National Park Service
U.S. Department of the Interior

FIRE ISLAND NATIONAL SEASHORE
NEW YORK

FIRE AND FUELS MANAGEMENT PLANS

Environmental Assessment /Assessment of Effect

August 2004

Environmental Assessment
Assessment of Effect

FIRE MANAGEMENT PLAN
Fire Island National Seashore
2004

Summary
National Park Service (NPS) policy requires that any NPS unit with combustible vegetation must prepare a Fire Management Plan. Policy also directs the management of hazardous wildland fuels. Three alternatives were considered for the Fire Island National Seashore Fire Management Plan:

- Alternative 1 - No-Action, continued suppression of wildland fires; mowing herbaceous vegetation near park facilities, historic structures, and urban interfaces; and removal of hazard trees;
- Alternative 2 - NPS preferred action that would adopt a fire management program of appropriate management response to unwanted wildland fires while utilizing prescribed fire and mechanical treatments for hazard fuels management; and
- Alternative 3 – appropriate management response to unwanted wildland fires coupled with mechanical fuels management.

Two other alternatives were considered but rejected. Alternative 4 would have authorized wildland fire use. This alternative was rejected because of potential conflicts with residential communities and cooperating agencies. The concept may be a viable alternative some years in the future when and if public support, refinement of desired conditions, and additional information on local fire ecology become available. Alternative 5, the no-management alternative, would allow all wildland fires to burn unimpeded by management action. No other manipulative activities (e.g., hazard fuels management) would be permitted. This alternative was rejected because it compromises public safety, causes undue risk to values to be protected (e.g., historic structures), and is inconsistent with federal policy and regulations.

Suppression operations in each alternative would quickly respond to wildland fires and achieve effective control to protect human life and property with the least amount of damage to the park's natural and cultural resources. The alternative of wildland fire use was considered and rejected because Fire Island NS is not sufficiently large enough to sustain free-burning fires without substantial risk to high-value resources and park neighbors. Managing wildland fire for resource benefits also requires personnel with specialized skills and qualifications. It is unlikely that qualified personnel would be readily available to Fire Island within the time constraints required by policy.

This environmental assessment analyzes impacts to firefighter and public safety; vegetation; wildlife and wildlife habitat; threatened, endangered, or sensitive species; air quality; wetlands; soils; wilderness; cultural resources; visitor experience, aesthetic resources, and park operations;

and describes the cumulative effects of each alternative. None of the direct, indirect, or cumulative impacts of the proposed action are considered major for any of the impact topics.

Fire Island National Seashore is hereinafter referred to as Fire Island NS, the Seashore, or the park. Comments to specific units of this park will address the units by name.

Public Comment

Note to Reviewers and Respondents:

If you wish to comment on this environmental assessment, you may mail comments to the name and address below. This environmental assessment will be on public review for 30 days. Please note that names and addresses of people who comment become part of the public record. If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment. We will make all submissions from organizations, businesses, and individuals identifying themselves as representatives or officials of organizations or businesses available for public inspection in their entirety.

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Chapter 1 – PURPOSE AND NEED

Background

Fire Island National Seashore was created in 1964 by an Act of Congress (Public Law 88-587). Approximately 26 miles (42 km) of Fire Island and several smaller islands are encompassed within the Seashore boundaries. The Seashore was established "for the purpose of conserving and preserving for the use of future generations certain relatively unspoiled and undeveloped beaches, dunes and other natural features within Suffolk County, New York, which possess high values to the Nation as examples of unspoiled areas of great natural beauty in close proximity to large concentrations of urban population." In 1965, Congress added the 615-acre William Floyd Estate, a historic property, to the Seashore (Public Law 89-244). This property is located in Mastic Beach on Long Island north of Moriches Bay. Included on the property are 11 historical buildings and their contents and the family cemetery. In 1980, Public Law 96-585 designated 1363 acres of parkland, located between Smith Point and Watch Hill, as the Otis Pike Fire Island High Dune Wilderness area. Historic structures, such as those at Fire Island Lighthouse and William Floyd Estate, are administered by the National Park Service.

Land ownership within Seashore boundaries includes: NPS, 6,093 acres; state/local, 12,499 acres; private, 987 acres. Most private land (960 acres) is located within 17 communities on the barrier island.

Fire Island is a narrow 32-mile long barrier island located in Suffolk County south of Long Island, New York. Fire Island is separated from Long Island by the Great South Bay and on the extreme eastern tip by Moriches Bay. The park has concurrent jurisdiction that encompasses 1,000 feet into the Atlantic Ocean and 4,000 feet into the Great South Bay including the islands adjacent to the bay shoreline. Fire Island varies in width from about 450 feet (137 m) near Barrett Beach to 3100 ft. (945 m) at Great Gun Beach.

The Robert Moses Causeway provides access to the western end of Fire Island (i.e., Robert Moses State Park). This is also the off-season vehicle access point for the FIIS sites including the Fire Island Lighthouse and Sailors Haven/Sunken Forest. Access to the eastern end of the Island is by William Floyd Parkway. The FIIS sites of Watch Hill and Talisman are reachable only by vessel. Vehicle access on Fire Island is attained by driving the beach and by very low standard access ways and dune crossings. A permit system regulates vehicle use. Visitor access to Fire Island is primarily by boat.

The Otis Pike Fire Island High Dune Wilderness, at the eastern end of the Seashore, is the only NPS Wilderness Area in the North Atlantic Region and the only Wilderness Area of any designation in the State of New York. Consisting of 1,363 acres, it is divided near its mid-point by the nonfederal lands of Bellport Beach. All residential type structures were removed by 1993. Boardwalks are found at the Smith Point and Old Inlet Areas. Minimal facilities (dock and restrooms) remain at Old Inlet.

The topography and vegetation of Fire Island are typical of barrier islands. On the ocean side of the island is a berm where sand is deposited and/or removed by wave and wind action. Primary

and secondary dunes behind the berm are vegetated with grasses and shrubs. On Fire Island, the primary dunes (i.e., where primary dunes still exist) may be more than 35 feet high. Behind the dunes are flat low-lying area swales vegetated by shrubs, trees, and herbaceous vegetation. Beyond the swale, i.e., to the bay side, are tidal wetland vegetation communities.

