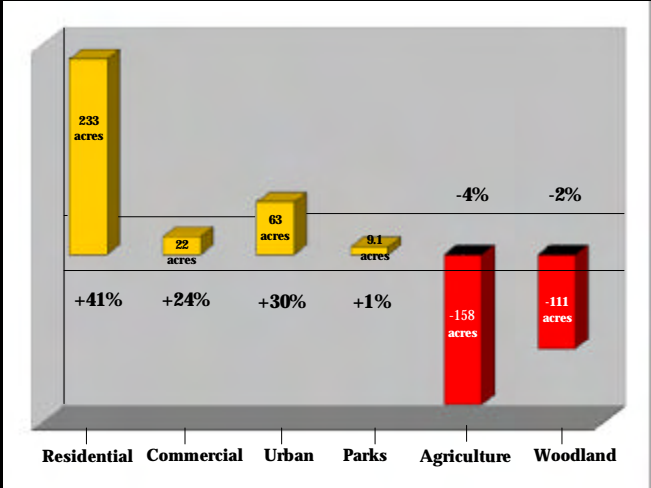
Ebey's Landing National Historical Reserve

Land Use
Agriculture

Changes from 1983 to 2000



Net Change of Land Use between 1983 and 2000



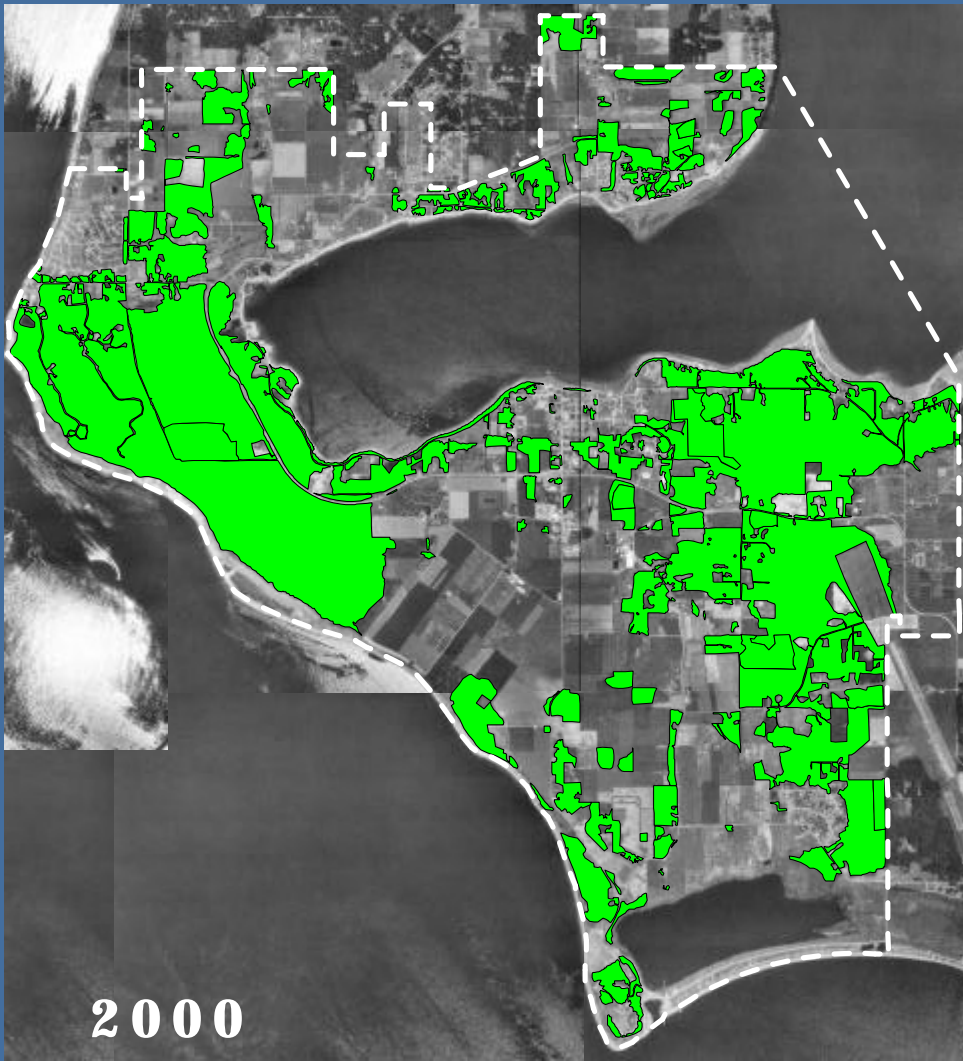
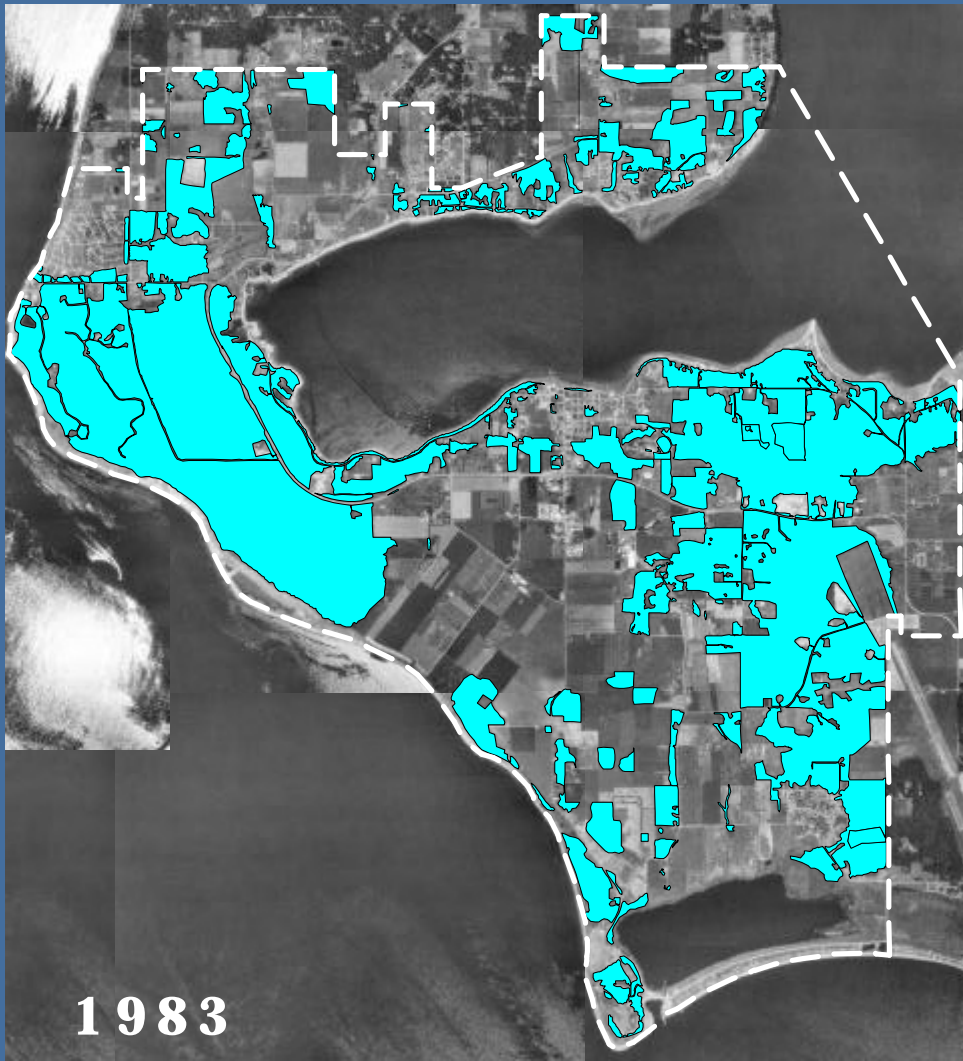
- LEGEND
- 1983
 - 2000
 - GAINS
 - LOSSES
 - MUSSEL FLATS 1983
 - MUSSEL FLATS 2000
 - MUSSEL FLATS GAIN
 - MUSSEL FLATS LOSS
 - URBAN
 - URBAN GAIN
 - URBAN LOSS

Ebey's Landing National Historical Reserve

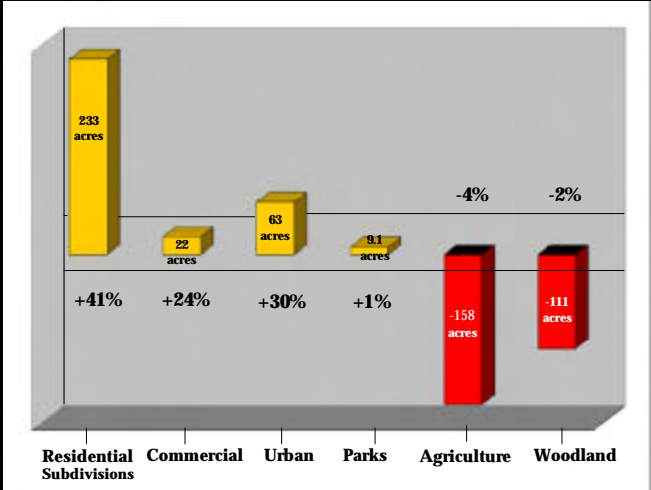
Figure 2b

Land Use
Woodland

Changes from 1983 to 2000



Net Change of Land Use between 1983 and 2000

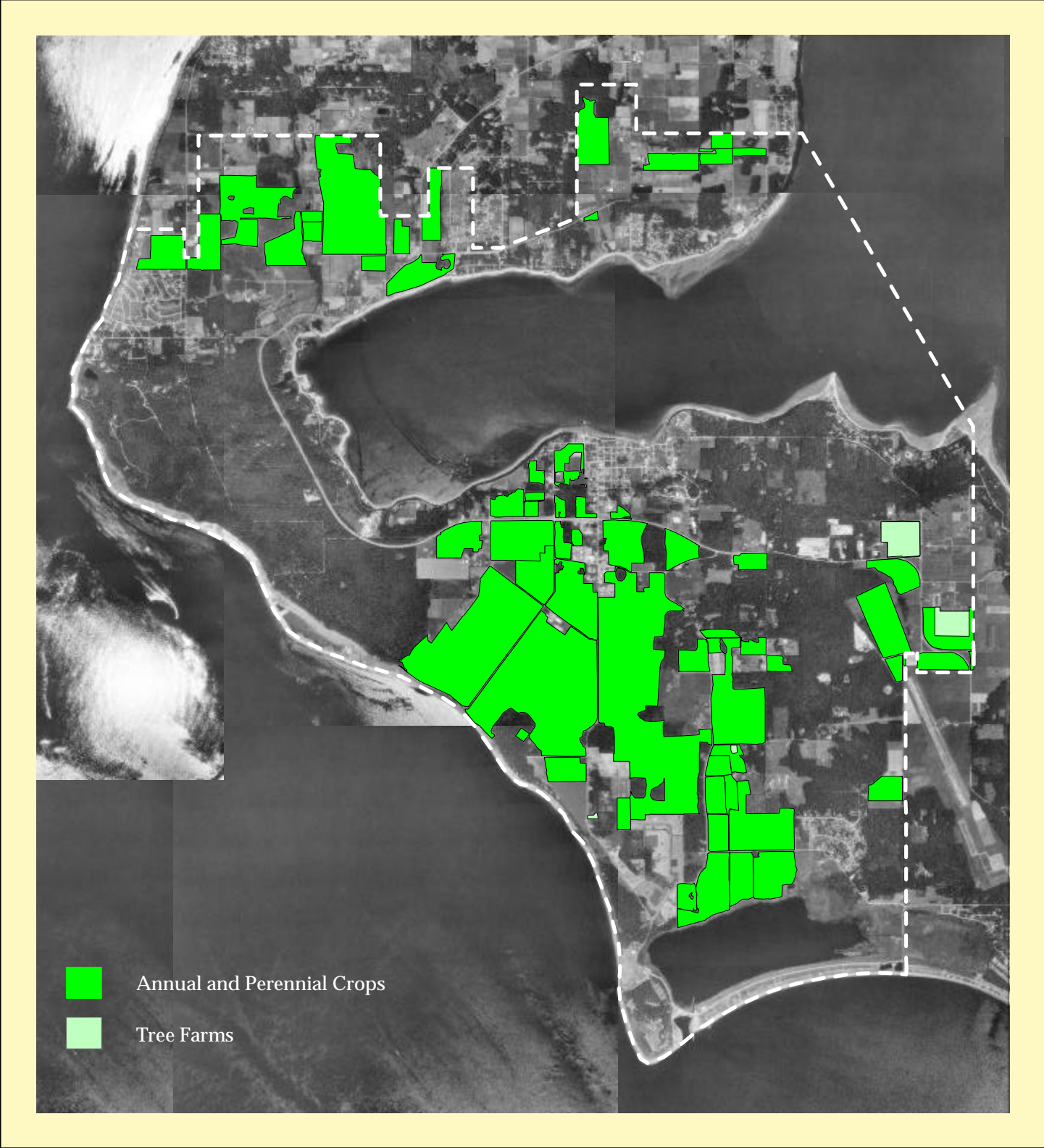


- LEGEND
- 1983
 - 2000
 - GAINS
 - LOSSES
 - MUSSEL FLATS 1983
 - MUSSEL FLATS 2000
 - MUSSEL FLATS GAIN
 - MUSSEL FLATS LOSS
 - URBAN
 - URBAN GAIN
 - URBAN LOSS

Ebey's Landing National Historical Reserve

Vegetation Related to Land Use
Cropland 2000

Changes from 1983 to 2000



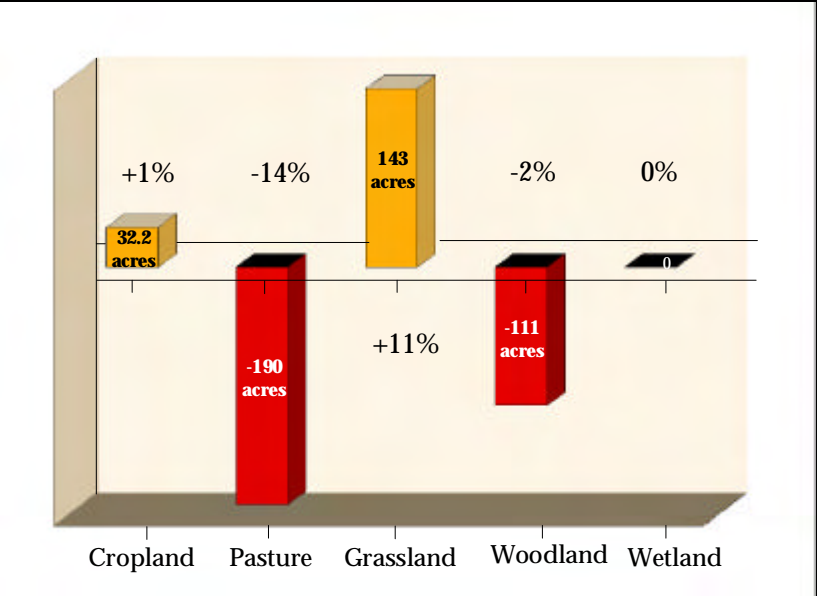
SUMMARY

Vegetation Related to Land Use

Areas are expressed in acres

	1983	2000
Cropland	3323.4	3355.6
Pasture	1329.2	1138.6
Grassland	1293.8	1437.1
Woodland	5401.9	5290.7
Wetland	127.5	127.5

