APPENDIX D. FMP MITIGATION MEASURES

Mitigation Measures for the PRNS/GGNRA North Fire Management Plan

To ensure that the action alternatives protect natural and cultural resources and the quality of the visitor experience, a consistent set of mitigation measures would be applied to actions of the Fire Management Plan. The National Park Service will complete appropriate environmental review (i.e., as required by National Environmental Protection Agency, the National Historic Preservation Act, the Endangered Species Act and other relevant legislation) for future actions not covered in the *Final Fire Management Plan/EIS*. As part of the environmental review, the NPS would avoid, minimize, and mitigate adverse impacts to the greatest extent possible. In addition as part of the project review process, projects carried out in designated wilderness will be required to go through a minimum requirement process. In this two step process, the park must: 1). make a determination as to whether or not a propose management action is appropriate or necessary for the administration of the park as wilderness; and 2). if the project or activity is appropriate or ness in wilderness, make a selection of the management method/tool that causes the least impact on the physical resource and experiential qualities of wilderness.

Guidance on the use of herbicides in conjunction with implementing the FMP is found on page 38 of the FMP FEIS.

> If herbicides are used, they are applied according to strict specifications using detailed Material Safety Data Sheets. Any application requires the approval of the park's Integrated Pest Manager and the Washington Office coordinator for herbicide application. No applications occur in riparian or wetland areas (FMP FEIS page 38).

The following mitigation measures would be applied regardless of the alternative selected:

General

> G-1. To ensure that implementation of fire management plan actions conforms to findings of this impact assessment, subsequent fire year plans and individual projects will be subject to NPS project review. Prior to approval, all projects will be submitted through an NPS internal review process wherein an interdisciplinary team will evaluate if the potential effects of the proposed projects are adequately addressed through the FMP NEPA process. Conformance to the conclusions in the FMP EIS will be documented for the NEPA record. If the team finds that the project has major new environmental effects not addressed in this EIS or effects greater than those described in this EIS, a separate environmental process will be conducted.

Soils

General

S-1. Individual burn plans will be written with enough detail to determine the extent of impacts to soil from erosion. Subject matter experts will determine if the erosion control plan submitted is sufficient to prevent long-term moderate or major impacts on the rate of soil erosion. In other words, the expert will determine if the proposed erosion control strategy will be sufficient to ensure no greater than minor impacts to soils from erosion. If the assessment finds that standard erosion control strategies will be insufficient to avoid long-term moderate or major effects on the rate of erosion, a separate NEPA process will be initiated for that burn plan. Strategies used to minimize impacts to soils can include avoiding steep slopes, timing burns to minimize erosion potential, or using erosion control devices during or after burns.

S-2. Watershed level planning will be used to assure that erosion rates within any one watershed will conform to the conclusions of environmental effect reached in this FEIS, (e.g., impacts will be no more than moderate in intensity). Watershed level planning will be triggered when proposed actions have potential to exceed 10% of the total area of one or more FMP watersheds in one year. This mitigation measure assures that planning considers the watershed scale, and if a potential effect is identified, that a specific assessment be conducted for the burn plan to assure the conformance of watershed level effects with this FEIS.

For Prescribed Burns

S-3. Some coarse, woody debris, if available, will be left on the site for nutrient cycling and mycorrhizal function.

S-4. All constructed fire lines will be rehabilitated to prevent compaction if needed.

For Mechanical Treatments

S-5. Mechanical regrading of roads will be conducted to specifications identified in the PRNS Trails Inventory and Condition Assessment and Road Memorandum of Understanding with adjacent land management agencies. Use of these specifications will minimize erosion from fire roads.

S- 6. For FMP tree removal actions in areas with highly erosive soils or slopes over 15%, tree stumps will be left in place and cut as close to ground surface as feasible.

For Wildland Fire Control Activities

S-7. Following wildland fires, soil rehabilitation efforts will be focused on rehabilitating ground disturbance from heavy equipment.

S-8. Unless no feasible alternative is available, heavy equipment will not be used in areas where soils are wet or extensive compaction could occur. If staging of equipment or

supplies occurs on soils, a clearly marked and visible limit of disturbance line will be installed using either stakes, flagging, or fencing. Surface soils in areas subjected to compaction will be scarified at the end of the period of use to retard runoff and promote revegetation.

S-9. Erosion control measures will be implemented where project actions could leave soils exposed to runoff prior to revegetation. Erosion control measures include covering exposed soils with weed-free chipped material, native duff, erosion control blankets, or certified sterile rice straw.

S-10. Where surface soils must be disturbed and soils support native vegetation, existing vegetation and topsoil will be retained and reinstalled whenever feasible.