The William Floyd Estate is a 615-acre tract located on the south shore of Long Island. The estate is the former home of General William Floyd, a signer of the Declaration of Independence, and subsequent generations of the family. The manor house, a 25 room, two-story historic structure, is located in the northern part of the property. In addition to the main house, there are several historic outbuildings, a cemetery, and lawns and gardens. There is a maintenance area, including one permanent structure, and two barns. There is also a curatorial building and a duplex employee residence on the estate. The northern boundaries of the site are defined from the residential community by an eight-foot chain link fence. A twenty-foot wide fuel break/road follows along the interior side of the boundary between the visitor entrance and service entrance.

The site rises gradually from mean sea level to an elevation of 20 feet. Approximately 25% of the land area lies in tidal salt marsh, with the remaining land composed of mature timber forests and cultivated fields. Most roads within the estate are grass-covered trails that blend with the forest environment. The Estate is surrounded by heavily populated areas and has the highest incidence of human-caused wildland fire within the Seashore.

Fire Island has a temperate-maritime climate. Proximity to the sea moderates extremes of temperature so that minimum winter temperatures and maximum summer temperatures have a narrower range than areas further inland. The average yearly temperature is 51°F, though temperature extremes may range from below 0°F to over 100°F. The frost-free period is 180 days. Great South Bay regularly ices over during winter, causing ice flows and vegetative disturbance on bayside shores. Coves, smaller bays, and shores along marshes may completely freeze over.

The average annual precipitation in the park is 45.8 inches and is fairly uniformly distributed throughout the year. Dry months are rare. Monthly average precipitation ranges from a minimum of 3.4 inches in September to a maximum of 4.5 inches in August. Precipitation occurs from cyclonic storms in winter, spring, and fall; thunderstorms in summer; and hurricanes in late summer and fall. Fire Island is normally snow free, but snow does fall periodically from October to April and may remain on the ground for several weeks. Onshore (i.e. southwesterly) winds prevail in spring and summer; offshore winds (i.e. westerly and northwesterly) prevail during winter.

Purpose

The purpose of this planning effort is to develop a fire management program at Fire Island NS. As part of that planning process, this Environmental Assessment (EA) analyzes fire and fuels management program alternatives and their direct, indirect, and cumulative impacts. Three alternatives are analyzed: Alternative 1 - No-Action, continued aggressive suppression of wildland fires, mowing herbaceous vegetation around selected sites, and removal of hazard trees; Alternative 2 - NPS preferred action that would adopt a fire management program of appropriate management response to unwanted wildland fires while utilizing prescribed fire and mechanical treatments for fuels management; and Alternative 3 – appropriate management response to un-

wanted wildland fires coupled with mechanical fuels management. Under Alternative 2, prescribed fire may also be used to maintain historic fire-dependent communities. Subsequent to this EA, a Fire Management Plan (FMP) will be developed to direct fire management activities. The Fire Management Plan will identify Fire Management Units, values to be protected, and individual management actions in conformance with NPS fire management policies.

Need

The National Park Service's *Management Policies* (2001) and Director's Order 18 – Wildland Fire Management – require that each park area with vegetation capable of sustaining fire develop a plan to manage fire and hazardous fuels on its lands. To comply with NPS policy, Fire Island NS needs to have a comprehensive fire management program that protects natural and cultural resources, the public, and employee and park facilities.

Scope of Plan

The scope of the Fire Management Plans is confined to areas within the authorized boundaries of Fire Island NS. Therefore, the Fire Management Plans would address the approximately 6,093 acres of federal land within Fire Island NS. Five alternatives were identified (see Chapter 2); of these, two were rejected and three are evaluated in this EA. This EA considers impacts within the Seashore and adjacent areas that could reasonably be impacted by fire and fuels management actions.

Fire Planning Considerations

In compliance with the National Environmental Policy Act (NEPA), this EA describes for comparative purposes the potential effects of implementing alternative fire management programs at Fire Island NS. At the conclusion of the NEPA process, an operational FMP and fuels management protocols would be approved in accordance with the selected alternative.

Included with the description of the preferred alternative are proposed actions which may be conducted within a typical 5-year period following the approval of the park's FMP. On an annual basis, the Fire Island NS staff would evaluate fuel and resource conditions, progress on treatments and results, funding availability, and other issues to update a 5-year fuels treatment plan. The plan and its updates would be consistent with the program objectives and the selected alternative defined in the FMP and the EA. In this way, the fire and fuels programs incorporate an adaptive management approach into planning and program implementation. To ensure ongoing compliance with specific laws such as the National Historic Preservation Act and the Endangered Species Act, requisite consultation for resource impacts is performed on a project-by-project basis where a programmatic agreement has not been developed.

It is possible that during the FMP annual evaluation and update changes in park conditions or in policy and law may indicate that the fire management plan is no longer applicable. It is also possible that the fire program staff may propose a hazard fuels treatment plan that is inconsistent with the FMP and EA. If the Fire Island NS staff decides to revise the FMP or fuels treatment plan, and if said revisions would result in new impacts not considered in the original EA, then

such a program change would necessitate additional NEPA analyses. Please note that regardless of whether changes are made to the plan, if new regulatory requirements, threatened and endangered species listings, or changes to the environment have occurred since the original EA, additional compliance would be required to continue implementing the program.

Fire and Fuels History

Fire was once an important factor in shaping much of the vegetative mosaic in the Fire Island National Seashore (Horton, et al. 1986). For example, the Sunken Forest which now is dominated by holly (*Ilex opaca*), sassafras (*Sassafras albidum*), shadbush (*Amelanchier canadensis*), and black gum (*Nyssa sylvatica*) once contained a substantial component of pitch pine (*Pinus rigida*) as evidenced by pollen cores (Backman and Patterson 1984). The authors state "The pollen and charcoal records reveal a pattern of fires followed by succession to pitch pine and then holly and associated species. The present maritime forest replaced pitch pine through autogenic succession in the absence of destructive fires during the past two centuries."

Since the establishment of Fire Island NS in 1964, wildland fires have been actively suppressed on the park by park staff and/or neighboring fire departments. The NPS database for the 28 years from 1974 through 2001identifies 31 wildland fires which burned a total of about 395 acres. (Files from the William Floyd Estate indicate 17 other small wildland fires which are not included in the database (Stavdal 2004); all fires but one were less than 1 acre. These fires are not included in the distribution below.) A maximum of 5 fires was recorded in 1991. No fires were recorded in 12 of the 28 years. All fires were controlled during the first burning period (i.e., on the same day as discovered). Almost all fire starts were human-caused. The distribution of fires by size was as follows:

	≥ 1 acre	1-10 acres	10-50 acres	50-100 acres	> 100 acres
No. of fires	17	8	5	0	1 (147 ac)
% of total fires	55	26	16	0	3

For this period of record, fire incidence averaged 1.1 fires per year, though most years when burning occurred there were multiple (2-4) fires. Nearly 85% of the recorded acreage was burned by 6 fires. Conversely, 80% of fires were 10 acres or less. Average fire size, which is skewed by the 6 larger fires, was nearly 13 acres.