Net Change in Land Use between 1983 and 2000



LEGEND

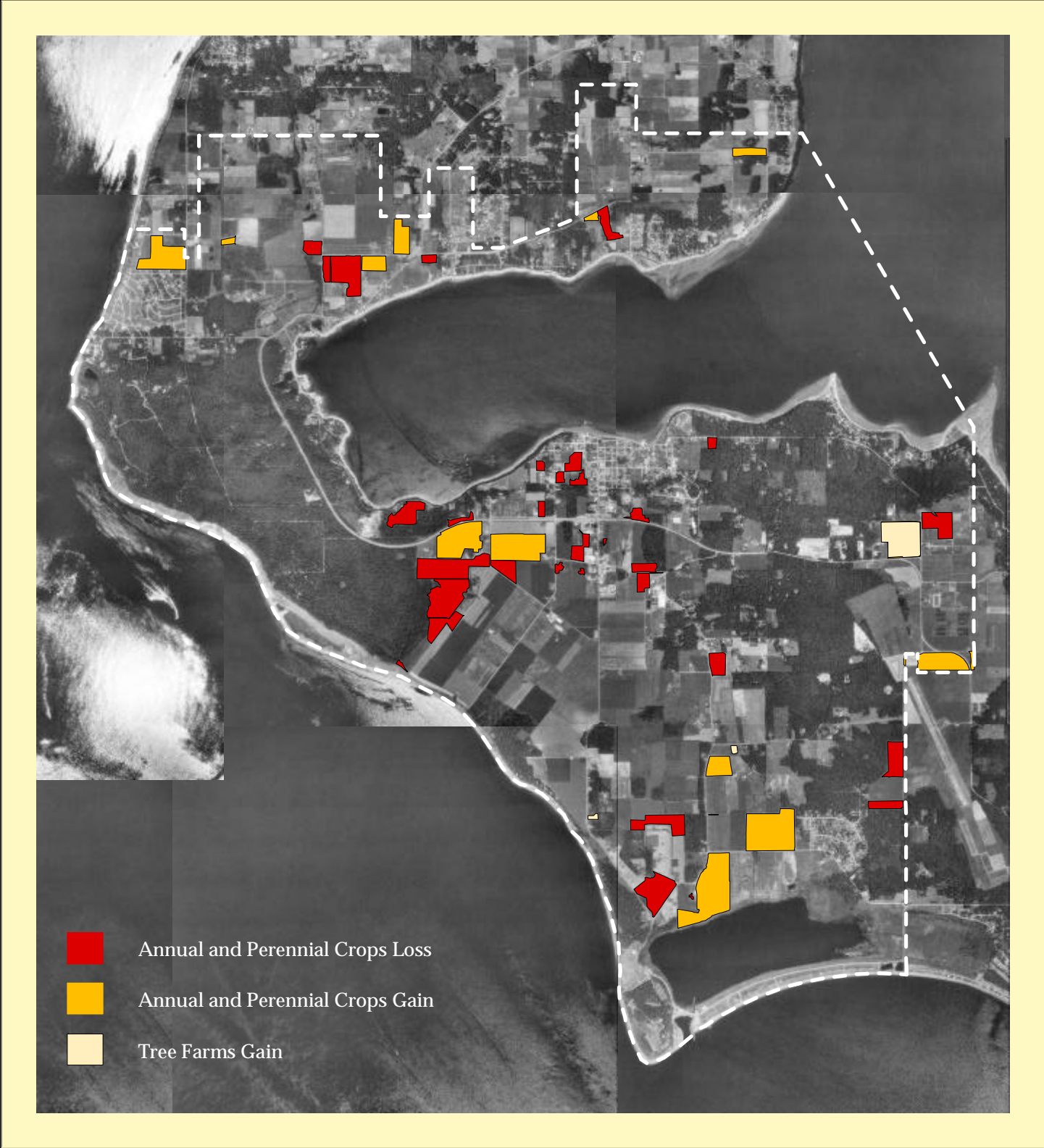


Ebey's Landing National Historical Reserve

Vegetation Related to Land Use

Cropland Changes

Changes from 1983 to 2000



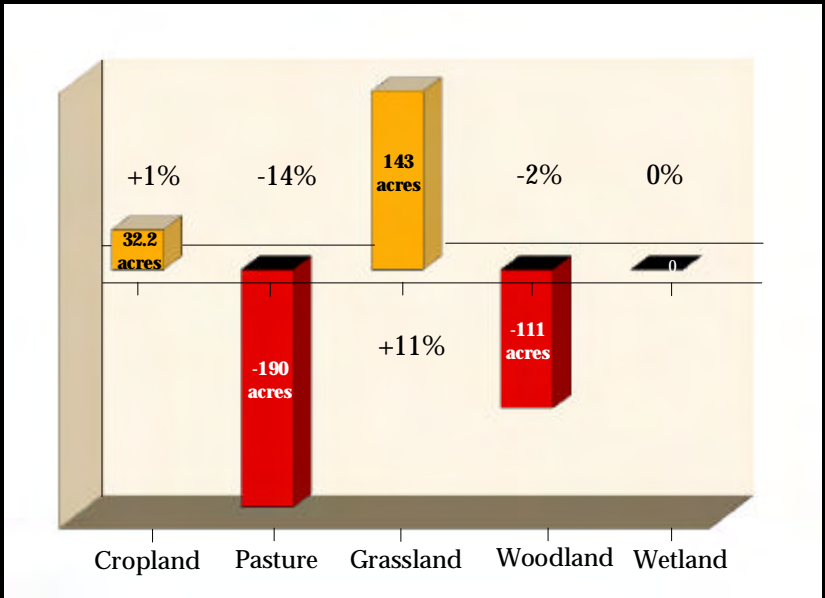
SUMMARY

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Areas are expressed in acres

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Cropland	3323.4	3355.6
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Net Change in Land Use between 1983 and 2000



LEGEND



Ebey's Landing National Historical Reserve

Vegetation Related to Land Use
Pasture 2000

Changes from 1983 to 2000



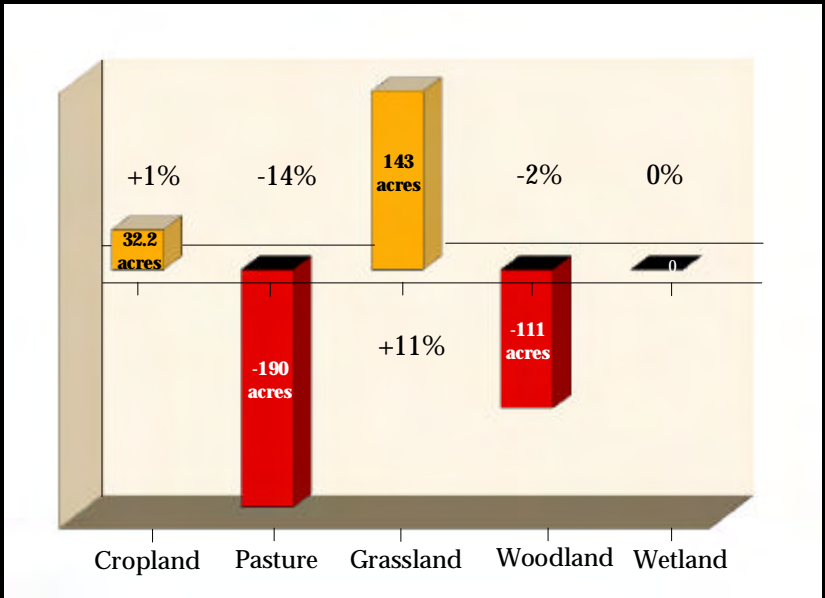
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Net Change in Land Use between 1983 and 2000



LEGEND



Ebey's Landing National Historical Reserve

Vegetation Related to Land Use
Pasture Changes

Changes from 1983 to 2000



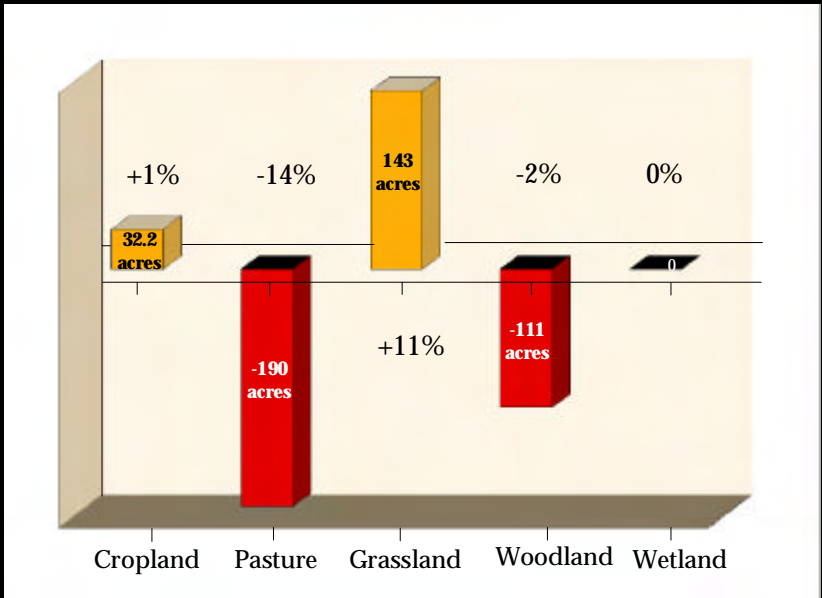
SUMMARY

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Net Change in Land Use between 1983 and 2000



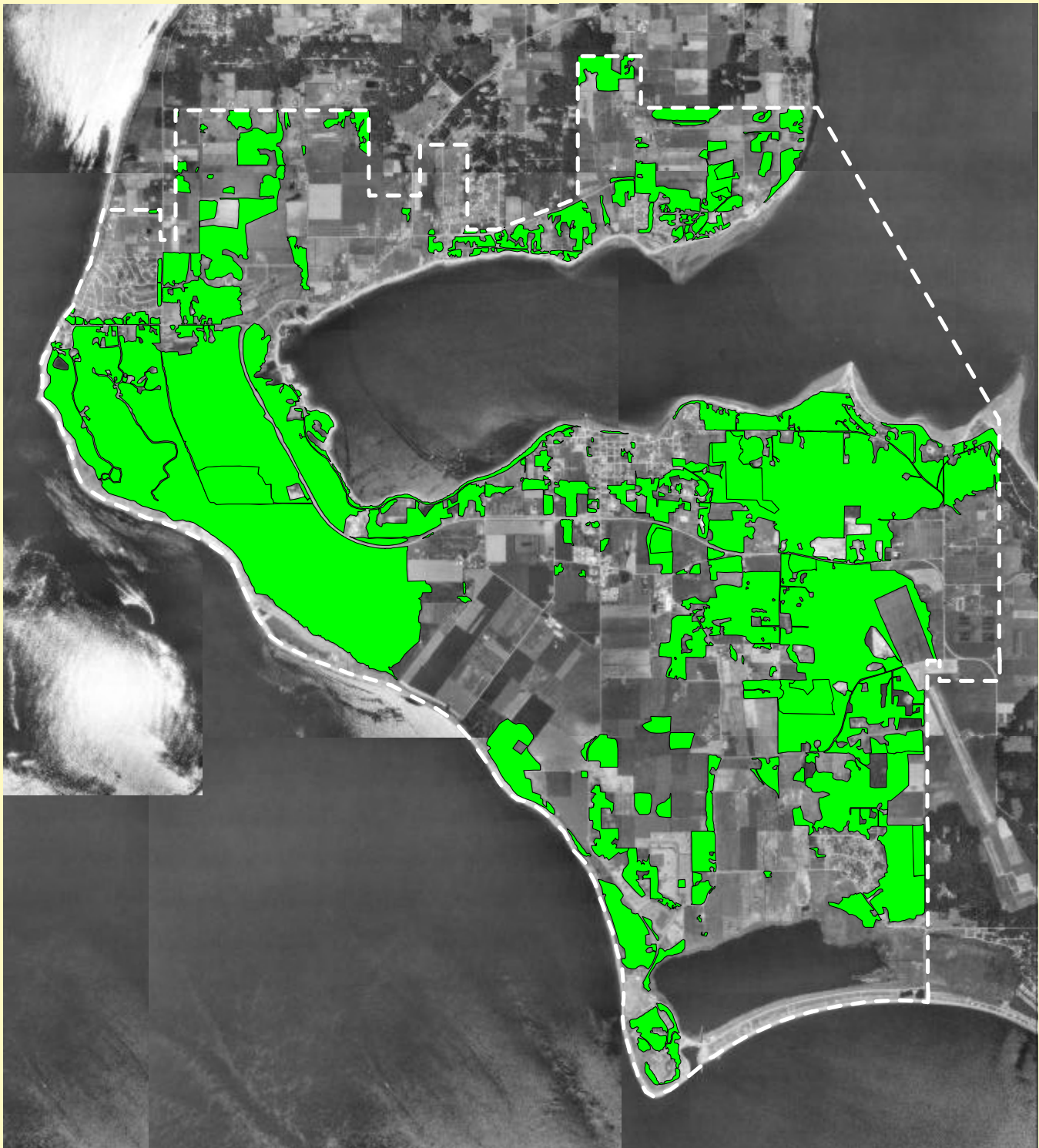
LEGEND



Ebey's Landing National Historical Reserve

Vegetation Related to Land Use
Woodland 2000

Changes from 1983 to 2000



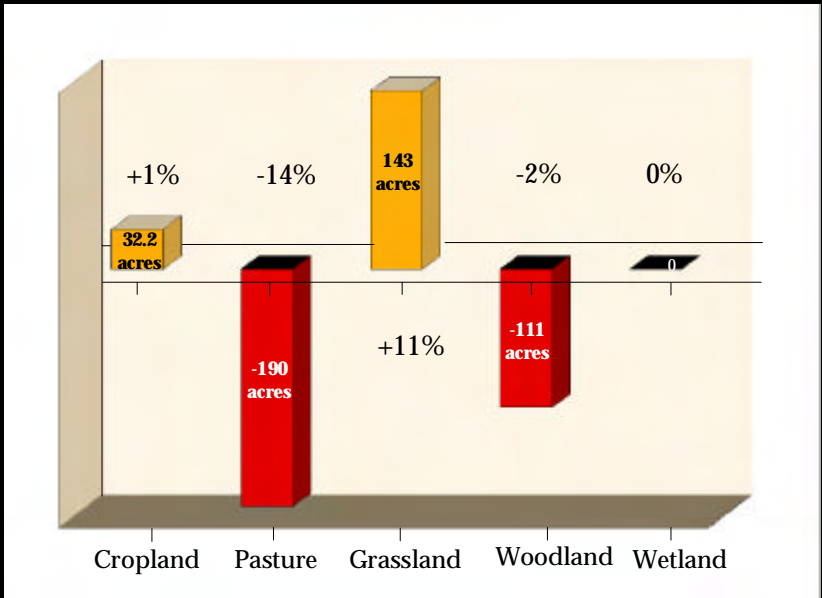
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Net Change in Land Use between 1983 and 2000



LEGEND



Ebey's Landing National Historical Reserve

Vegetation Related to Land Use
Woodland Changes

Changes from 1983 to 2000



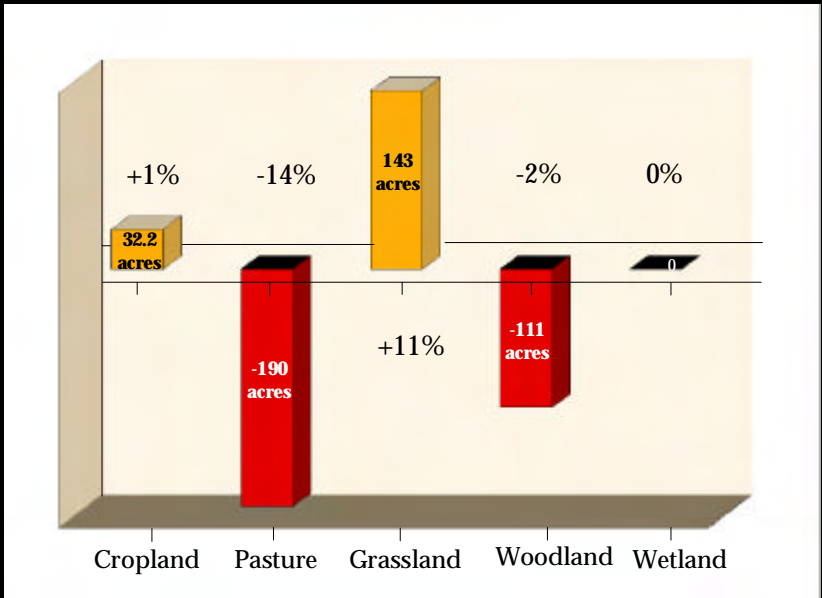
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Net Change in Land Use between 1983 and 2000