Air Quality

A-1. If recommended by BAAQMD, prescribed burn plans submitted for review could be modified to reduce production of pollutants. Options include modifying burns to reduce the area burned, reducing fuel loading (e.g., mowing and understory thinning), or managing fuel consumption. Treatments to reduce overall air emissions from prescribed burns can include:

- Mowing grass and reducing density of vegetation in brushlands.
- Mechanical treatment of forested areas by removing standing or downed trees, understory thinning, thinning of forests, and creation of shaded firebreaks.
- More frequent, less intense burns to prevent unwanted vegetation from becoming established in clearings or in forest understory.

A-2. Increasing combustion efficiency or shifting the majority of combustion away from the smoldering phase and into the more efficient flaming phase will reduce emissions (except NOx, which is produced in greater quantities at higher temperatures). Methods to accomplish this will include pile or windrow burning, rapid mop-up, and shortened fire duration. Pile or windrow burning will generate more heat and burn more efficiently and be most effective in reducing forest fuel rather than brush type fuels.

A-3. The park will develop a Smoke Communication Strategy to guide management of smoke events during prescribed fires, managed wildland fires, suppression actions, and fires occurring outside the park. Notification of proposed burns will be disseminated through local media and postings to provide adequate advance notice to persons with sensitivities to smoke when burning is planned. Information will be provided to visitors, employees, and residents in smoke affected areas regarding health issues and concerns. The park will monitor particulate levels in the park during large smoke events to provide data for future assessments.

A-4. $PM_{2.5}$ monitoring data will be collected at Bear Valley in Point Reyes National Seashore. Data collected will be shared with local, regional, and national air quality agencies and databases.

A-5. To reduce smoke and pollutant generation during late summer and early fall, efforts will be made to burn fuel concentrations, piles, landings, and jackpots outside of the prescribed burning season to increase the number of units that can be burned without overloading the airshed on days with good dispersal conditions.

A-6. To avoid impacts to visibility in the Class I PRNS portion of the project areas, burning will be avoided on holidays or other periods when recreational visitation is typically high.

A-7. To avoid public health and nuisance impacts to neighboring communities, prescribed burns will be conducted under meteorological conditions that will avoid smoke drift into sensitive residential areas and that will transport smoke away from populated areas. Planning for prescribed burning also will consider the smoldering period to avoid fires where downslope winds during the night could carry smoke into residential areas at the base of ridges.

Water Quality and Water Resources

W-1. Individual burn plans will be written with enough detail to determine the extent of erosion within the burn area due to a) the prescribed burn and/or, b) mechanical treatments. Subject matter experts will determine if the erosion control plan submitted is sufficient to prevent long-term moderate or major impacts to the water resources and water quality, and will assure project compliance with TDML implementation plans for Tomales Bay, Lagunitas Creek, and Walker Creek, according to availability through adoption by the EPA. Strategies to minimize erosion and sediment transport to water resources associated with prescribed burning include avoiding oversteep slopes, timing burns to minimize erosion potential, or using erosion control devices after burns. Strategies to minimize erosion and sediment transport to water resources associated with mechanical treatment include avoiding oversteep slopes, avoiding scraping or clearing to bare mineral soil (leave duff layer), or installing erosion control devices as part of mechanical treatment (if necessary).

W-2. Watershed level planning will be used to assure that prescribed burning and/or mechanical treatment within any one watershed will conform to the conclusions of the environmental effect reached in this EIS (e.g., the impacts will be no more than moderate in intensity). Watershed level planning will be triggered when proposed actions have the potential to exceed 10% of the total area of one or more FMU watersheds in one year. This mitigation measure assures that planning considers the watershed scale and, if a potential effect is identified that a specific assessment be conducted for the burn plan to assure the conformance of the watershed level effects within this EIS.

W-3. Helispots, staging areas, and spike camps will be located at least 100 feet away from streams, creeks, and other water bodies.

W-4. All fire line (both handline and dozer line) will be rehabilitated as quickly as possible, which will include application of Burned Area Emergency Response (BAER) techniques such as recontouring, soil stabilization as needed, and monitoring for erosion and treatment as necessary in the first winter following disturbance.

W-5. When developing prescribed burn boundaries, non-treatment buffer areas will be established around perennial, intermittent, and ephemeral channels associated with Lagunitas Creek, Olema Creek, Pine Gulch Creek, and other coastal drainages originating from Inverness Ridge. Some treatment within buffer areas, including hand removal of non-native species and "cool" burns of non-native grasses, may occur within these areas. Fire lines around these areas will be mowed - not graded or scraped - in order to leave a 100-foot vegetated buffer strip from burn areas.