For purposes of this analysis, the EA will project 5-7 wildland fires in a typical 5-year period: 3-4 fires of less than 1 acre each, 1-2 fires of 1-10 acres, and 1 fire of 10-50 acres. The acres burned in a typical 5-year period will be projected as about 50-75 acres.

The typical natural fire season in Fire Island is divided into spring and fall seasons when herbaceous vegetation is dormant. During the summer, higher relative humidity from sea breezes and higher live fuel moisture in growing vegetation generally reduce fire incidence and intensity. Human-caused fires, however, may occur throughout the spring, summer, and fall.

The various vegetation communities in Fire Island NS may be clumped in Northern Forest Fire Laboratory (NFFL) Fuel Models 1, 3, 5, 8, and 9 (see Anderson 1982).

Fuel Model 1 is a grass model. Fire behavior in this model is characterized by high rates of spread, moderate intensity, and low resistance to control. With a 5 mph wind, contiguous vegetation, and typical fuel moistures, rates of spread in this fuel model may be up to 75 feet per minute and flame lengths may approach 12 feet. In the park, this fuel model describes salt marsh, beachgrass, and beachgrass-beach heather vegetation communities.

Fuel Model 3 is also a grass model, though fuel bed depth is greater than in Fuel Model 1. Fire behavior in this model is similar to that of Fuel Model 1 though rates of spread are slightly faster (up to about 100 ft/min). In the park, this fuel model describes reed vegetation communities.

Fuel Model 5 is a shrub model. It is used to describe eastern hardwood forest with understory vegetation where live fuel moisture influences fire ignition and spread. Fire behavior in this model is characterized by moderate rates of spread and moderate flame lengths. With a 5 mph wind, contiguous vegetation, and typical fuel moistures, rates of spread in this fuel model may be up to 50 feet per minute and flame lengths may approach 6-8 feet. This fuel model describes bearberry, beach plum, and bayberry-chokecherry communities in the park. Because fuels in these vegetation types are usually not continuous, rates of spread and flame length will usually be lower than the model predicts.

Fuel model 8 is a timber model characterized by low rates of spread, short flame length, and fairly low resistance to control. It describes closed canopy stands of hardwoods that have leafed out. Fires are supported in a compact litter layer comprised mainly of leaves, twigs, and needles. Little undergrowth is present. With a 5 mph wind, contiguous vegetation, and typical fuel moistures, rates of spread in this fuel model may be 2-3 feet per minute and flame lengths may be 2-3 feet. This fuel model describes shadbush-highbush blueberry communities, pitch pine woodlands, maritime forests, and oak forests in the park.

Fuel Model 9 is another timber model characterized by higher rates of spread, longer flame lengths, and higher resistance to control. It can describe hardwood stands after leaf fall. High winds can cause higher rates of spread than predicted because of spotting from rolling and blowing leaves. Concentrations of dead and down material could contribute to torching of trees, spotting, and crowning. With a 5 mph wind, contiguous vegetation, and typical fuel moistures, rates of spread in this fuel model may be 6-8 feet per minute and flame lengths may be 4-5 feet. This is the primary fuel model describing oak forests throughout the fall fire season and during periods of late summer drought.

Fire return interval or fire frequency is the expected time between natural fires in a vegetative type based on the past fire history. Most vegetation communities in Fire Island NS are characterized by relatively short fire return intervals. The expected fire return intervals range from greater than 200 years (maritime woodlands) to less than ten years (oak forests, grasslands). The natural fire frequency of most pitch pine habitat is 12 to 25 years. In the Pine Plains of New Jersey, fire frequency is 6 to 8 years (http://www.fs.fed.us/database/feis).

Fire regime refers to the history of fire in an ecosystem based on fire return intervals and fire severity (see Appendix 1). Ecosystems vary by vegetation type and their ability to tolerate altered

fire regimes. Within ecosystems, both plant and animal species vary in their response to fire, with some species favored and others not. Most vegetation communities in the Seashore would fall within Fire Regimes I, II, III, and V (see Appendix 1).

Within each fire regime, condition classes are applied. The condition classes are used to characterize both general wildland fire risk and resulting ecosystem condition. Condition class ranges from 1 to 3, from low to moderate to high. Condition Class 1 means that, even though fire has been excluded for a considerable time, the present fuel condition is such that the response to fire would be within the range of historic variability (i.e., fire effects would be in the expected range and there would be a low risk of losing key ecosystem components). Condition Class 2 means that an area has missed at least one fire return interval, but the effects of a new fire would probably remain within the range of historical variability. Condition Class 3 means that an area has missed several fire return intervals and fire effects may be significantly different from historical fire effects. Please see Appendix 1 for expanded definitions and descriptions of NFFL Fuel Models, Fire Regimes, and Condition Classes.

Condition classes at Fire Island National Seashore have not been systematically identified. Other disturbances than fire (hurricanes, erosion) also play a role in modifying vegetation at the Seashore, and some of these may mimic the effect of fire disturbance to some degree. Most of the oak stands, shrublands, and grasslands in Fire Island NS are probably in Condition Class 1 or 2. The majority of areas identified for treatment in the preferred alternative exhibit more dense overstories, dense mid-stories of shade tolerant saplings, and/or increased understory fuel loading from deadfall or invasive nonnative species. Even the Sunken Forest in its current composition, based on the pollen record of very infrequent fires, could be in Condition Class 1 or 2. In the longer term, based on pollen records that indicate the area was earlier a pitch pine forest, the Sunken Forest could be considered in Condition Class 3.

Relevant Laws, Policies, and Planning Documents

A multitude of laws, regulations, and policies influence development and implementation of a Fire Management Plan for Fire Island NS. The following relate directly to preparation of the Fire Management Plan and this Environmental Assessment for Fire Island NS.

> **NPS Organic Act of 1916** – Congress directed the U.S. Department of the Interior and NPS to manage units "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 U.S.C. § 1). Congress reiterated this mandate in the Redwood National Park Expansion Act of 1978 by stating that the NPS must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 U.S.C. § 1 a-1).
>
> **National Environmental Policy Act (NEPA)** – The purpose of NEPA is to encourage productive and enjoyable harmony between man and his environment; to promote efforts which would prevent or eliminate damage to the environment and stimulate the health

and welfare of mankind; and to enrich the understanding of the ecological systems and natural resources important to the Nation. NEPA requirements are satisfied by successful completion of an EA or EIS, in addition to a decision document.