LEGEND



Ebey's Landing National Historical Reserve

Vegetation Related to Land Use
Grassland 2000

Changes from 1983 to 2000



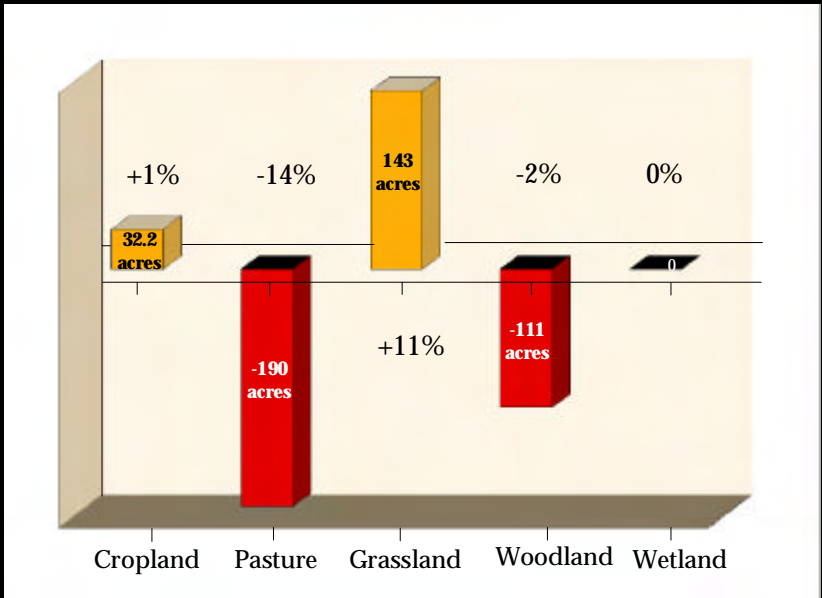
SUMMARY

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Woodland	5401.9	5290.7
Wetland	127.5	127.5

Net Change in Land Use between 1983 and 2000



LEGEND



Ebey's Landing National Historical Reserve

Vegetation Related to Land Use
Grassland Changes

Changes from 1983 to 2000



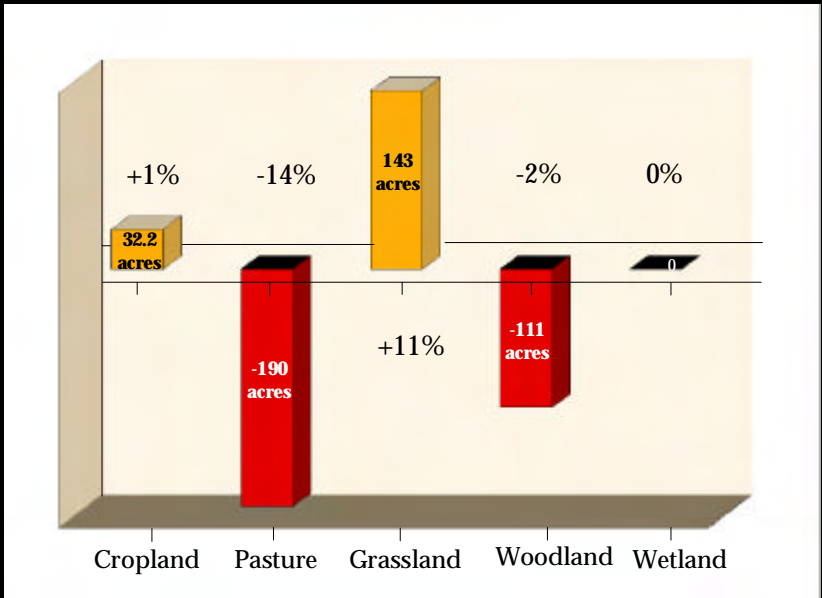
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Net Change in Land Use between 1983 and 2000



LEGEND



Ebey's Landing National Historical Reserve



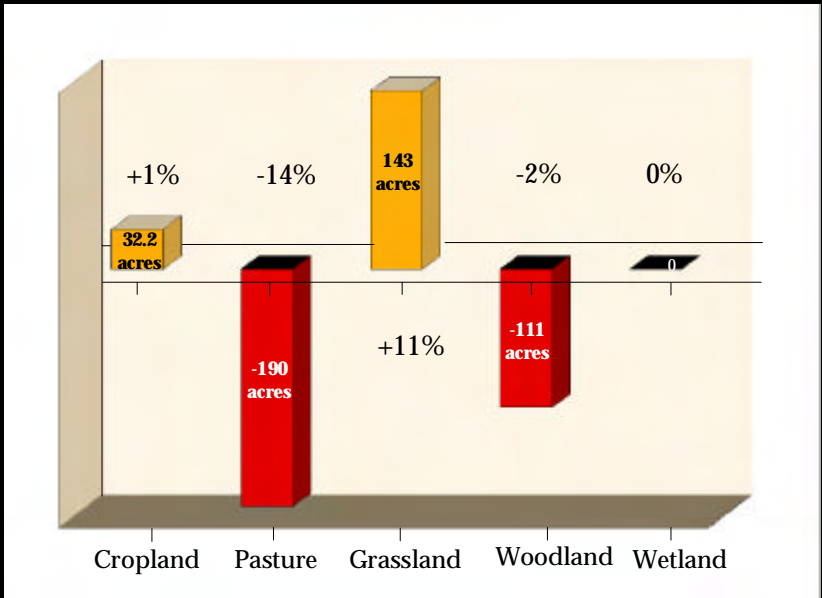
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Wetland	127.5	127.5

Net Change in Land Use between 1983 and 2000



LEGEND



Circulation Network

2000

Changes from 1983 to 2000



Cumulative Road Distance by Type

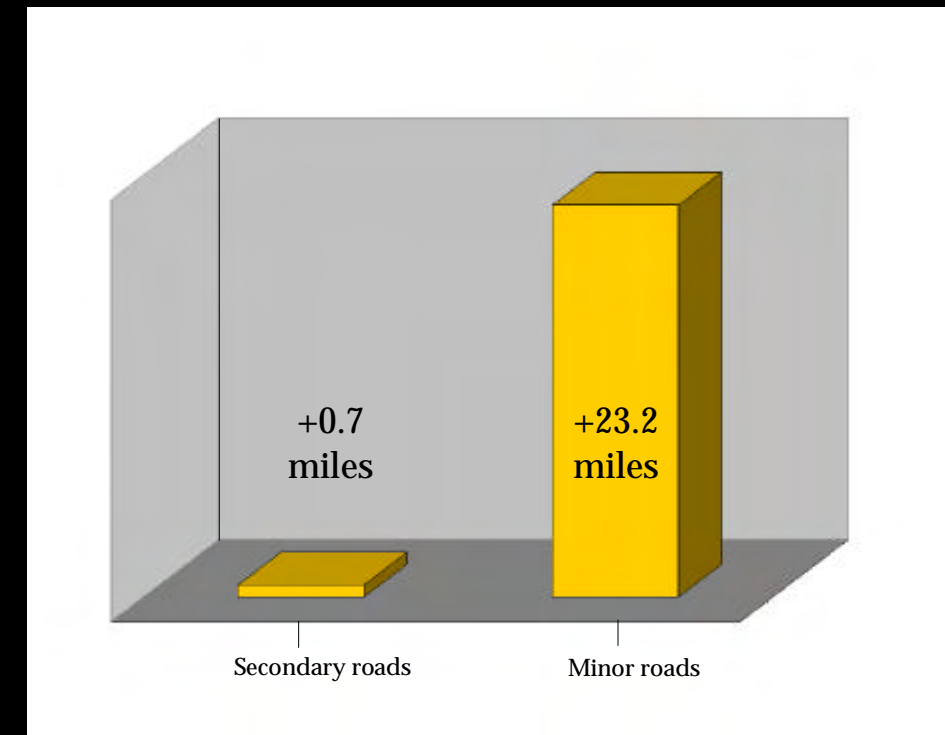
Road Type	Distance (miles)
Highway	9
Major roads	21.3
Secondary roads	54.0
Minor roads	87.1
Total roads	171.4

Circulation Network Changes

Changes from 1983 to 2000



Net Change in Roads from 1983 to 2000



There were no changes in highways or major roads between 1983 and 2000.

Ebey's Landing National Historical Reserve

Boundaries

Hedgerows and Windbreaks, 2000

Changes from 1983 to 2000



Cumulative Distance by Type	
Boundary Type	Distance (miles)
Hedgerows	25.7
Windbreaks	4.7



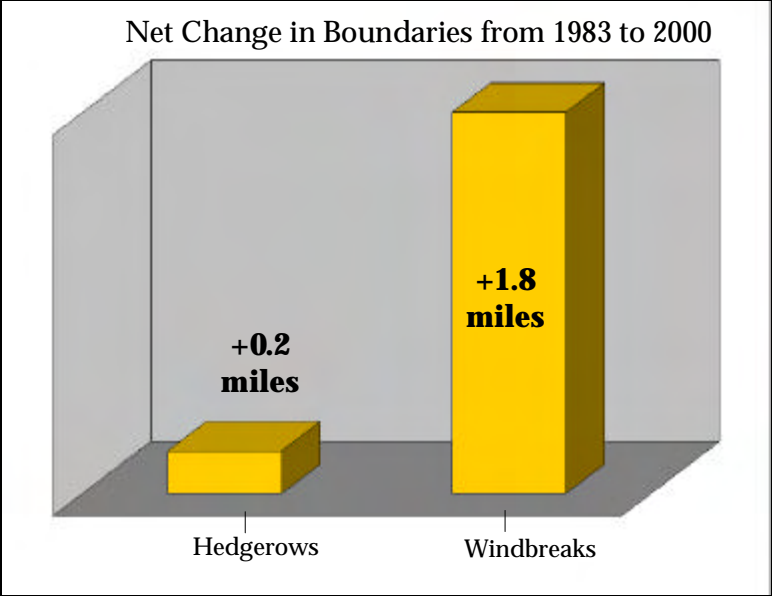
Ebey's Landing National Historical Reserve

Figure 5a

Boundaries

Hedgerows and Windbreaks, Changes

Changes from 1983 to 2000



Ebey's Landing National Historical Reserve

Figure 5b

Cluster Arrangements

Changes from 1983 to 2000

No change in intact cluster number or location occurred between 1983 and 2000.

Change in Cluster Structures between 1995 and 2000

Reserve building data using National Register designations were first available in 1995.

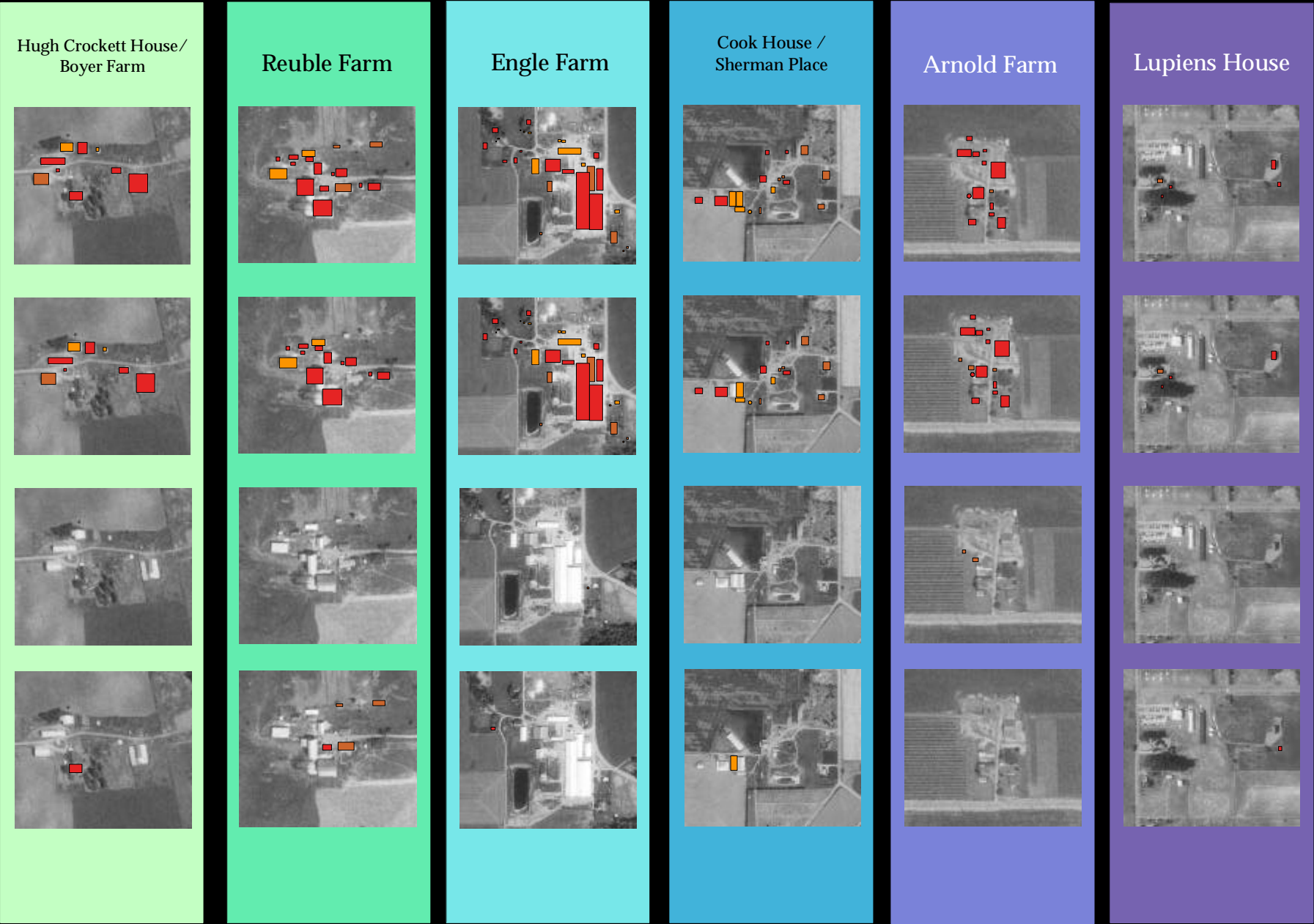


1995

2000

GAINS

LOSSES



Historical clusters are designated by the National Park Service as properties with multiple structures related to farming or other land use activities associated with the history of the Reserve.

The background orthophotos were photographed in 1990.
Historic cluster data for 1995 were obtained by Gretchen Luxenberg and Cathy Gilbert of the National Park Service.

- 1 Hugh Crockett House / Boyer Farm

2 Reuble Farm

3 Engle Farm

4 Cook House / Sherman Place

5 Arnold Farm

6 Lupiens House

7 Meyer House

8 Gilbert / Eggerman House

9 Gillespie Farm

10 C. Wanamaker House
- 11 Samuel Hancock House

12 Galler Place / Al Sherman Farm

13 Ed Jenne House

14 Col. Walter Crockett Farm

15 John Kineth Jr. Farmhouse

16 LeSourd / Sherman Farm

17 Harmon / Pearson / Engle House

18 Tuft House

19 Gould House / Smith Farm

20 Art Holmburg Place
- 21 Morris Place

22 Van Dam Place

23 J. Neinhuis Place

24 Vandervote Farm

25 Vandewerthorst Place

26 Neinhuis / Leach Place

27 Arnold / Grasser Place

28 Ferry House

29 Boothe House

30 Fort Casey

LEGEND

- HISTORICAL CLUSTERS
- CONTRIBUTING STRUCTURES
- COMPATIBLE STRUCTURES
- NON-CONTRIBUTING STRUCTURES

National Register Definitions

Contributing structures : Structures that are at least 50 years old and have maintained integrity. Historic integrity requires that a property be in its original location and still exhibit its original design, setting, materials, workmanship, feeling, and association.