Vegetation

The following mitigation measures will be applied to reduce impacts from prescribed fire and mechanical treatment within all vegetation types:

V-1. "Pre"-Treatment Measures

- Individual prescribed burns will be conducted within the framework of a multidisciplinary planning effort. Personnel from fire management and from resource management will work together to identify areas that are expected to benefit from prescribed burning. Existing data on the response of plant communities in the Seashore to fire will be consolidated and analyzed to determine optimal areas, configurations, and times for burns. Clear objectives will be developed for prescribed burns that will include measurable parameters to determine the effects of the burns on vegetation. Following burns, vegetation will be analyzed to determine the effects of the burn, which will aid in future burn planning.

- Prescribed burns will be conducted at a time of year when introduction or spread of non-native plants will be minimized, and mortality of non-native plant species will be maximized.

- Whenever possible, existing roads or trails will be used as firebreaks for prescribed burns and for wildland fire suppression.

- Vegetation managers will work with fire management staff to develop maps of areas that support plant communities of special management concern (e.g., uncommon communities, wetlands, riparian areas, dunes, areas with no non-native plants that need to be kept intact, areas with highly invasive non-native plants that should not be spread) so fire personnel can attempt to avoid such areas when making decisions about fire management tactics.

V-2. "During" Treatment Measures

- Soil disturbance will be minimized to the greatest extent possible to reduce potential for introduction or spread of invasive non-native plant species.

- The aerial extent of disturbance associated with mechanical treatments will be kept to the minimum necessary to reduce fire risk.

- For helispots or spike camps, previously disturbed sites and open areas will be used whenever possible to minimize additional disturbance.

- Burn piles will be kept small to minimize the area disturbed and to allow for the recolonization of sterilized patches by mycorrhizal fungi and other soil organisms in adjacent areas.

V-3. "Post"-Treatment Measures

- Areas subject to fire management treatments will be monitored periodically for the presence of invasive non-native plant species, and if such species have established or spread as a result of such activities, the non-natives will be removed.

- All fire line (both handline and dozer line) will be rehabilitated as quickly as possible, which will include application of Burned Area Emergency Response (BAER) techniques such as recontouring, soil stabilization as needed, and monitoring for and removal of invasive non-native plant species for a minimum of three years following a fire.

V-4. In grasslands

- Follow-up non-native plant monitoring and removal will be conducted to remove new recruits that come into the site in years following prescribed burning or mechanical treatments.

- All grassland burns will be carefully monitored to ensure burn objectives (= recruitment and long-term maintenance of native species without introduction of invasive non-native plant species) are being met.

- To improve grassland plant species composition, and reduce the chance of invasion or spread of non-native species, native seeding trials will be conducted following fire management treatments in some areas.

- Small pilot burns (less than 100 acres) will be conducted in the Tomales Point FMU grassland to determine plant community response. These burns will be carefully monitored to ensure burn objectives (= recruitment and long-term maintenance of native species without introduction of invasive non-native plant species) are being

met. If pilot projects determine objectives can be met using prescribed fire, individual burn size will increase to a maximum of 150 acres.

V-5. In Bishop pine:

- Follow-up non-native plant monitoring and removal will be conducted to remove new recruits that come into the site in years following prescribed burning or mechanical treatments.

- Prescribed burning in Bishop pine stands will occur only if the burns can be conducted under conditions that will result in germination and recruitment of new stands of Bishop pine. Relatively cool fires under moist conditions may not meet this objective.

- Initially, prescribed burns in Bishop pine forest habitat will be small and will be carefully monitored to ensure burn objectives (= recruitment and long-term maintenance of Bishop pine and associated native species without introduction of invasive non-native plant species) are being met.

V-6. In Douglas-fir/coast redwood forests:

- If pre-burn thinning of trees is required in forested stands, the trees to be thinned will be no larger than 10” in diameter.

- Prior to conducting prescribed burning in Douglas-fir or coast redwood forests, Seashore fire and vegetation managers, and wildlife and plant ecologists will collaborate to fully develop rationale, objectives, prescriptions, and plans for conducting burns in the redwood forests within the project area.

V-7. In hardwood forests:

- Site-specific objectives will be developed for prescribed burns in hardwood forest habitat. The intent of such burns may be to reduce density or abundance of this vegetation type to encourage coastal scrub development, or may be to improve the ecological health of the hardwood plant communities. Unique, site-specific burn prescriptions and timing will be required to meet these differing objectives.

V-8. In coastal scrub:

- In coastal scrub small pilot burns (> 50 acres) will be conducted. These burns will be carefully monitored to ensure burn objectives (= recruitment and long-term maintenance of native species without introduction of invasive non-native plant species) are being met. If pilot projects determine objectives can be met using prescribed fire, individual burn size will increase to a maximum of 200 acres.

Wetlands

W-1. Burns will be allowed to back into and burn around wetlands and meadows or through them if the vegetation is dry enough to carry fire. Wetlands will be avoided to the greatest extent possible during fire confinement and containment.