National Historic Preservation Act (NHPA) – The purpose of NHPA is to ensure the consideration of historic properties in the planning and implementation of land use and development projects. Section 106 requires federal agencies to assess the effects of their undertakings on historic properties and provides for review of those undertakings by the public and by the Advisory Council on Historic Preservation.

Director's Order-12 (DO-12) – DO-12 is the NPS guidance for Conservation Planning, Environmental Impact Analysis, and Decision Making. DO-12 states the guidelines for implementing NEPA according to NPS regulations. DO-12 meets all Council on Environmental Quality (CEQ) regulations for implementing NEPA. In some cases, NPS has added requirements under DO-12 that exceed the CEQ regulations.

Director's Order-18 (DO-18) – DO-18, the NPS guidance for Wildland Fire Management, states that "every NPS unit with burnable vegetation must have an approved Fire Management Plan." DO-18 defines what an approved FMP must include, stressing that "firefighter and public safety is the first priority" and promoting "an interagency approach to managing fires on an ecosystem basis across agency boundaries." Director's Order 18 also directs parks to identify, manage, and reduce, where appropriate, accumulations of hazardous fuels. Procedures for completion, review, approval, and required contents for FMPs are provided in Reference Manual-18 (RM-18). Until an FMP is approved, NPS units must take aggressive suppression action on all wildland fires.

The Federal Wildland Fire Management Policy and Program Review (USDI/USDA 1995) and Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide (USDI/USDA 1998) provide specific guidance on fire policy, planning, and implementation. A more complete listing of relevant laws, Executive Orders, and policies is provided in Table 1 by impact topic.

The current General Management Plan (1977) for Fire Island NS directs suppression of all wildland fires that pose threats to life and property. The GMP, in its broad objectives, provides an opportunity to use fire to maintain natural processes. A new GMP is scheduled for 2007. In preparation for the new GMP, several studies and assessments are currently underway or scheduled for the immediate future. These include an archeological overview, cultural landscape studies of the Lighthouse and the William Floyd Estate, and an ethnographic overview assessment.

The Resource Management Plan for Fire Island NS (1998 update) states: "The forests and fields of the William Floyd Estate may require special actions such as controlled burns and an active hazardous fuels management program. On Fire Island the Wilderness area, park developed areas, and federal tract properties between the island's private communities also may require special prescribed fire/burn considerations." The park's Strategic Plan (2000) does not address fire management directly, though the Mission Statement says: "The National Park Service is committed to preserving Fire Island National Seashore's cultural and natural resources, its values of

maritime and American history, barrier island dynamics and ecology, biodiversity, museum collection objects, and wilderness." The Wilderness Management Plan (1983) noted that research on past fire occurrence was needed to determine the role of fire in the Wilderness. Until that information was compiled, the fire management objectives of the Wilderness were (1) "to prevent man-caused fires," (2) "to suppress man-caused wildfires …," and (3) "to continue monitoring fire weather while conducting specific fire research. Horton et al. (1986) provided that research information.

Objectives

The objective of management of Fire Island, as stated in the enabling legislation, is "for the purpose of conserving and preserving for the use of future generations relatively unspoiled and undeveloped beaches, dunes and other natural features…"

As outlined in the 1977 *General Management Plan*, the William Floyd Estate has two major objectives:

1. To interpret the history and to preserve the historical resources of the estate as a continuum of the William Floyd family.
2. To maintain the features of the existing landscape and current land-use practices, and to stabilize existing structures until use/occupancy agreements expire and future public uses are determined.

Management objectives that relate to resource protection in the Fire Island NS General Management Plan (National Park Service 1983) include:

> "To protect and preserve natural plant and animal communities..."
>
> "To manage Fire Island in ways that will enhance natural processes and mitigate the impacts of human interference with these processes..."
>
> "To maintain and/or restore all area not required for public or administrative use to a natural condition using aesthetically appealing and environmentally compatible methods."

Fire and fuels management goals for Fire Island NS include:

- Maintain the highest level of firefighter and public safety in all fire and fuels management operations.
- Protect human life, park natural and cultural resources, park structures and facilities, and urban interface boundaries from adverse impacts attributable to wildland fires, hazardous fuels, and hazard trees, commensurate with values at risk and firefighter and public safety.
- Foster and maintain interagency fire management partnerships to improve initial attack suppression response capabilities.
- Ensure that fire management activities do not adversely affect residential communities adjacent to the park.

- Assist local agencies in the suppression of wildland fires adjacent to the park boundary to prevent the spread of unwanted fires into federal lands and to protect property on private lands.
- Utilize prescribed fire and/or other methods, as appropriate, to maintain long-term stability and diversity of fire-dependent vegetation communities and wildlife populations, stimulate biodiversity, reduce exotic plants, restore protected species, and improve forest health.
- Utilize minimum impact suppression techniques to reduce or avoid effects of fire suppression on biotic systems, cultural or historic resources, and neighboring communities.
- Ensure smoke production from prescribed fires does not violate State and/or federal standards; minimize smoke impacts to park neighbors.
- Utilize fire prevention and interpretive programs to increase public awareness and acceptance of fire and fuels management programs and to reduce the incidence of human-caused ignitions.
- Identify and assess hazardous fuels that have the potential to adversely impact natural and cultural resources. Utilize prescribed fire and/or other methods (e.g., mechanical) to reduce threats posed by hazard fuels conditions.

Scoping Issues and Impact Topics

Scoping Issues

Internal scoping was conducted with the park's Interdisciplinary Team and Regional Office specialists. Issues which were raised in scoping included:

- Fire events may have adverse impacts on cultural and sensitive natural resources within the park, including sensitive species and federally listed threatened and endangered species.
- Fuels are accumulating in areas, increasing fire hazard conditions.
- Visitors, staff, adjacent owners, and firefighters may be at risk during high fire severity periods.
- Smoke near major roads is a public safety concern.
- Fires can easily cross boundaries in many locations along Fire Island NS.
- Consultation should be initiated pursuant to §7 of the Endangered Species Act and §106 of the National Historic Preservation Act to ensure that proposed actions would not adversely affect endangered species and cultural resources.