Compatible structures : These structures have been introduced into the cluster in less than 50 years ago yet have used building technology that is compatible with the surrounding historic components of the complex.

Non-contributing structures : These structures may be historic or new but have either lost or never had historic integrity.

1995 - 2000 GAINS	Historical Clusters						TOTAL
	Hugh Crockett House	Reuble Farm	Engle Farm	Cook House	Arnold Farm	Lupiens House	
Contributing Structures	0	0	0	0	0	0	0
Compatible Structures	0	0	0	0	0	0	0
Non-contributing Structures	0	0	1	0	2	0	3

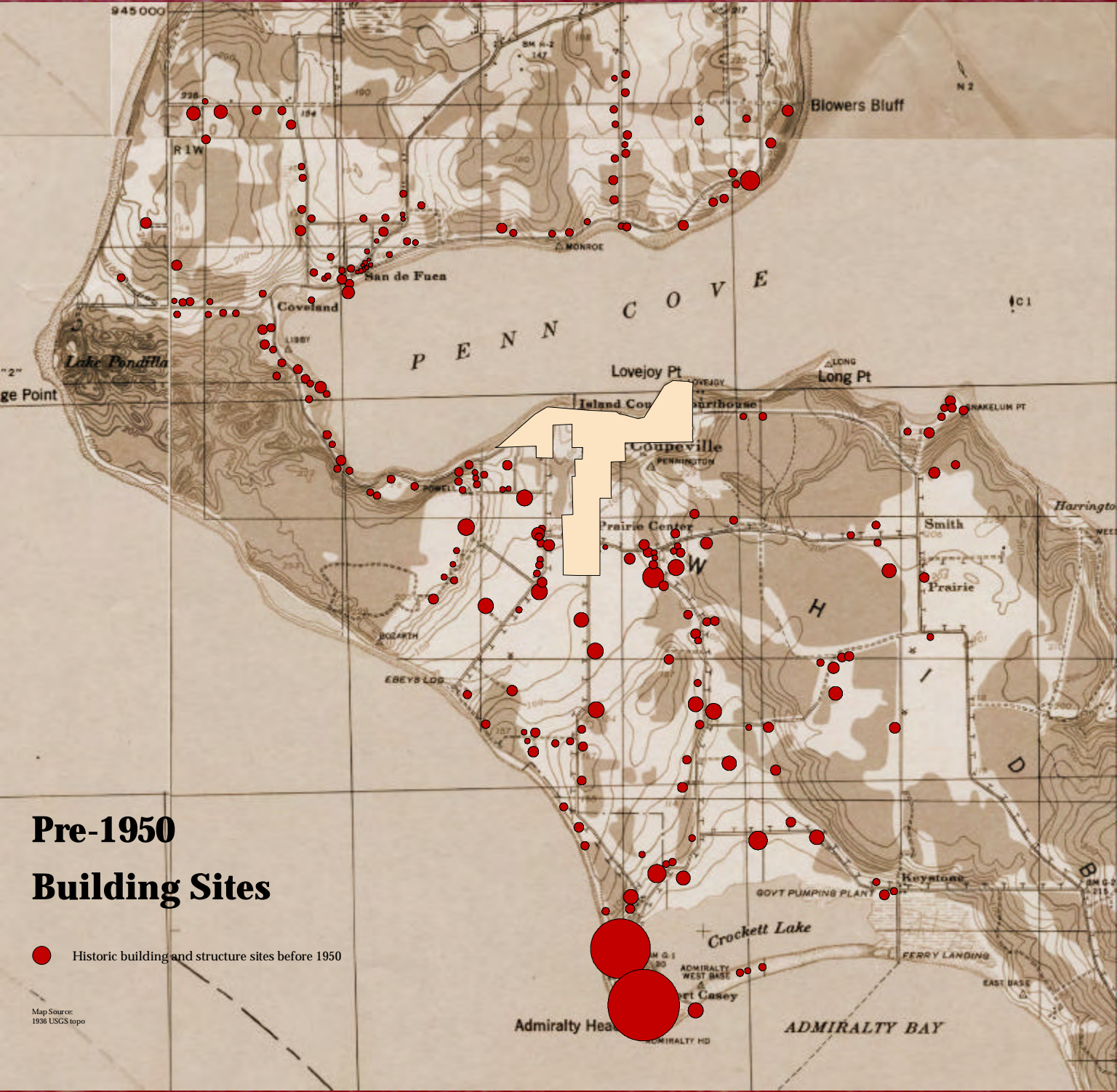
1995 - 2000 LOSSES	Historical Clusters						TOTAL
	Hugh Crockett House	Reuble Farm	Engle Farm	Cook House	Arnold Farm	Lupiens House	
Contributing Structures	1	1	1	0	0	1	4
Compatible Structures	0	0	0	1	0	0	1
Non-contributing Structures	0	3	0	0	0	0	3

Ebey's Landing National Historical Reserve

Figure 6

Historic Buildings and Structures

Historic Changes from pre-1950 to 2000

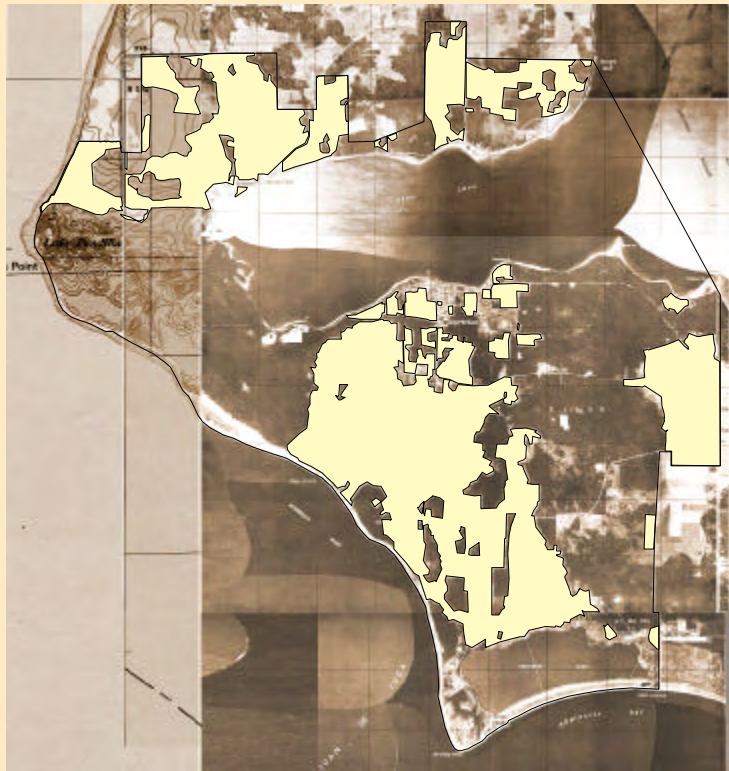


Ebey's Landing National Historical Reserve

Figure 7

Historic Land Use
Agriculture and Woodland

Pre-1950



Agriculture

Agricultural use has retained integrity. The most prominent change that has occurred in agricultural land use since 1941 is the conversion of some areas to residential use.

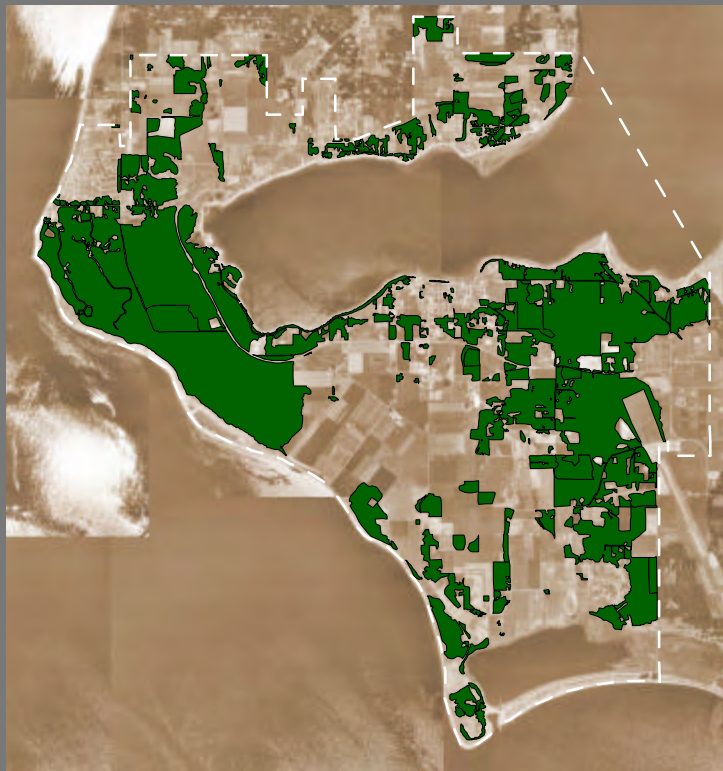
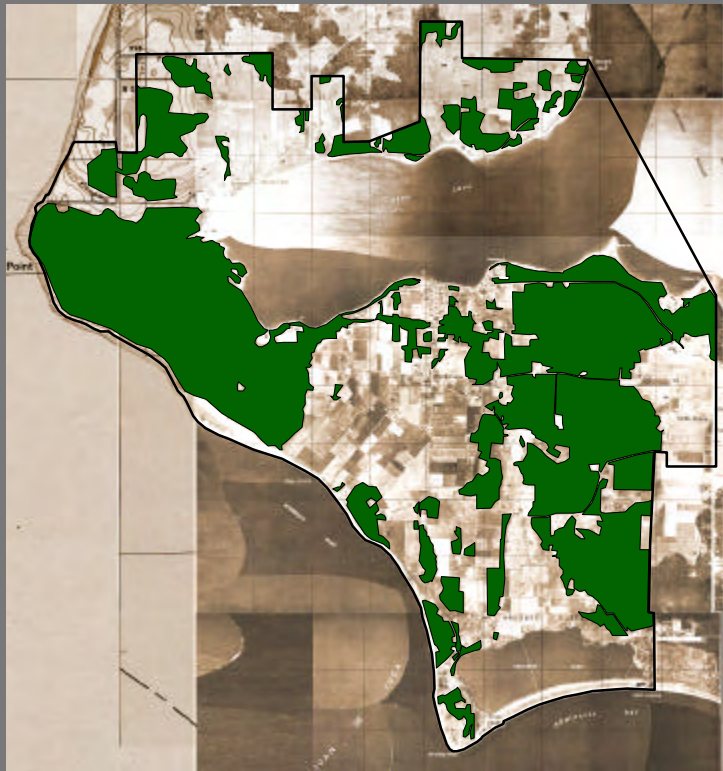
2000



Historic Changes from pre-1950 to 2000

Woodland

Woodlands have retained their cultural integrity. The most significant change that has occurred since 1941 is the erosion of the edges of the woodland and the conversion of much of this land to residential use.

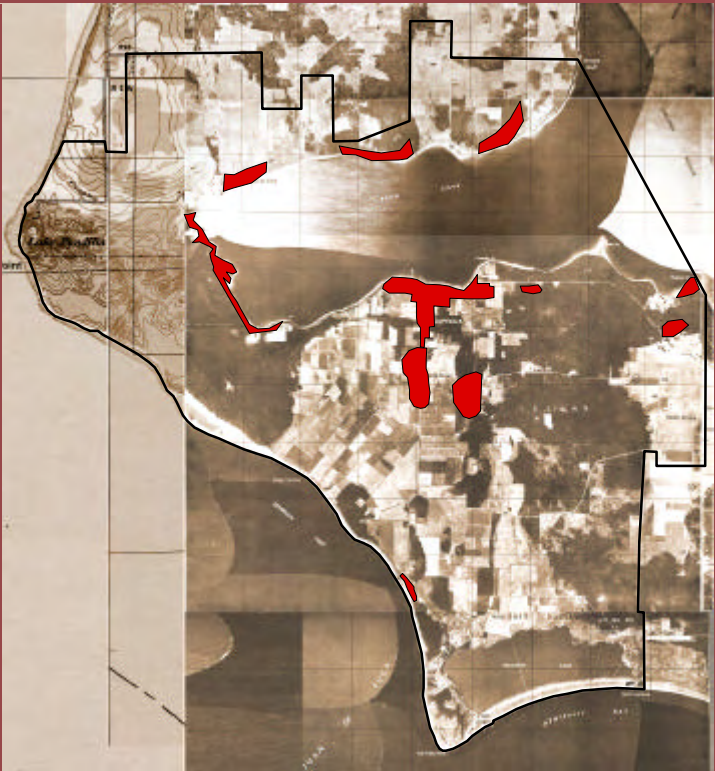


Historic Land Use

Residential / Commercial and Parks / Defense / Cemetery

Historic Changes from pre-1950 to 2000

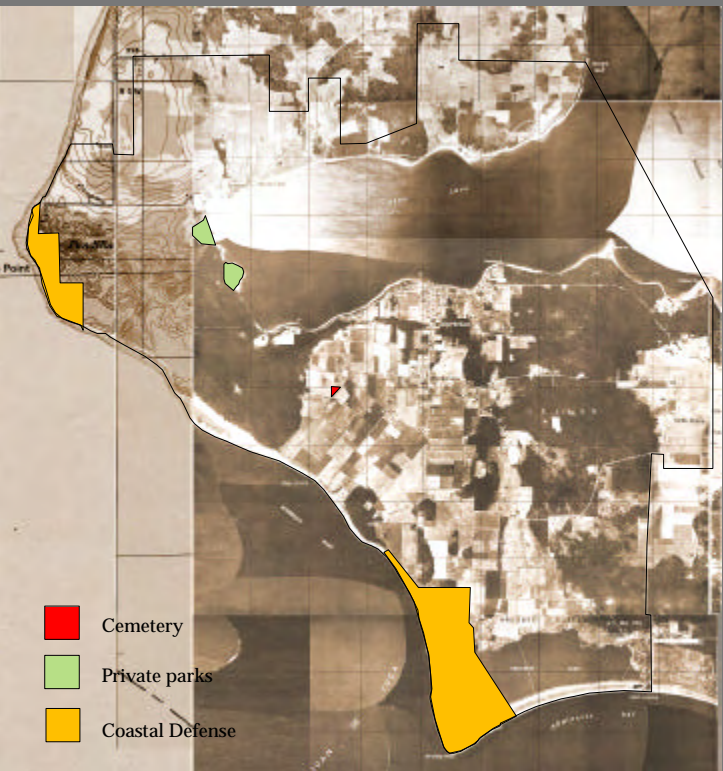
Pre-1950



Residential / Commercial

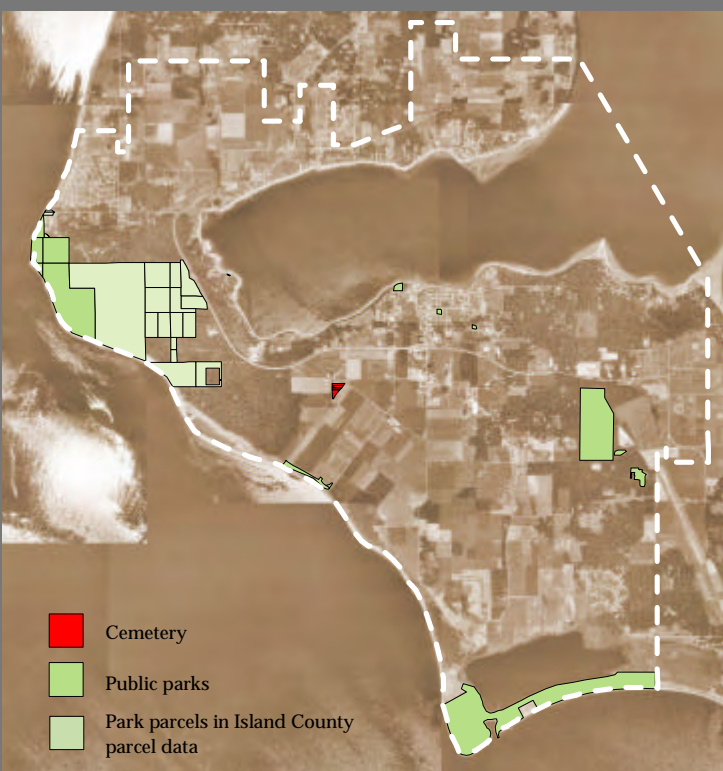
Residential/Commercial land use has increased substantially since 1941. However, the areas that were residential/commercial remain as residential/commercial land use, and thus, this category has retained cultural integrity. The increase in residential/commercial land use is probably the most significant change in the Reserve, especially around Coupeville and in the areas where subdivisions have been created. Areas along Penn Cove contain more year-round homes rather than predominantly vacation homes. The most significant change in these areas is the increase in density.