W-2. Fire suppression activities will not occur in wetlands unless there are no alternatives available to control the spread of a wildland fire.

W-3. Fires near wetlands will be ignited when wetlands are too moist to sustain fire spread, thereby minimizing impacts to wetlands.

W-4. To the greatest extent possible, mechanical treatments will not occur in wetlands.

W-5. Wetlands may be used as natural boundary for prescribed fires. When a wetland area is being used as a boundary, the control line will occur in adjacent uplands, not in wetlands.

W-6. Prescribed fires will not occur more frequently than the time required for native plant species to set seed.

W-7. Foams or other fire retardants will not be used in or near wetlands.

W-8. Firebreaks or fire lines will be constructed in previously disturbed areas whenever possible.

W-9. Chipped material will not be spread in wetlands.

Special Status Species

SS-1. Known populations of special-status plant and animal species will be monitored to ensure long-term impacts are avoided. Known populations of special status species will be avoided when locating helispots or spike camps.

SS-2. In Spotted Owl Habitat:

- annually identify and map areas where spotted owls are nesting,
- protect occupied and previously used nest sites from unplanned ignitions,
- do not conduct prescribed burns within 400 meters of an occupied or previously used nest site,
- do not conduct mechanical treatments with mechanized equipment within 400 meters of an occupied or previously used nest site between February 1 and July 31 (breeding season),

- conduct post-treatment monitoring to ascertain any impacts.

SS-3. In Point Reyes Mountain Beaver Habitat:

- identify and map areas known to support Point Reyes mountain beaver and areas that have habitat suitable for supporting Point Reyes mountain beaver,
- protect known and potential habitat from unplanned ignitions,
- establish buffer areas 30 feet wide around known habitat areas, and
- conduct small burns (less than 100 acres) of mountain beaver habitat each year.

SS-4. Avoid conducting burns during the nesting season, March 15 through August 15, unless biologists can ascertain that birds are not nesting in the planned burn area.

SS-5. During the tule elk calving seasons, burns will be conducted in habitat away from areas where birthing and loafing of females and calves occur.

SS-6. To protect California red-legged frogs, areas to be treated by mechanical means or prescribed fire will have a buffer area of 30 feet established around known breeding habitat.

SS-7. The annual work plan for FMP implementation will be provided to NOAA Fisheries each year to allow that agency to monitor the types of projects proposed.

Cultural Resources

CR-1. Pre-Action:

- Cultural resources will be considered during all fire management planning efforts.
- Fire management personnel and other staff will receive annual training on cultural resources and fire management actions.
- All cultural resources will be evaluated with respect to hazardous fuel loads. As needed, fuel loads will be reduced using methods commensurate with avoiding or minimizing adverse effects. Maintaining light fuel loads on and in close proximity to cultural resources will be emphasized. All areas slated for ground disturbing activities will be subjected to pre-action field surveys. This includes areas likely to be disturbed during future wildfires.
- Pre-burn survey will be conducted prior to all prescribed burns as dictated by resource distribution and vulnerability, vegetation and topography, and expected fire behavior.

- Consultation with local Native American communities will continue to occur in the context of fire management actions. Spiritual sites and important plant communities will be identified and appropriately managed for preservation, maintenance, and/or rehabilitation.

- Computer and other databases containing cultural resources data will be created and maintained, and made available to fire management personnel in the event of emergencies.

- Cultural resources specialists from adjacent land management agencies will be consulted in order to coordinate mitigation efforts prior to planned and unplanned fire management actions.

- Appropriate cultural resources monitoring protocols will be established and implemented.

- Potential research opportunities to study the effects of fire management actions on cultural resources will be identified.

CR-2. During-Action:

- A cultural resource specialist or resource advisor will be present during all fire management actions where recorded and unrecorded resources of interest are considered at risk. Additional survey will be conducted on an as-needed basis.

- Observations of fire behavior and other variables will be made with respect to recorded cultural resources and/or areas with high probability of containing unrecorded cultural resources.

- Cultural resources data will be shared with fire management personnel as needed to avoid or minimize adverse effects.

- A cultural resource specialist or resource advisor will educate fire management personnel about cultural resources and the potential impacts of fire management actions.

CR-3. Post-Action:

- The post-action condition of all recorded cultural resources will be assessed. Resources requiring stabilization or other treatment will be mitigated.

- As appropriate, post-action survey will be conducted in previously surveyed and unsurveyed areas. Previously unrecorded cultural resources will be assessed for condition, and stabilization and other protection needs.

- Monitoring and research data will be compiled, evaluated, and used to help refine cultural resource compliance for fire management actions.

Human Health and Safety

HH-1. Firefighters will be frequently rotated and allowed to rest or sleep when needed, and fire lines and safety zones will be used to minimize exposure.