The park also conducted external scoping with partners, cooperators, and permitting agencies. On March 11, a scoping meeting was conducted with many cooperating local agencies (see Chapter 4). Additional public scoping was not conducted. No additional issues were raised during external scoping.

Impact Topics

Issues and concerns affecting this project were identified by NPS specialists; no additional issues were identified through external scoping. After scoping, issues and concerns were dis-

tilled into distinct impact topics to facilitate the analysis of environmental consequences, which allows for a standardized comparison between alternatives based on the most relevant information. The impact topics were identified on the basis of federal laws, regulations, and orders; NPS *Management Policies*; and NPS knowledge of limited or easily impacted resources.

Topics analyzed in this EA include: firefighter and public safety; soils; air quality; water resources; floodplains and wetlands; vegetation; wildlife; threatened, endangered, or sensitive species; wilderness; visitor experiences, aesthetic resources, and park operations; and cultural resources. Each of these impact topics is individually addressed later in this Environmental Assessment.

Impact Topics Dismissed from Further Consideration

NEPA and CEQ regulations direct agencies to "avoid useless bulk…and concentrate effort and attention on important issues" (40 CFR 1502.15). Certain impact topics that are sometimes addressed in NEPA documents for other kinds of proposed actions or projects have been judged not to be substantively affected by any of the fire and fuels management alternatives considered in this EA. These topics are listed below and in Table 1, and a rationale is provided for dismissing specific topics from further consideration.

Soundscape/Noise: Noise is defined as an unwanted sound. Hazard fuels reduction, hazard tree removal, prescribed fires, and fire suppression can all involve the use of noise-generating equipment such as chainsaws, trucks, and aircraft. Each of these fire management tools, especially chainsaws and helicopters, is quite loud (in excess of 100 decibels) and operators are directed to use hearing protection equipment.

NPS Management Policies and Director's Order #47, *Sound Preservation and Noise Management,* direct the protection of the natural ambient soundscape. NPS policy is to minimize and manage dissonant human-caused sounds. Noise would be quickly dissipated in the open environments of Fire Island NS and would have a negligible impact for all alternatives. The use of such equipment would be extremely infrequent in light of the fuel types at Fire Island NS (hours or days per decade). This is not frequent enough to substantively interfere with human activities in the area or with wildlife behavior. Nor would such infrequent noise chronically impair the solitude and tranquility associated with the Seashore. Further, since the park is bounded by urban areas and the ocean, the ambient noise levels from the surrounding lands are often temporarily high. Therefore, this impact topic is dismissed from further analysis in this EA.

Lightscape: In accordance with National Park Service *Management Policies* (2001), the park strives to conserve natural landscapes including limiting the use of nighttime lights. No effects on the natural lighting are anticipated from any of the alternatives. Therefore, this impact topic is dismissed from further analysis in this EA.

Waste Management: None of the fire management alternatives would generate noteworthy quantities of either hazardous material or solid wastes that need disposal in haz-

ardous waste or general sanitary landfills. Therefore, this impact topic is dismissed from further analysis in the EA.

Transportation: None of the fire management alternatives would substantively affect road, water-based, or aerial transportation in and around Fire Island NS. One exception may be the temporary closure of nearby roads during fire suppression or prescribed burning activities or from dense smoke from such fires. However, as evidenced by recent fire history, such closures would be very infrequent and would not substantially impinge on local transportation. Therefore, this impact topic is dismissed from further analysis.

Utilities: Some types of projects involving construction may temporarily impact telephone, electrical, natural gas, water, and sewer lines potentially disrupting service to customers. Other projects may exert increased demand on telephone, electrical, natural gas, water, and sewage infrastructure sources and services, thus compromising existing services or creating a need for new facilities. None of the fire and fuels management alternatives would cause any of these effects to any extent. Therefore, this impact topic is dismissed from further analysis.

Land Use: Visitor and administrative facilities, as well as historic structures, are located within the Seashore. Residential, agricultural, industrial, and commercial land uses occur in areas outside the Seashore boundaries. Fire management alternatives would not affect land uses within the Seashore or in areas adjacent to it. Therefore, this impact topic is dismissed from further analysis.

Socioeconomics. NEPA requires an analysis of impacts to the "human environment" which includes economic, social, and demographic elements in the affected area. Implementation of the proposed action, particularly prescribed burning, may require temporary closures of project areas which may, in turn, inconvenience some park visitors. Such closures, however, are likely to be small in size and of very short duration. Some fire and fuels management activities may bring a short-term need for additional personnel in the park, but that would not substantially affect local businesses. The Long Island area has a strong economy independent of the park. Thus the proposed action would not impact local businesses or other agencies. Therefore, the socioeconomic environment will not be addressed as an impact topic in this document.

Environmental Justice: Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. Executive Order 13045 requires federal actions and policies to identify and address disproportionately adverse risks to the health and safety of children. None of the fire and fuels management alternatives would have disproportionate health or environmental effects on minorities or low-income populations or communities as defined in the Environmental Protection Agency's Environmental Justice Guidance (1998). Therefore, environmental justice was dismissed as an impact topic in this document.

Prime and Unique Agricultural Lands: In August of 1980, the Council on Environmental Quality (CEQ) directed that federal agencies must assess the effects of their actions on farmland soils classified by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) as prime or unique. Prime or unique farmland is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seeds; unique farmland produces specialty crops such as fruits, vegetables, and nuts. Some soils in the project area (William Floyd Estate) are classified as prime and unique farmlands. However, the proposed action does not include any components such as construction or water developments that would change the use of the land or diminish the potential value of the lands as designated. The cumulative impact of the preferred alternative on prime and unique farmlands is negligible. Therefore, the topic of prime and unique farmlands was dismissed as an impact topic in this document.

Wild and Scenic Rivers: NPS *Management Policies* direct that proposed actions which have the potential to impact wild and scenic rivers must be evaluated in accordance with NPS procedures for implementing NEPA. Since neither Fire Island NS nor adjacent lands are proposed or designated as wild, scenic, or recreational rivers, this impact topic was dismissed from further analysis.

Indian Trust Resources: Indian Trust Assets are owned by Native Americans, but held in trust by the United States. Requirements are included in the Secretary of the Interior's Secretarial Order 3206, "American Indian Tribal Rites, Federal – Tribal Responsibilities, and the Endangered Species Act," and Secretarial Order 3175, "Departmental Responsibilities for Indian Trust Resources." Indian trusts do not occur within Fire Island NS and, therefore, are not evaluated further in this document.