2000



Parks / Defense / Cemetery

The coastal defense land use has not retained integrity since Fort Ebey and Fort Casey have been converted from active forts to parks. The cemetery has remained unchanged, and thus retains integrity. The only parks that we are aware of that existed in 1941 were private along Penn Cove. Currently, a significant number of parks exist including the parks marked as a lighter green that are zoned in Island County's parcel data as parks.



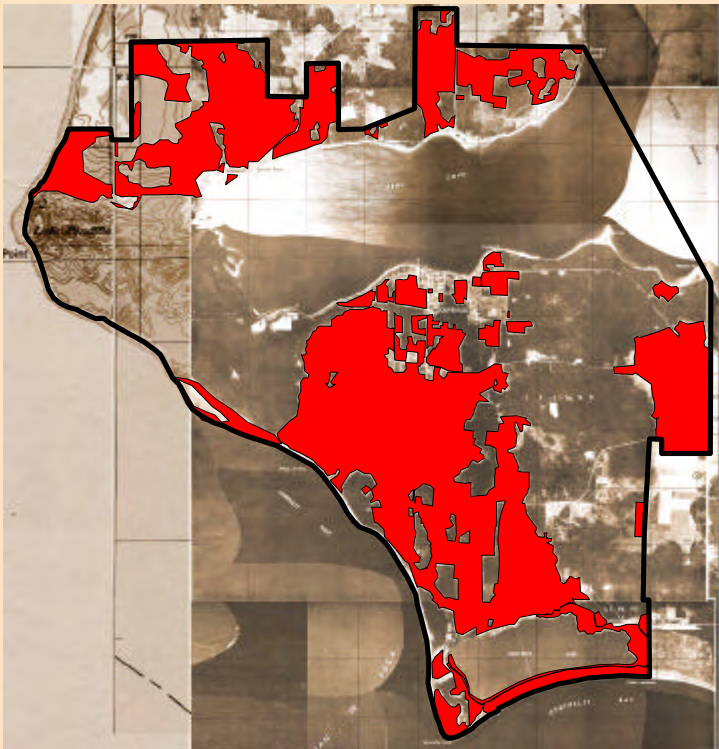
Ebey's Landing National Historical Reserve

Historic Vegetation

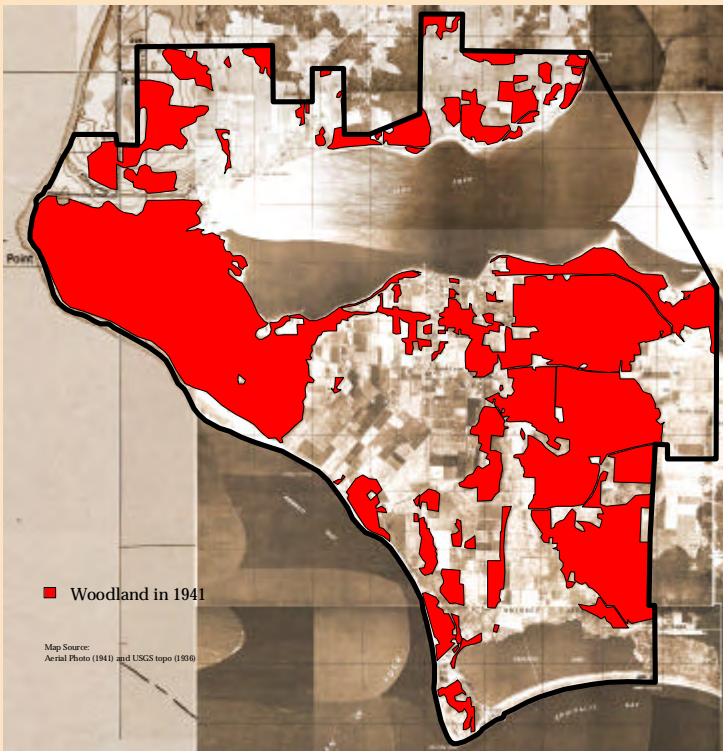
Historic Changes from pre-1950 to 2000

Pre-1950

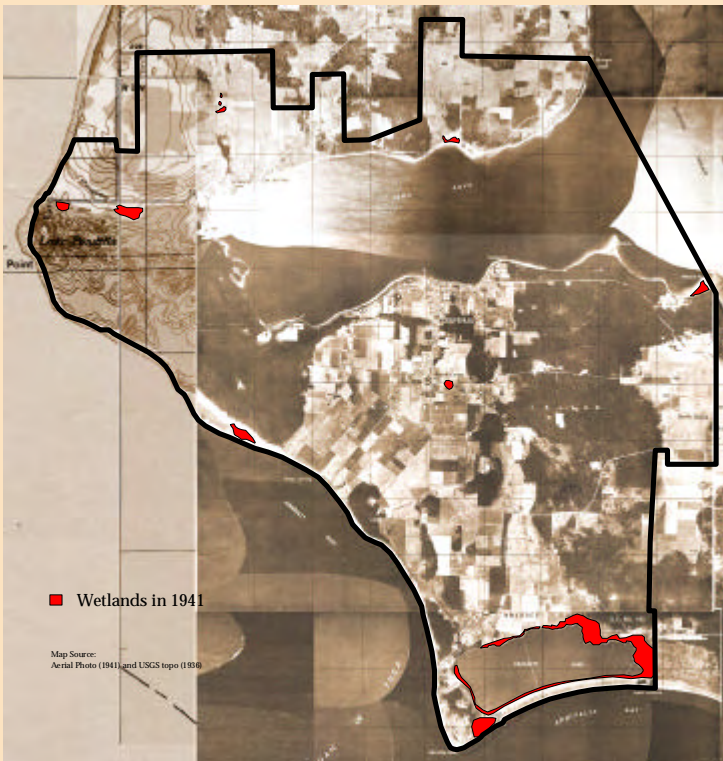
Open Fields



Woodland



Wetlands*



Historic vegetation has been categorized as open fields (pasture, cropland, and grassland), woodland, and wetlands.

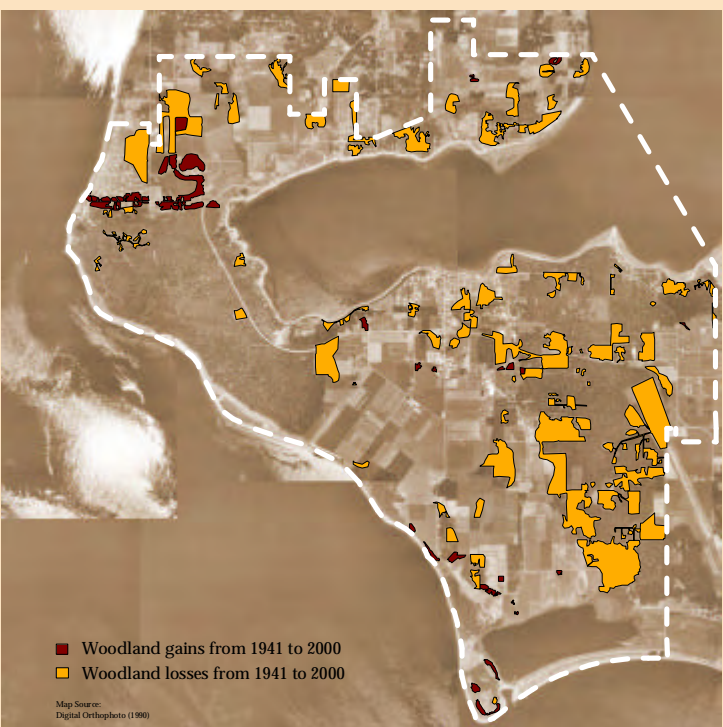
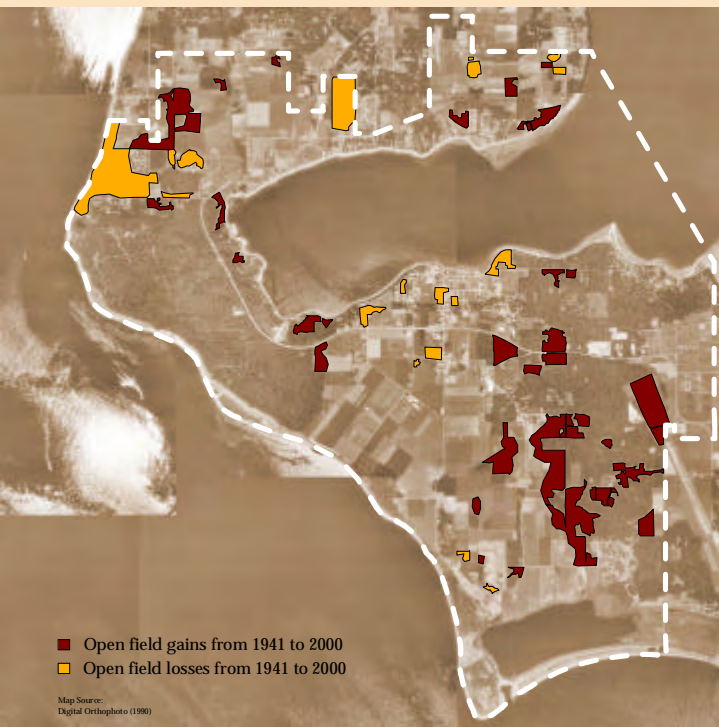


Conservation of Historic Vegetation

The areas of open field, woodland, and wetland that have remained intact since historic times are highlighted in red.

* Wetland analysis methods and categorization varies between years and therefore actual changes in wetlands cannot be reliably shown.

Changes



Changes in Historic Vegetation

While the majority of the vegetation has been conserved since 1941, some changes have occurred. Some open fields have been converted to residential subdivision or urban use, while new open fields have been converted from woodland. Some woodland has also been lost for residential development and for uses such as the airfield in Smith Prairie. Significant wetlands still exist around Crockett Lake and Perego Lagoon.

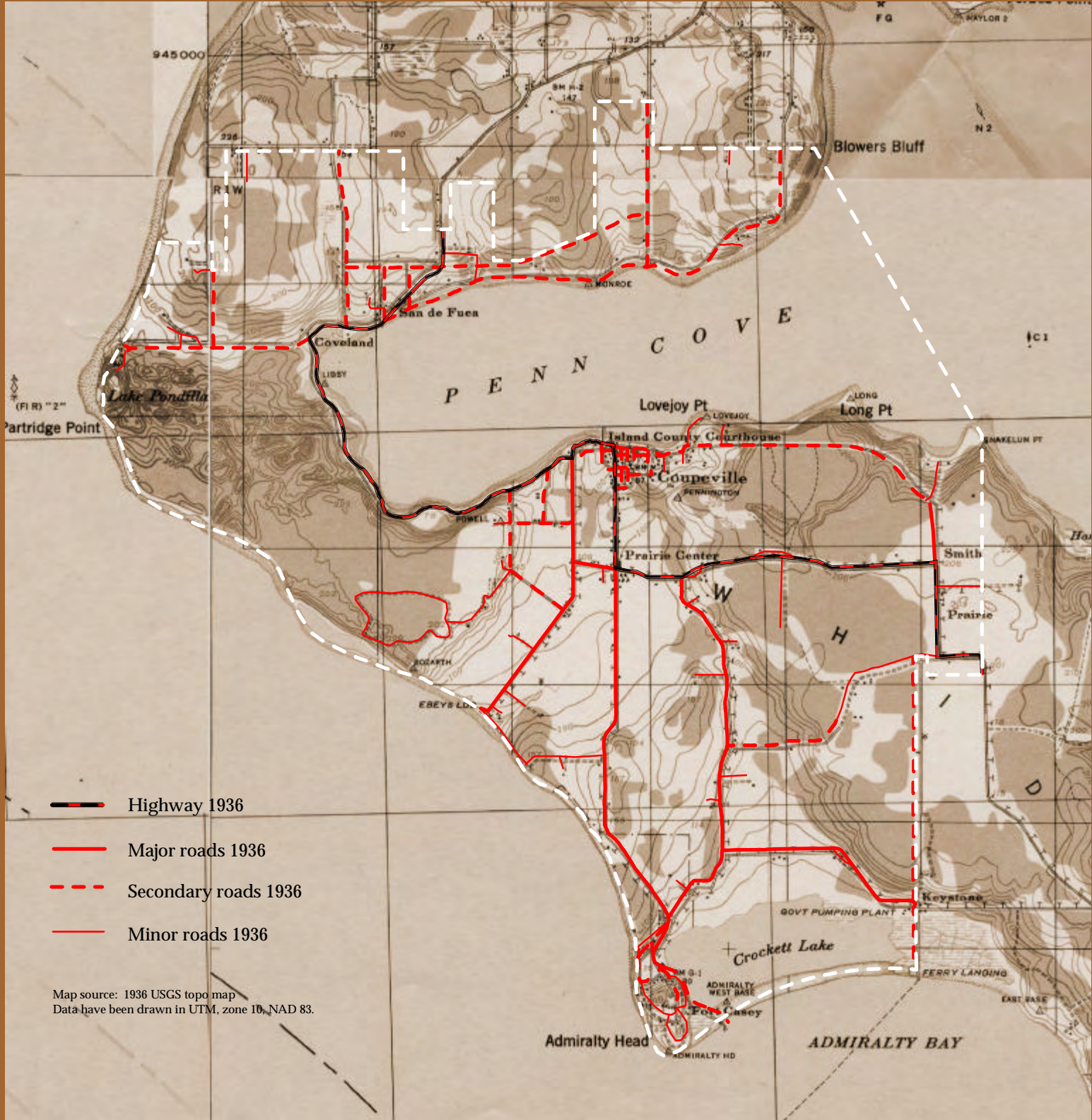
Ebey's Landing National Historical Reserve

Figure 9

Historic Circulation

Roads Remaining from pre-1950

Historic Changes from pre-1950 to 2000



Seven of the Reserve's primary roads were in place by 1870, linking the settlers with Coupeville, the County Seat, the markets on Penn Cove, and each other. Within a few years, additional roads were added as the upland areas were settled and Fort Casey was constructed on the south end of the island. By 1899, this system of roads was in place. Today they continue to function as the primary circulation network through the Reserve.



Ebey's Landing National Historical Reserve

Figure 10a

Historic Circulation

Gains



— Roads gained between 1936 and 2000

Historic Changes from pre-1950 to 2000

The most remarkable change in Reserve circulation is the addition of roads. Many of these roads connect residential properties to major roads. Other significant changes include the addition of a road through the western woodland and along Keystone Spit.