Resource Conservation: The NPS *Guiding Principles of Sustainable Design* provides a basis for achieving sustainability in facility planning and design, emphasizes the importance of biodiversity, and encourages responsible decisions. The guidebook articulates principles to be used such as resource conservation and recycling. None of the fire management alternatives would minimize or add to resource conservation or pollution prevention in the park. Therefore, this impact topic is dismissed from further analysis in this EA.

Table 1. Summary of Impact Topics.

Impact Topic	Retained or dismissed from further evaluation	Relevant Laws, Regulations or Policies
Firefighter and Public Safety	retained	Director's Order #18; NPS *Management Policies*
Soils	retained	NPS Organic Act; NPS *Management Policies*
Air Quality	retained	Clean Air Act (CAA); CAA Amendments of 1990; NPS Organic Act; NPS *Management Policies*, New York State law
Water Resources	retained	Clean Water Act; Safe Drinking Water Act; Executive Order 12088; Fish and Wildlife Coordination

		Act; National Park Service Organic Act; *NPS Management Policies 2001*
Floodplains and Wetlands	retained	Executive Order 11988; Executive Order 11990; Rivers and Harbors Act; Clean Water Act; NPS Organic Act; NPS *Management Policies*; DO #77-1, *Wetland Protection*
Vegetation	retained	NPS Organic Act; NPS *Management Policies*; Executive Order 13112 of 1999 *Invasive Species*; NPS Director's Order 77-7, *Integrated Pest Management*
Wildlife	retained	NPS Organic Act; Fish and Wildlife Coordination Act; Executive Order 13186, *Migratory Birds;* Migratory Bird Treaty Act; NPS *Management Policies*
Threatened, Endangered, or Sensitive Species	retained	Endangered Species Act; NPS Organic Act; Migratory Bird Treaty Act; Fish and Wildlife Coordination Act; Bald and Golden Eagles Protection Act; NPS *Management Policies.*
Wilderness	retained	The Wilderness Act; NPS *Management Policies*; Director's Order 41
Visitor Experience, Aesthetic Resources, and Park Operations	retained	Americans with Disabilities Act; NPS Organic Act; NPS *Management Policies*
Cultural Resources	Archeology, historic structures, and cultural landscapes retained If ethnographic resources that might be affected by wildland or prescribed fire are identified during the ongoing review, those resources will be appropriately protected in the Fire Management Plan.	Section 106 of National Historic Preservation Act; Archeologic and Historic Preservation Act; Archeological Resources Protection Act; National Environmental Policy Act; Native American Graves and Repatriation Act; 36 CFR 800; Executive Order 13007; Executive Order 11593; the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation; Programmatic Memorandum of Agreement Among the NPS, Advisory Council on Historic Preservation, and the National Council of State Historic Preservation Officers (1995); NPS *Management Policies*; Director's Order 28, *Cultural Resource Management Guideline*; Director's Order 12, *Conservation Planning, Environmental Impact Analysis, and Decision Making*
Noise	dismissed	NPS *Management Policies*; Director's Order 47, *Sound Preservation and Noise Management*
Lightscape	dismissed	NPS *Management Policies*
Waste Management	dismissed	NPS *Management Policies*
Transportation	dismissed	NPS *Management Policies*
Utilities	dismissed	NPS *Management Policies*
Land Use	dismissed	NPS *Management Policies*
Socioeconomics	dismissed	40 CFR Regulations for Implementing NEPA; NPS *Management Policies*
Environmental Justice	dismissed	Executive Order 12898
Prime and Unique Farmlands	dismissed	Council on Environmental Quality 1980 memorandum on prime and unique farmlands
Wild and Scenic Rivers	dismissed	Wild and Scenic Rivers Act; NPS *Management Policies*
Indian Trust Reserves	dismissed	Department of the Interior Secretarial Orders No. 3206 and No. 3175
Resource Conservation	dismissed	NEPA; NPS *Guiding Principles of Sustainable Design*; NPS *Management Policies*

Chapter 2 – ALTERNATIVES CONSIDERED

Alternatives were framed through discussions among Fire Island NS personnel and Northeast Region fire management staff. The alternatives cover the range of what is physically possible, acceptable by policy, and feasible for local managers (i.e., all reasonable alternatives). Prescribed burning may occur in oak, pitch pine, shrub, grassland, and salt marsh communities. Hazard fuels projects would be conducted primarily near park-private interface boundaries, historic structures, and visitor use areas. With all alternatives, unplanned wildland fires would be suppressed under an appropriate management response, consistent with the federal wildland fire policy. The levels of proposed accomplishment indicated in each alternative are dependent on sufficient staffing and funding. Treatments noted in the alternatives may be of smaller total acreages in any given year.

Alternative 1 - No-Action

This alternative represents a continuation of current management actions; it does not mean an absence of active management of fire and fuels. Under the no-action alternative, the fire and fuels management program would consist of initial attack on wildland fires, mowing herbaceous vegetation in old fields and near historic structures, and removal of individual hazard trees in selected areas.

Suppressing wildland fires (initial attack) is accomplished by depriving a fire of additional fuels (e.g., building a fire line that is cleared down to mineral soil) or by cooling the fire sufficiently to prevent further combustion (e.g., applying water to the flaming front). Fire Island NS would not have the option of using natural and/or man-made barriers in a confine strategy except when appropriate to ensure firefighter safety.

Predicting the average annual acreage of unwanted wildland fire is quite uncertain, dependent as it is on climatic conditions, fuels conditions, locations, and other factors. Since park establishment in 1974, an average of 1.1 wildland fires have occurred annually (range 0-5 fires) with over 80% of wildland fires limited to 10 acres or less. In most years when fires occurred, the park experienced 2-4 fires. According to the park's fire history records, five fires have grown to 30-40 acres and one fire was nearly 150 acres in size. Average fire size was nearly 13 acres. If the park averages 1-2 fires per year within the protection area and fire size averages about 13 acres, the annual burned area under the no-action alternative would be 13-26 acres.

Mechanical treatment would be used to remove hazardous trees and herbaceous vegetation near structures, cultural resources, park boundaries, and visitor use areas to reduce potential fire intensity, increase defensible space and human safety, minimize risk to private and public property, and facilitate visitor use activities. Mechanical treatment methods include cutting, mowing, chopping, limbing, chipping, sawing, and similar activities using hand-held tools. Hazard tree removal is carried out under the current management practices of the park. Associated vehicle use would be with rubber-tired, rather than tracked, vehicles and would result in minimal ground disturbance.