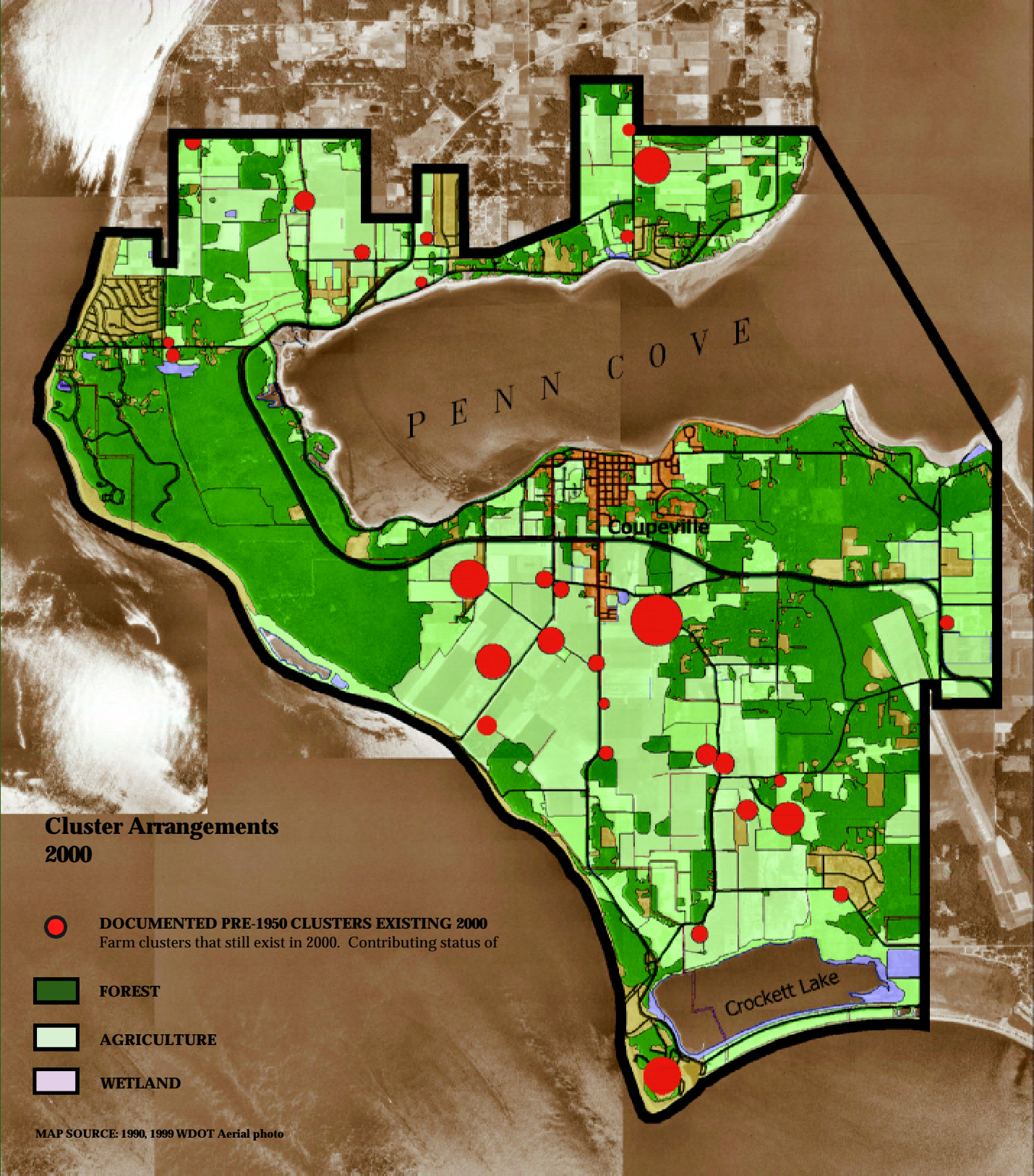
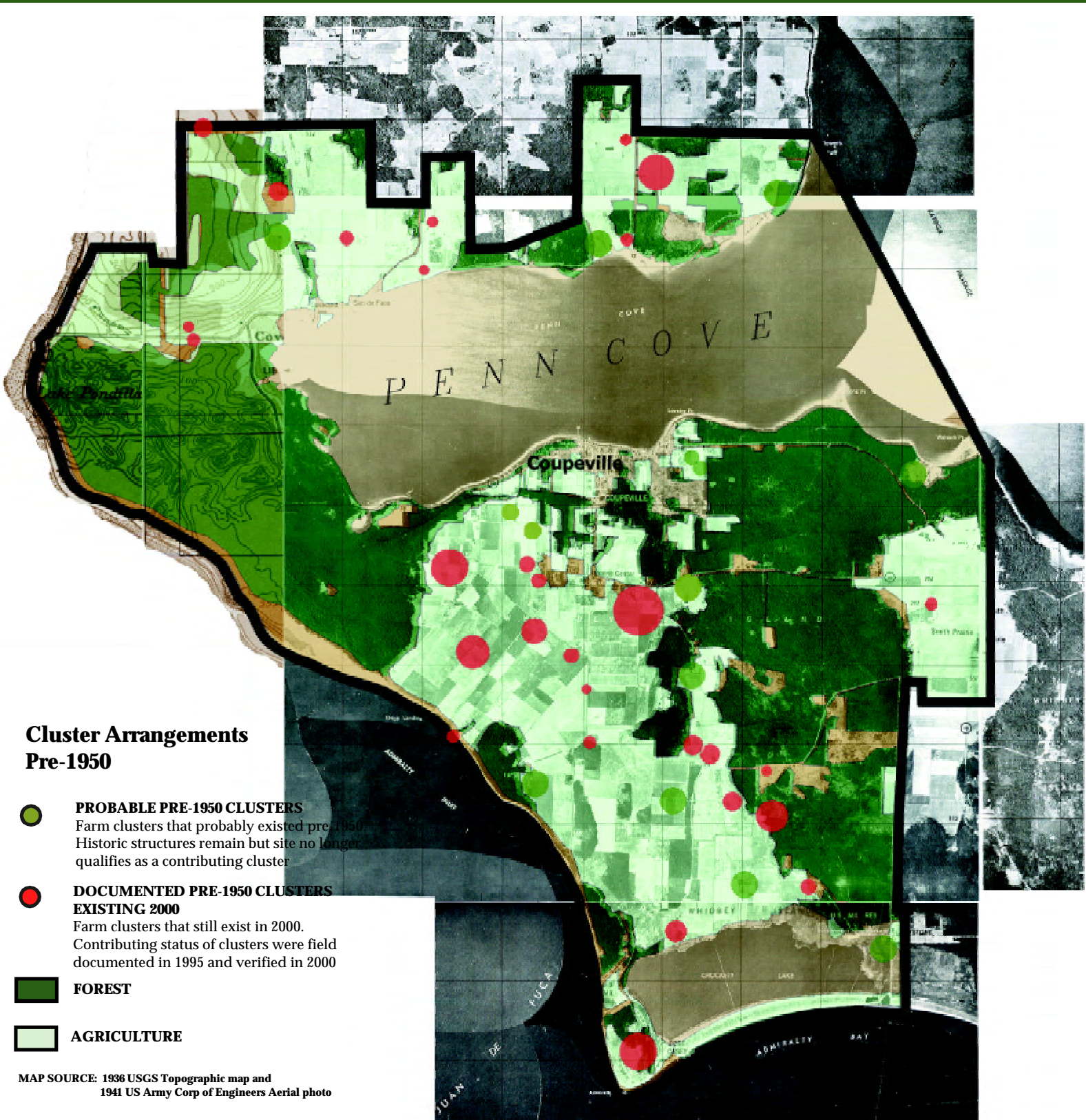
Almost all pre-1950 roads still exist. One of the most significant transitions in use of these historic routes concerns the highway. The old highway became Madrona Way, while the new highway was built more inland to handle the increase in traffic. Because all the major historic roads still exist today, pre-1950 circulation has retained integrity.



Ebey's Landing National Historical Reserve

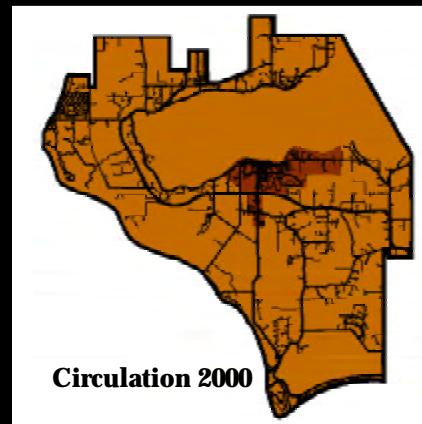
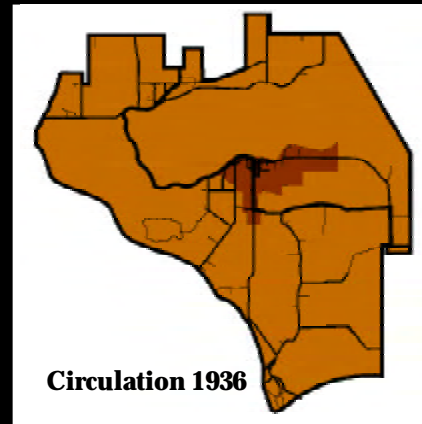
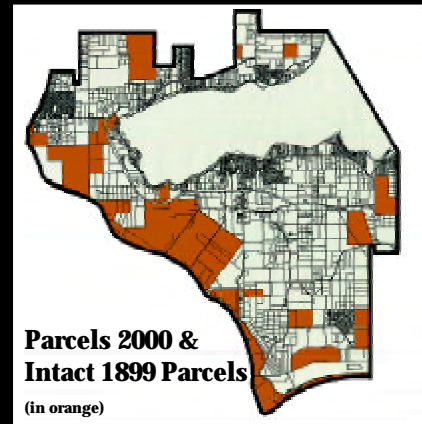
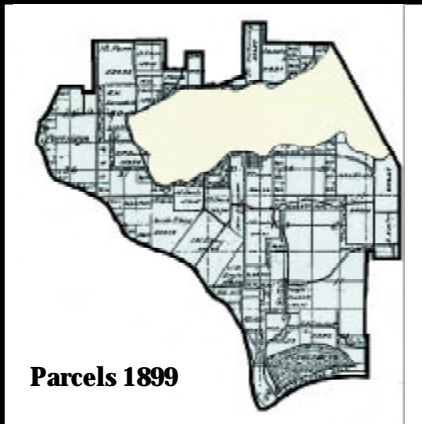
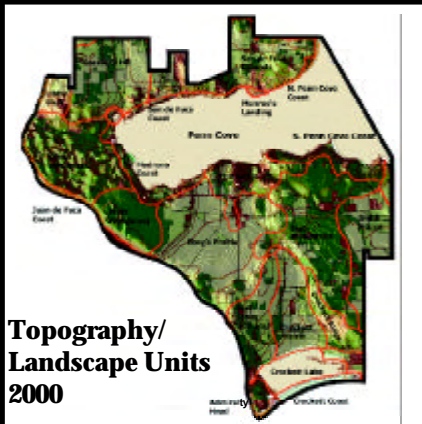
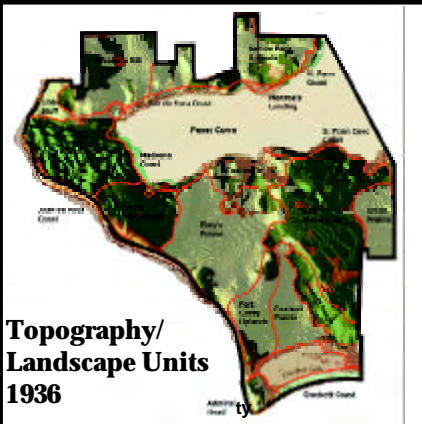
Historic Cluster Arrangements

Historic Changes from pre-1950 to 2000

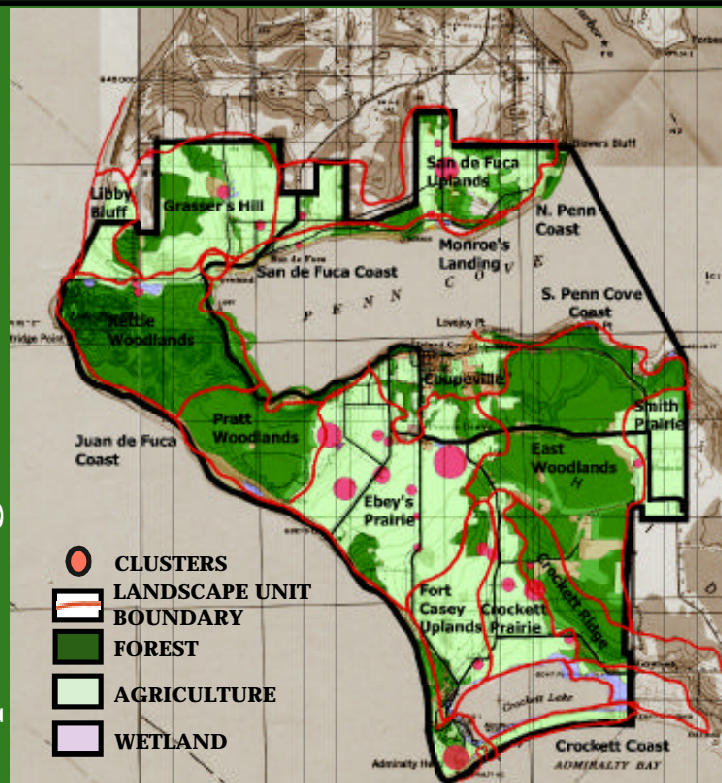


Spatial Organization

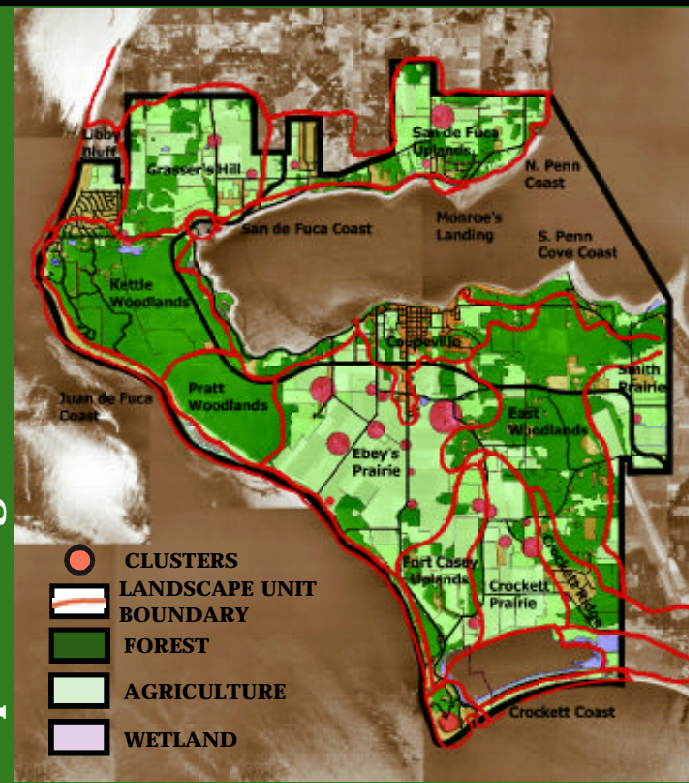
Historic Changes from pre-1950 to 2000



Spatial Organization 1936



Spatial Organization 2000



"Spatial organization is the three-dimensional organization of physical forms and visual associations in the landscape, including the articulation of the of ground, vertical and overhead planes that define and create spaces."

- A Guide to Cultural Landscape Reports: Landscape Lines, NPS

TOPOGRAPHY remains constant as Ebey's Landing's organizing framework. Bluffs, ridges, open prairies, kettle ponds, and water bodies are key topographic features that determine patterns of vegetation, land use, views, boundaries, and circulation.

VEGETATION patterns respond to topography in the distribution of forested lands or open prairies and fields, and help define landscape spatial units. Most vegetation patterns have been conserved since 1936, with some loss of forests and fields to development, and some conversion of fields to forest.

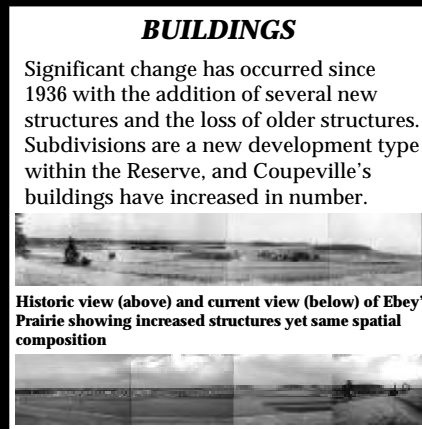
VIEWS/VISTAS are basically intact, particularly the sense of woods and open fields as well as bluff views. Some views have been obscured due to growth of trees and shrubs. The biggest changes have occurred in San de Fuca with the addition of structures visible from vista points across Penn Cove. Similarly, views of Coupeville have also changed with the introduction of numerous structures.