Thus, a typical 5-year fire and fuels management program would consist of:

- Suppression of 1 to 2 wildland fires per year, totaling approximately 13 to 26 acres per year.
- Mechanical removal of individual hazard trees and mowing herbaceous vegetation on about 60-80 acres annually.

Alternative 2 – Appropriate Management Response and Integrated Fuels Management
The preferred alternative would incorporate an appropriate management response to all wildland fires, mechanical treatment of hazard fuels, and the use of prescribed fire to meet resource management objectives.

Appropriate management response (AMR) provides for the full range of suppression strategies for management of wildland fires. Under this scenario, managers may choose to utilize natural or man-made barriers in a confine strategy to lower cost, increase firefighter safety, or minimize the impacts of suppression actions. The acreage burned by wildland fire may increase slightly from Alternative 1 since fire managers would have the option of selecting from the full range of suppression strategies.

Director's Order 18 directs parks to identify, manage, and reduce, where appropriate, accumulations of hazardous fuels. Mechanical treatment would be used to clear vegetation away from structures, cultural resources, private property boundaries, and other high-value resources in order to reduce fire spread potential, create defensible space, and provide increased public and firefighter safety.

Prescribed fire and mechanical treatments may be used individually or in combination (including sequence) to achieve natural resource, cultural landscape, and fuels management objectives. Each treatment would involve developing an implementation plan and obtaining appropriate permits and approvals. Mechanical treatment of hazard fuels has the potential to treat an additional 10-15 acres annually. Prescribed burning for hazard fuels reduction, maintenance of fire-dependent communities, and research may average 20-40 acres per year for the initial 5-year period. Prescribed fires would be planned and approved consistent with the method and format required by RM-18, including compliance with smoke management regulations or guidelines.

Hand crews and chain saws would be the primary means of mechanical fuel management used in forested and shrub habitats near park boundaries and close to park facilities at risk from wildland fires. In areas with grasslands, mowing machines would be the primary means of treatment. Lightweight vehicles would be appropriate in areas where impact, slope, aspect, vegetation type and structure, and distance from developed areas dictate their use. Park personnel and contractors using hand and power tools would perform mechanical fuel reduction in the treatment areas.

Prescribed fire may be used on those areas where mechanical treatments are not effective in reducing medium to fine fuels and/or further reduction of fuels is needed. In addition, prescribed fire would be used where effective mechanical removal of medium to fine fuels would require heavy machinery and cause ground disturbance. Prescribed fire may be used to maintain reduced levels of wildland fuel and remove ladder fuels within treatment areas.

The preferred season for broadcast fire is the winter, early spring, or fall when plants are physiological dormant, making them more resistant to fire effects. Typically, the window of opportunity during which prescription parameters are appropriate for implementation of a burn is relatively narrow, and may be limited to only a few days or several weeks during a given year.

Wildland fire used for resource benefit would not be permitted.

During a typical 5-year period, then, the following fire and fuels management activities may be implemented:

- Suppression of 1-2 wildland fires totaling about 13-26 acres using an appropriate management response.
- Mechanical removal of hazard trees and herbaceous vegetation on 60-80 acres annually.
- Mechanical reduction of hazard fuels on an additional 10-15 acres annually. These would occur primarily near residential subdivisions, park facilities, visitor use areas, and historic structures. Woody material would be scattered or hand-piled for later burning or removal.
- Implementation of 2-5 prescribed fires in pitch pine, oak, shrub, salt marsh, grassland and/or "old field" communities totaling up to about 100-200 acres over a typical 5-year period. Individual prescribed fires would seldom exceed 50 acres.
- Pile burning may occur in various locations during 2 or 3 years of a typical 5-year period to dispose of removed biomass from hazard fuels reduction projects.

Alternative 3 – Appropriate Management Response and Non-fire Fuels Management
This alternative is similar to Alternative 2 except that use of prescribed fire would not be permitted. Using an appropriate management response to unwanted wildland fire, fire managers may choose to utilize natural or man-made barriers in a confine strategy to lower cost, increase firefighter safety, or minimize the impacts of suppression action. Mechanical treatment of hazard fuels would be the same as under Alternative 2. The acreage burned by wildland fires may increase slightly from Alternative 1 since fire managers would have the option of selecting from the full range of suppression strategies.

During a typical 5-year period, the following fire and fuels management activities would be implemented:

- Suppression of 1-2 wildland fires totaling about 13-26 acres using an appropriate management response.
- Mechanical removal of hazard trees and herbaceous vegetation on 60-80 acres annually.
- Mechanical reduction of hazard fuels on an additional 10-15 acres annually. These would occur primarily near residential subdivisions, park facilities, visitor use areas, and historic structures. Woody material would be scattered or hand-piled for later burning or removal.

Measures Undertaken to Lessen Adverse Impacts under All Alternatives
Given the uncertainty of the locations of wildland fires and the relatively small acreage that may be burned with prescribed fire or treated by hazard fuels projects, the measures undertaken to

reduce impacts for all alternatives will focus primarily on cultural resources and management constraints.

Fire management actions identified under all alternatives have the potential to adversely affect cultural resources (cultural resources are identified in Chapter 3). Measures which could be undertaken to avoid or minimize impacts include:

- Use of rubber-tired vehicles involved in fire suppression, prescribed burning, and mechanical hazard fuels management projects to minimize the potential of disturbing archeological sites.
- Use of water and/or natural barriers as much as possible rather than construction of handlines to contain wildland and prescribed fires to minimize the potential of disturbing archeological sites.
- Use of a suite of mitigation actions, used either individually or in combination, to reduce the potential effect of wildland fires and suppression actions on historic structures. These include blacklining around the structures, treating with fire retardant foam concurrent with fires, wrapping with heat reflective materials, and establishing sprinkler systems on and around structures concurrent with wildland fire suppression activities.
- Contact the park's cultural resource specialist concurrent with the detection of wildland fires and during planning stages of hazard fuels reduction projects and prescribed burns to ensure avoidance, to the greatest extent feasible, of cultural resources.
- Monitor fire and hazard fuels management activities and halt work if previously unknown resources are located; protect and record newly discovered resources.
- Brief suppression, prescribed fire, hazard fuels, and hazard tree personnel about protecting natural and cultural resources.
- In fire suppression operations, protection of structures and features will be more important than minimizing acres burned.
- Coordinate with other fire suppression agencies and resources to ensure the best management practices are used in all fire, hazard tree, and hazard fuels management activities.
- Coordinate rehabilitation of firelines and other disturbed areas with natural and cultural resource specialist.