CIRCULATION is comprised of roadways, as well as boat travel into Penn's Cove. Most travel still occurs on the seven major roads constructed by 1870. Significant changes include the addition of numerous secondary roads, which divides the Reserve into a finer scale, and the re-routing of Highway 20.

PARCELS have changed dramatically from their original configuration. Property divisions, and the introduction of subdivision housing, have created more boundaries, structures, roads, and land uses not contributing to the character of the Reserve. However, there are numerous parcels that have not changed in size and shape in the last 100 years.



Historic view (above) and current view (below) of San de Fuca from Madrona Way showing increased structures



Historic view (above) and current view (below) of Ebey's Prairie showing increased structures yet same spatial composition



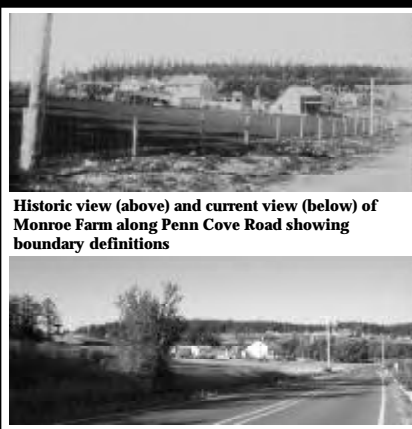
Historic view (above) and current view (below) of Gould Farm in Ebey's Prairie demonstrating cluster configuration

CLUSTERS

Building clusters are a natural outgrowth of agriculture land use, and contribute to the spatial character of the Reserve. 27 farm clusters have been identified (1983, 1995) as having integrity, and these remain intact although there have been individual structures lost or gained within some clusters. The most important farm clusters remaining are those originating from the Donation Land Claim (DLC).

BOUNDARIES

Boundaries help define the Reserve's spatial organization. Physical and visual boundaries are created by roads, property divisions, field and crop patterns, and woodland edges, and include small-scale features like fences, hedges, and windbreaks. The majority of these boundaries are still intact, although new boundaries are created with additional roads and property divisions. Changes have occurred in the locations of hedgerows, and historic photographs show more widespread use of fences than appear today.

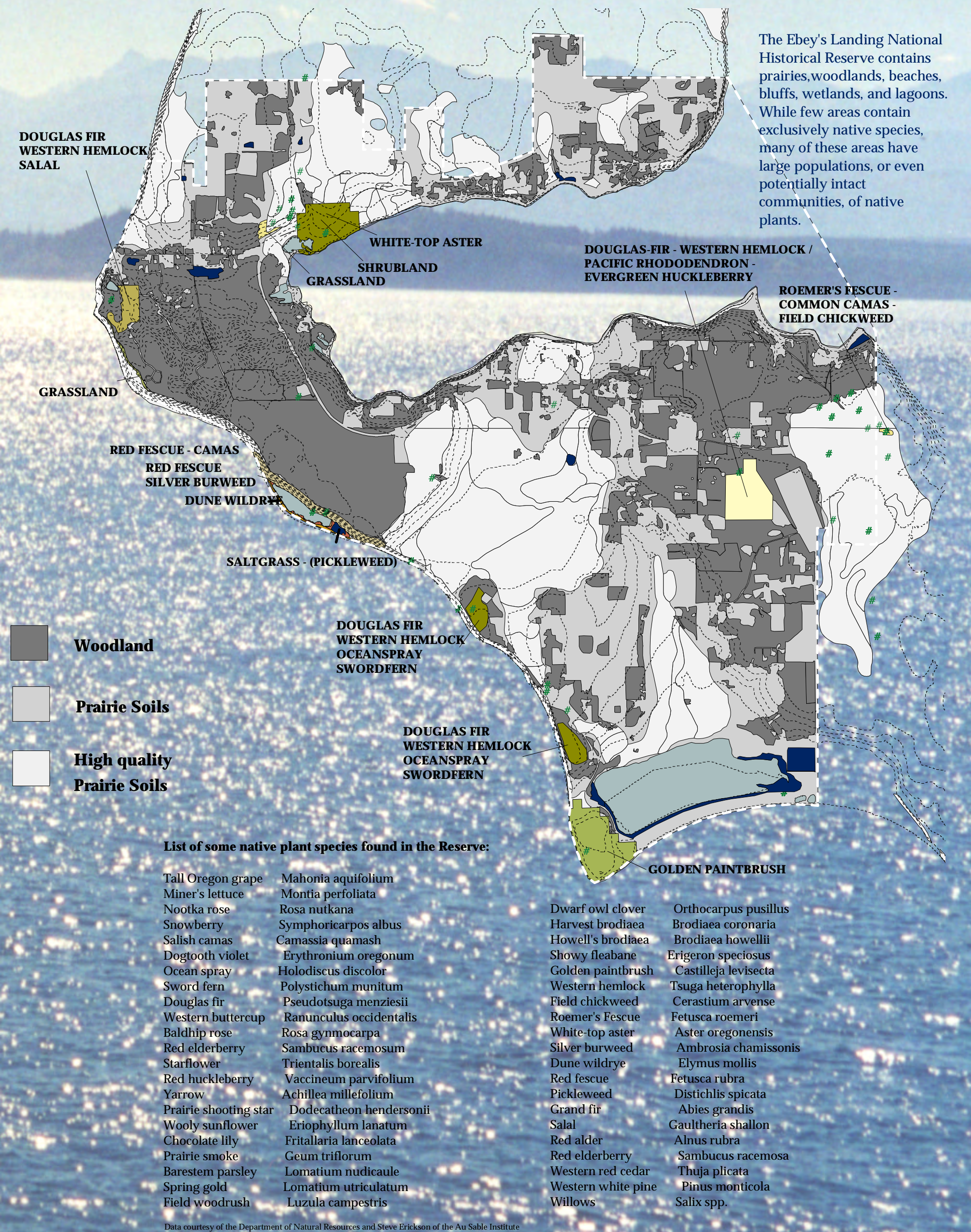


Historic view (above) and current view (below) of Monroe Farm along Penn Cove Road showing boundary definitions

Ebey's Landing National Historical Reserve

Natural Systems and Features

Historic and Modern Patterns



The Ebey's Landing National Historical Reserve contains prairies, woodlands, beaches, bluffs, wetlands, and lagoons. While few areas contain exclusively native species, many of these areas have large populations, or even potentially intact communities, of native plants.

Historic Integrity

By 1950, almost 100 years of Euro-American agriculture had transformed this landscape. Populations of species have likely changed, including some isolation and potential loss of prairie species. Introduction of new roads have resulted in the decline of some biota. In 2000, the western and eastern forests are still largely intact, the main prairies of Crockett, Smith and Ebey are still in the same location, and the surficial wet areas have remained largely in the same place. Because of the inadequacy of historic data, any significant changes that most likely occurred are not discernible.

Ebey's Landing National Historical Reserve

Figure 13

Views and Vistas

Historic Changes from Pre-1950 to 2000



Historic views and vistas can provide us with information regarding the preservation of historic integrity. Below each historic view shown in this poster is a modern photo taken from approximately the same vantage point. The red icons locate the photos within the Historical Reserve.

While changes in historic views are evident, especially regarding the addition of structures, the majority of the views have retained their cultural integrity.

Appendix B: List of Posters

Changes from 1983-2000

- Structures
- Structures Gains and Losses
- Land Use
- Vegetation Related to Land Use
- Circulation Network
- Boundaries: Hedgerows and Windbreaks
- Cluster Arrangements

Changes from Pre-1950-2000 and Assessment of Integrity

- Historic Buildings and Structures
- Historic Circulation
- Historic Vegetation
- Historic Land Use
- Spatial Organization: Historic Changes 1936-2000
- Views and Vistas
- Natural Systems and Features: Historic and Modern Patterns
- Historic Cluster Arrangements

Appendix C: Metadata

Posters 1983 – 2000

General notes:

All the GIS data generated for the Ebey's Landing National Historical Reserve project were drawn on 1990 orthophotos to ensure that they are properly georeferenced and orthorectified. The reason the 1990 orthophotos were used as a spatial reference for creation of all data was because they were the only orthorectified photos available. These data are recorded as UTM, Zone 10, NAD 27 (meters.)

Accurate drawing of information from the 1983 IR aerial photo or 1999 aerial photo image files onto the 1990 digital orthophotos was made possible through the use of the software TAS Basic (allows local georeferencing and scaling.) Thus, a zoomed in area of the 1983 or 1999 image file could be georeferenced to the same zoomed in area of the 1990 digital orthophoto.

The sources for all the data include the 1983 landscape inventory cards, the 1983 IR aerial photographs, the 1999 color aerial photographs, the 1990 digital orthophotos, field surveys, textual references, photos and discussions with Rob Harbour and Gretchen Luxenberg.

Gains and losses data layers were created either by drawing each new polygon onto a new data layer, copying polygons from other data layers and pasting onto a new data layer, or using an ArcView script that allows the user to subtract two themes (2000-1983 for gains and 1983-2000 for losses.) When the latter technique was used the areas within the associated database file are not correct (they reference the original polygon that was cut.)

For data layers where areas and perimeter are relevant, these values were added using the script, "calcp1.ave" from the ArcView website. The first area and perimeter columns are calculated in meters. New columns have been created that translate the area calculations to acres and the perimeter calculations to miles.

The .dbf file for the "Clusters 83" data layer includes the names of each cluster.

A complete listing of data layers for 1983 and 2000 is below:

Air park	Major roads
Boundary polygon	Military reserve
Boundary line	Minor roads
Buildings (and structures)	Mussel farms
Cemetery	Parks
Clearcuts	Pasture
Clusters	Pasturecoupe
Commercial	Penn Cove
Commercialcoupe (commercial in Coupeville)	Secondary roads
Coupe polygon (boundary of Coupeville as a polygon)	State game farm
Cropland	Subdivision wooded
Croplandcoupe (Cropland in Coupeville)	Subdivisions
Dump	Tree farm
Grassland	Urban
Grasslandcoupe (Grassland in Coupeville)	Utility right-of-way
Gravel pit	Water
Hedgerows	Wetland
Highway	Windbreaks
Historical buildings	Woodland
Logging roads	Woodlandcoupe

1995 – 2000 Clusters

Cluster contributing (contributing structures and buildings within clusters)

Cluster compatible (compatible structures and buildings within clusters)

Cluster non-contributing (non-contributing structures and buildings within clusters)

Circulation Network

The categorization of roads was established on the 1983 landscape cards. Roads were divided into highway, major roads, secondary roads, and minor roads. These same categories were used for the 2000 data.

For the 1983 road data layers in GIS, every road on the 1983 landscape inventory cards was

matched with the same road on the 1990 digital orthophotos. This allows the roads to be georeferenced and orthorectified in the same projection as all the other data. Logging roads (determined from the 1983 IR aerial photos) and utility right-of-ways were not included on the poster but exist as separate data layers. For the 2000 roads, I first checked to see if each 1983 road was still in existence by comparing the GIS 1983 road layers with the 1999 aerial photos. Next, all new roads found on the 1999 aerial were added to the 2000 road layers. The roads were not systematically field checked since most of the new roads are private, however major and secondary roads were included in field surveys. For both 1983 and 2000, “driveways” were included if they were over 100 feet.

Boundaries

Boundaries include hedgerows and windbreaks. A first attempt to transfer hedgerows from the 1983 landscape inventory cards to the 1990 digital orthophoto was made. The 1983 IR aerial photos were referenced for more accurate information on the placement of these hedgerows. During this data check new hedgerows were found on the 1983 IR aerial photos. As a result, a systematic scrutiny of all the 1983 IR aerial photos was made to find new hedgerows and to add them to the 1983 hedgerow layer that was drawn over the 1990 digital orthophoto. A systematic scan of the 1999 aerial photos was made to first identify if the hedgerows present in 1983 are still there and to, secondly, determine if there are any new hedgerows. These data were transferred to the new data layer placed over the 1990 digital orthophoto using surrounding reference points. A map was made of these potential 2000 hedgerows and it was checked in the field to the best of our ability staying on major and secondary roads. The 2000 hedgerow data layer was then updated with this field information. Windbreaks in this project are defined as large trees occurring in an axial alignment. These range from small strips of leftover forest to individually planted poplars. Since windbreaks were difficult to identify from the photos, there exists a bias towards more windbreaks in 2000. We started with a road survey of windbreaks. These were mapped referring to the 1999 aerial photos and the 1990 orthophotos. The 1983 IR photos were independently examined for windbreaks. The 1983 IR photos were then checked for the field surveyed 2000 windbreaks. If they were present, the windbreak was added to the “Windbreak 83” layer. As a result of this method, there is a “Windbreaks gain” layer but no “Windbreaks loss” layer.

Structures

All structures were identified on the 1983 IR aerial photos and transferred to an orthorectified GIS data layer (Buildings 83) by referencing the 1990 black and white orthophotos (UTM). Each of the historic buildings on the 1983 cards was then referenced to the 1990 orthophotos. If the cards indicated that a structure was historic, then that structure was moved from the “Buildings 83” data layer to the “Historic buildings 83” data layer. It was only noticed at the end of the work, that not all the historic buildings were drawn on the 1983 landscape inventory cards. Because of this, the historic buildings that are only referenced in the 1983 building inventory cards and are not marked on the 1983 landscape inventory cards are not included within the “Historic buildings 83” theme. To create the Buildings 2000 theme, the “Buildings 83” theme, placed on top of the 1990 orthophotos, was opened on one half of the computer screen. On the other half of the computer screen, the 1999 photos (not orthorectified) were open. The structures on the “Buildings 83” theme that appeared on the 1999 photos were copied onto the “Buildings 2000” theme. The same process was conducted for creating a theme for historic buildings in 2000. Then, by turning on the “Historic buildings 2000” theme and the “Buildings 2000” theme, all the remaining structures that were on the 1999 photos but not on either the “Historic buildings 2000” theme or the “Buildings 2000” theme were considered new structures in 2000. These were added to the “Buildings 2000” theme. No distinction was made between buildings and structures since a comprehensive field check of each structure was not within the scope of the project. The location of historic buildings on the 1983 layer may not be precisely accurate. A potential source of error for all the historic buildings that were transferred from the 1983 landscape inventory cards to data layers is that often the USGS map upon which the historical building icons were drawn contained very little spatial information. Therefore, because every historic building was not field checked, the actual structure marked on the GIS theme as historic may not be in exactly the correct location. For example, the actual historic building may be next door to the building marked historic on the GIS map. Note that there are many more historic structures on the “Historic buildings 2000” theme than the “Historic buildings 1983” theme. This is attributable to additional data that was gathered for the National Register nomination in 1997. More detailed explanation of this outcome can be found under “Cluster Arrangements,” below.

Cluster Arrangements

Information for structures within clusters for 1983 are contained on the “Historic buildings 83” theme and the “Buildings 83” theme. Distinctions between noncontributing and compatible buildings were not made for 1983 since such information was not available. The method used for determining historic vs. non-historic buildings within clusters was the same as for non-cluster buildings. Each cluster was identified on the 1983 IR photo and on the 1983 cards. Relative placement and designation of historic vs. non-historic buildings was made as accurately as possible transferring the spatial locations from the cards to the IR photos to the GIS theme (on the 1990 digital orthophotos). However, a potential source of error exists for the exact location of historic buildings within the cluster.

Individual data layers for contributing, noncontributing and compatible buildings were made for 1997 based on the drawings made for each cluster in the National Register nomination. This information was not always consistent with the National Registry reference in the 1983 building inventory books. When a discrepancy existed, we deferred to the drawings. The historic status for each noncontributing building was not possible because of a lack of spatial information in the 1983 books. Thus, distinctions were not made between noncontributing historic and noncontributing non-historic buildings.

For cluster information in 2000, we updated the 1997 themes for contributing, noncontributing and compatible buildings with 1999 orthophotos. Buildings that were lost or added in each cluster were marked on the drawings. Gretchen Luxenberg verified whether lost buildings were actually gone and determined whether new buildings were noncontributing or compatible. No effort was made to update other buildings not in clusters as to their acquisition or loss of contributing status.

By referencing the inventory books, we determined that those buildings that were noted as “historic” on the 1983 cards included noncontributing structures. Therefore, for the 2000 historic building layer, we included those structures that were deemed historic on the 1983 cards but were later noted as noncontributing on the 1997 drawings. If the noncontributing structures on the 1997 drawings were not listed as historic on the 1983 cards, they were added to the “Buildings 2000” theme (in addition to being on the 1997 noncontributing building cluster theme.) To summarize, the “Historic buildings 83” theme contains only those buildings noted as “historic” on the 1983 cards (to our best determination of location.) All other structures visible on the 1983 IR photos were placed on the “Buildings 83” theme.

The Ferry House and Fort Casey were added to the existing clusters layer. However, details about any changes within these clusters have not been imported in the data layers.

Note that there are many more historic structures on the “Historic buildings 2000” theme than the “Historic building 83” theme. The reason for this is that the 1997 cluster drawings thoroughly and specifically denoted contributing buildings and structures. These buildings were not always marked as historic on the 1983 cards or were not marked on the 1983 cards at all (see note above about structures not drawn on 1983 landscape inventory cards.) However, the gains and losses themes take these discrepancies into account and only include those structures actually gained or lost based on aerial photos and field checks.

Vegetation Related to Land Use

Vegetation related to land use includes cropland, pasture, grassland, woodland, and wetland.

There are several possible sources of error in the pasture, cropland, and grassland data layers for 2000 and the subsequent changes (gains and losses.) Distinctions between cropland, pasture, and grassland were often difficult using aerial photos. Therefore, we did incomplete windshield surveys (because of the request to use only main thoroughfares through the Reserve) to correct some data and to train our eyes to better interpret the aerial photos. Frequently, the same plot of land was rotated between cropland, pasture and grassland. This was particularly problematic by introducing the possibility that some tracts of cropland that were fallow may have been mistakenly identified as grassland or pasture.

The 1999 aerial photos were used to determine the parcels of pasture, cropland, and grassland that were inaccessible by the main roads. This technique is of course limited, however, features such as horse/cow barns, cows, horses and deteriorated ground served as adequate indicators for pasture from aerial photos.

The pasture, cropland, woodland, and grassland data layers were tested for overlapping.

Woodland data for 1983 were created by transferring the information from the 1983 IR aerial photos onto the 1990 digital orthophotos. Reference was made to the 1983 landscape inventory cards, however the 1983 IR aerial photos provided more location information.

Woodland 2000 data were created in the same manner as above only by using the 1999 aerial photos instead of the 1983 IR aerial photos. Clearcuts were placed on a separate layer as well as on both woodland data layers.

The 1983 wetland data layers were created by using the 1983 landscape inventory cards exclusively and transferring that information onto the 1990 digital orthophotos. Although we have other GIS data regarding wetland soils, those data were obtained over a long period of time and do

not provide us with the ability to make a comparison between 1983 and 2000. Thus, we field checked each wetland marked on the 1983 cards to create a 2000 wetland data layer. The 1999 aerial photos were searched for any evidence of other “open water” wetlands.

Land Use

Land use is comprised of the categories: residential subdivisions, urban, commercial, parks, agriculture, and woodland. Commercial includes gravel pits, the dump, the recycling center, mussel farms and the commercial airstrip. Parks includes the cemetery, state parks, city parks, and county parks. Agriculture includes cropland, pasture, and tree farms.

Urban boundaries for Coupeville were made by creating an image file of the boundary in Photoshop and adjusting the scale locally to fit the 1990 orthophoto using the software TAS Basic.

Residential subdivisions were classified based on their road layout, the relationship of the houses to the land, building siting, and to a small extent density. If the combination of these factors clearly indicated that the area is a subdivision it was classified as such. Aerial photographs were used to identify potential subdivisions, and each of these areas was field-checked. If a residential area was not clearly a subdivision it was not included in this category. Commercial data were found using the 1983 IR aerial photos, the 1983 landscape inventory cards, and the 1999 aerial photos. These data were drawn on the 1990 digital orthophotos in ArcView.

Parks for 2000 were determined using information from the Internet (park maps online) and the park parcels in the Island County parcel data layer (1998, updated in 1999.) This information was reviewed by looking at the land ownership map. Determination of the existence of these parks in 1983 was made by consulting with Rob Harbour.

Posters pre-1950 to 2000

General notes:

The data created for the pre-1950 to 2000 comparison are not intended to be considered as accurate as the 1983 to 2000 data. GIS was used only as a convenient tool but the maps should only be considered as diagrams. The data that were generated were recorded as UTM, Zone 10, NAD 27 (meters.)

For some of the comparisons, new 2000 data layers were created in order to be comparable with the more generalized nature of historic data. In most cases more specific data was merged to give a more generalized category for comparisons. There are indicated in the feet below.

Historic data sources include a 1936 USGS topo map, 1941 aerial photos of very low resolution covering all but the western edge of the Reserve, 1942 high resolution aerial photos of only about 1/10th of the Reserve (eastern edge), textual sources, historic photos, and the 1997 historic register nomination

Circulation

Data for historic roads were obtained from the 1936 USGS topo map that has been digitized and scaled to fit roughly in the same area as the 2000 data. The major 2000 roads were copied onto a new data layer for 1936 roads. Then the underlying 1936 USGS topo map was used to alter the “1936” roads appropriately. By using this method, the 1936 roads are approximately in the same georeferenced and orthorectified space as the 2000 road data layers.

The road gains layer was created by placing the 1936 road layers over the 2000 road layers. The 2000 roads that showed through (not overlapped by the 1936 roads) were copied and pasted onto a new layer. The road losses layer was created in the same manner except by placing the 2000 road layers over the 1936 data.

The 1936 USGS topo map may have underestimated roads within woodland as well as small roads.

Buildings and Structures

Due to lack of detailed pre-1950 data, building sites were mapped as sites instead of individual sites and structures.

The sources of data for the pre-1950 buildings and structures came from the 1983/1997 building inventory and the 1936 USGS topo map. In the 1983/1997 building inventory, all building sites (groups of related buildings and structures) within the Reserve were recorded including the dates of construction and whether they were still in existence in 1997. All of these sites were mapped onto the 1936 USGS topo map, excluding the individual buildings and structures within Coupeville and Fort Casey. Many sites were added from the 1983 building inventory that were not marked on the 1936 USGS topo map. Additionally, a number of buildings that were not listed in the building inventory were added to historic building layers by referencing the 1936 USGS topo map. A separate layer exclusively showing the buildings on the 1936 USGS topo map was also created. All buildings from the building inventory and

the 1936 USGS topo map were added to a new historic buildings data layer. Those buildings that were either on the 1936 USGS topo map and not in the building inventory or marked as demolished in the 1983/1997 building inventory update were considered buildings lost between 1936 and 2000. Entire building sites that were lost before 1983 do not show up as losses.

A separate rough sketch was drawn to estimate the number and approximate location of Coupeville buildings in order to estimate the numbers of historic buildings lost since 1936. This sketch also allowed us to estimate the error of buildings not drawn on the 1936 USGS topo map that were obviously older than 1936, and that were listed in the building inventory.

Cluster Arrangements

The sources of data for the historic clusters were the 1942 high resolution aerial photos of the eastern edge of the Reserve, the 1941 low resolution aerial photos, and the 1936 USGS topo map for the western edge. First, all the current historic clusters were found on the 1942 aerial photos and the 1941 aerial photos. This allowed us to train our eye for finding other clusters on the low resolution 1941 aerial photo. The candidate clusters were circled separately from the known clusters. To verify whether the candidate clusters were likely to have been historic clusters, we checked the buildings within each candidate cluster with the historic buildings mapped in the 1997 National Register nomination. If there was at least one building listed within the building inventory that was in that candidate cluster, and it appeared to be related to surrounding agricultural land use, the property was identified and a judgment was made by Park Historian and Superintendent Gretchen Luxenburg as whether it would have been a farm cluster. Sites identified as such were designated “probable clusters that have been lost.” Other areas that could have been clusters based upon aerial photography interpretation and the presence of a historic structure in the 1983 inventory, but for which there are no contributing historic structures remaining, were classified as “possible clusters” that have been lost. The final clusters are drawn on the 1941 aerial photo with the 1936 USGS topo map “pasted” onto the western edge.

Vegetation

The vegetation poster includes the categories open fields (including cropland, pasture, and grassland), woodland, and wetlands.

Open fields include both cultivated and non-cultivated land in one category because it is not possible to distinguish between these categories with our low resolution aerial photos. These data were drawn on the 1941 aerial photo with the appended 1936 USGS topo map on the western edge.

The 2000 open fields category was created by combining the cropland, pasture, and grassland data layers.

The historic woodland layer was created by tracing polygons around the woodlands on the 1941 aerial photo (with the 1936 USGS topo map on the western edge.)

The 2000 woodland layer was not altered from the 2000 woodland layer used in the 1983 to 2000 comparison.

The historic wetland layer was created by looking for wetlands on the 1941 aerial photo that had been marked on the 2000 data layer. Once these wetlands were found, we looked for other open water wetlands on the 1941 aerial photo.

Since the 1941 and the 2000 data layers were created on top of different maps (one projected and one not), an alternative method was used for generating the gains and losses data layers. For each data layer, the 1941 and 2000 data were traced separately. Then, the 1941 trace and the 2000 trace were lined up to the degree possible and gains and losses were traced from these overlapping polygons. These new traced maps were transferred roughly back to the 1990 digital orthophoto map so that comparisons could be made.

Land Use

The land use poster includes the categories: agriculture (including ranching and fallow grasslands but excluding native grasslands), residential/commercial, commercial/industrial, woodlands, coastal defense, cemetery, and parks.

The agriculture category was created by taking the open fields categories for 1941 and 2000 and subtracting what seems reasonable to have been native grassland (e.g., around Perego’s Lagoon.)

The residential / commercial data layers were generated by including urban development (Coupeville and Prairies Center in 2000 and Coupeville, Prairie Center, Coveland, and San de Fuca prior to 1950), subdivisions, and loose polygons around homes that did not clearly involve working the land for sustenance. Information from various textual sources was used along with historical photos to make these assumptions. For 2000, the Island County parcel layer was used to find properties zoned as “rural residential,” and these were added to residential. Vacation homes were included in residential.

The parks category was made by referencing maps and the 1998/1999 Island County parcel layer. Coastal defense borders were found on USGS topo maps.

Commercial/industrial includes commercial activities that were not intermixed with residential. These were found through the use of the aerial photos (gravel pits) and textual descriptions (fishing.)

Timberlands were considered to be the same as the woodlands in the vegetation poster.

The cemetery is clear on the map and has remained relatively unchanged.

Natural Systems and Features

Because insufficient data existed regarding the existence and combination of ecological systems, only the existing natural features are mapped.

The natural systems and features data layers included all bluff vegetation, all wetlands, all woodlands, grassland around the lakes, much of the grassland at Fort Casey, and the areas that clearly show the presence of locally rare grassland species found in Steve Erikson's database (Au Sable Institute.) While aerial photos clarified changes in the bluff vegetation, wetlands, and woodlands between 1941 and 2000, we made the assumption that the areas that currently contain locally rare prairie species most likely also did in 1950. We do not have reliable data to include other areas that might have contained native prairie species before 1950. Additionally on the natural systems and features poster, some of the species found in Steve Erikson's database that represent the range of existing native grassland species are mapped. These data do not represent all prairie species on the Reserve, but are only sites where prairie species have been observed.

Information regarding existing vegetation that originated from the Department of Natural Resources is shown on the poster. However, permission was granted by the DNR for this single use only and therefore any further use of this data requires a new contractual agreement with DNR. Contact information is included in the digital files.

Views and Vistas

The original task for comparing historic and modern views and vistas was aimed at comparing views that were nominated in the National Register of Historic Places in 1997. The contributing views and vistas that were in the nomination are:

1. Ebey's Prairie from the cemetery, and from Engle Road
2. Entry to Coupeville (from Ebey's Prairie into Prairie Center, and along Main Street) and Front Street in Coupeville
3. View from Front Street and the Wharf, across Penn Cove
4. View to Crockett Prairie and Camp Casey from Wanamaker Road
5. View to Crockett Prairie and uplands from the top of Patmore Road
6. View to Crockett Prairie and the uplands from Keystone Spit
7. View to Grasser's Lagoon from Highway 20
8. Views to and across Penn Cove along Madrona Way
9. Views from the bluff trail to Ebey's Prairie and Coastal Strip
10. View of Smith Prairie from Highway 20, entering the Reserve
11. Views from Monroe's Landing across the cove to Coupeville
12. Views from Fort Casey across Keystone Spit and Crockett Lake
13. View from Highway 20 across Ebey's Prairie
14. Engle Road to Uplands and west coast
15. Views to Grasser's Hill from Madrona Way

Unfortunately historic photos were not available for all of these views and vistas. As a result, we chose a different method for deciding which views and vistas to compare. We collected all landscape photos within the Museum's collection and within the Board's collection. We sorted them by location. We then chose the widest range of photos that would cover the largest area of the Reserve, including any categories in the original nomination that were possible. Our new set of views and vistas are:

1. View of Keystone Spit and the current ferry landing from Fort Casey
2. View of Keystone Spit and Crockett Spit from a higher vantage point at Fort Casey
3. Western coastline from Hill Road looking towards Ebey's bluff
4. View of Gould Farm in Ebey's Prairie from the wayside
5. Ebey's Prairie from below the cemetery
6. View of Prairie Center from below the cemetery
7. View west along Terry Road
8. View towards Penn Cove along Main Street
9. View of Front Street looking east from the museum
10. View of the old San de Fuca from Madrona Way
11. Travelers along Madrona Way (the old highway)
12. Views of the northern shore of Penn Cove from Captain Whidbey's Inn
13. View of the old courthouse along Madrona Way

14. View of the coast of San de Fuca
15. View of Monroe farm along Penn Cove Road

Modern photos were taken to match as closely as possible the vantage point of the historic photos. For many historic photos, the comparable modern view is obscured by vegetation. These photos were excluded from the poster, though they provide insight into changes in the Reserve.

Spatial Organization

A combination of topography and vegetation were used to determine areas of spatial and visual continuity. Digital elevation models were built in Arc View, and GIS surface cover layers such as Woodlands, Agriculture Land, Roads, and Coupeville were draped onto the DEM. Boundaries of “landscape rooms” or units formed by topography and vegetation were drawn over 1990 orthorectified aerial photographs. These landscape units were given names based on historic and physical identifying features with the assistance of the NPS Planning Team. Boundaries of the landscape units were drawn in PhotoShop.

For 1936 Landscape Units, the 2000 boundaries were laid over the 1936 USGS map. Boundaries were maintained as they are in 2000 unless the 1936 map showed differences in vegetation. A 1941 aerial photograph was then used to verify or modify the historic vegetation and Landscape Unit boundaries.

Year 2000 parcels were derived from Island County GIS data. To find parcels remaining from 1899, the 1899 map was visually compared with year 2000 parcels. Parcels remaining intact were colored in PhotoShop on the scanned 1899 parcel map.

The circulation maps included ArcView layers of major and minor roads based on a 1936 USGS map and the 1999 aerial photograph. The maps were converted to .tifs or the poster.

Appendix D: Planning Team

Prepared for the National Park Service by:

Jones & Jones Architects & Landscape Architects

105 S. Main St. Suite 300

Seattle, WA 98104

Phone: (206) 624-5702

www.jonesandjones.com

Principal-in-Charge: Keith Larson, AIA ASLA

Project Manager / Author: Nancy Rottle
Assistant Professor
University of Washington Department of Landscape Architecture

Project Team: Nathaniel S. Cormier, ASLA
April Mills
Christopher L. Overdorf, ASLA
Rene' M. Senos, ASLA