Additional management constraints which would further reduce potential adverse impacts of wildland fire suppression, hazard tree removal, and/or hazard fuel reduction under all alternatives include:

- Safety protocols will be established for all hazard tree, hazard fuels, suppression, and prescribed fire activities.
- Minimum impact suppression tactics would be employed in all tactical operations except as noted below.
- Fire retardant, if used, must be on the approved list of retardants used by the U.S. Forest Service and USDI Bureau of Land Management.
- Motorized equipment would not normally be used off of established roadways in the park. However, due to potential rapid rates of spread and the emergency nature of fires near the boundary, off-road use of motorized equipment, such as all-terrain vehicles and wildland fire engines, may be authorized by the Superintendent.

- Machinery used in hazard fuels and hazard tree activities, such as mowers and brush hogs, would be used only when soils were dry to minimize soil compaction and erosion.
- All extended attack and prescribed fire operations would have a park employee designated and available to assist suppression operations as a Resource Advisor. If qualified employees were not available, a Resource Advisor would be ordered through the interagency dispatch system.
- Helicopters may be used to transport personnel, supplies, and equipment. Improvement of landing sites would be kept to a minimum and would include consultation with the assigned Resource Advisor. Helibases and landing sites would be rehabilitated to prefire conditions to the extent reasonably possible.
- Suppression actions would avoid aerial and ground applications of retardant or foam within 300 feet of identified water sources.
- Except for spot maintenance to remove obstructions, no modifications would be made to roadways, trails, water sources, or clearings. All sites where modifications are made or obstructions removed would be rehabilitated to prefire conditions to the extent reasonably possible.
- Earthmoving equipment such as tractors, graders, bulldozers, or other tracked vehicles would not be used for fire suppression or prescribed fire. If special circumstances warrant extreme measures to ensure protection, the Superintendent may authorize the use of heavy equipment.
- Fireline location would avoid sensitive areas wherever possible.
- Following fire suppression activities, firelines would be recontoured and water-barred.
- As a matter of practice, burned areas would not be reseeded unless there are overriding concerns about establishment of invasive nonnative species. Any reseeding would be with native species and occur only with the Superintendent's prior approval.
- Park neighbors, park visitors, and local residents would be notified of all planned fire and fuels management activities with the potential to affect them. The public would be notified about treatment activities through procedures identified in project-specific work plans. These methods could include press releases, park entrance postings, local radio broadcasts, television broadcasts, and direct mailings. Emergency Services personnel will be contacted so that emergency calls into 911 can receive appropriate responses.

Measures Taken to Lessen Impacts as Part of Alternatives 2 and 3

- Hazard fuels removal around historic structures would mitigate the potential for impacts from wildland fires. Park staff will complete Section 106 consultation with the New York State Historic Preservation Officer (SHPO) prior to implementing hazard fuel reduction projects.
- Other standard cultural resource mitigation measures include the following: prior to doing treatment work, conduct an inventory of previously unsurveyed areas using an archeologist who meets the Secretary of the Interior's standards; dispose of slash in areas lacking cultural sites; avoid ground disturbance in areas containing known cultural sites; prior to implementation of work, protect character-defining elements of potential cultural landscapes.

Measures Taken to Lessen Impacts as Part of Alternative 2

- Prescribed fires will not be planned near cultural and other sensitive resources unless adequate planning has assured their protection.
- Prescribed fires would be scheduled for periods when ventilation is adequate to disperse smoke.
- Smoke management reporting procedures for burning in New York would be followed.
- For prescribed fires, mitigations would be included in the prescribed fire burn plan. Park staff will complete Section 106 consultation with the New York State Historic Preservation Officer (SHPO) prior to implementing prescribed fire projects.

Alternatives Considered and Rejected

Two additional alternatives were identified and considered in the scoping process. Neither was regarded as reasonable within the context of NPS policies (Director's Order 12, Section 2.7B); both were therefore eliminated from further analysis. Section 2.7B identifies as unreasonable alternatives those which could not be implemented if they were chosen, which cannot be implemented for technical or logistical reasons, that do not meet park mandates, that are not consistent with management objectives, or that may have severe environmental impacts.

Alternative 4 was called the wildland fire use alternative. This alternative would employ the full range of available fire management strategies including appropriate management response, wildland fire use, and prescribed burning. All unplanned ignitions would be subjected to Stage I analysis pursuant to the Wildland and Prescribed Fire Management Policy: Implementation Procedures Reference Guide. Mechanical fuel reduction methodologies would be the same as under Alternatives 2 and 3. This alternative differs from other alternatives in its authorization of wildland fire use (i.e., wildland fire used for resource benefit). This alternative was rejected because of potential conflicts with residential communities and cooperating agencies. The concept may be a viable alternative some years in the future when and if public support, refinement of desired conditions, and additional information on local fire ecology become available.

Alternative 5, the no-management alternative, would allow all wildland fires to burn unimpeded by management action. No other manipulative activities (e.g., hazard fuels management) would be permitted. This alternative was rejected because it compromises public safety, causes undue risk to values to be protected (e.g., historic structures), and is inconsistent with federal policy and regulations.

Environmentally Preferred Alternative

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969 (NEPA), which is guided by the Council on Environmental Quality (CEQ). The CEQ provides direction that "the environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA's Section 101" (*Forty Most Asked Questions Concerning Council on Environmental Quality's National Environmental Policy Act Regulations*, 1981.)

Section 101 of the National Environmental Policy Act states that "… it is the continuing responsibility of the Federal Government to … (1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations; (2) assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings; (3) attain the widest range of beneficial uses of the environment without degradations, risk to health or safety, or other undesirable and unintended consequences; (4) preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment which supports diversity and variety of individual choice; (5) achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and (6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources." The environmentally preferable alternative for this project is based on these national environmental policy goals.

Alternative 1 – No-Action (continue current management action). This alternative would suppress all wildland fires. This alternative would initially disturb the least amount of natural resources because it limits hazard fuels removal activities and precludes the use of prescribed fire. The alternative would not be as effective as Alternative 2 in maintaining the structure and diversity of natural vegetation because some of the vegetation communities are regarded as fire-dependent. Without a more aggressive mechanical removal of hazardous fuels, protection of natural resources and cultural resources may not be as complete as under Alternative 2. The no-action alternative may also expose firefighters to somewhat elevated risks as well as potentially increased costs because it emphasizes direct attack in suppression operations. Therefore, this alternative would not result in the same level of protection of natural and cultural resources and people over the long-term as would occur with the preferred alternative. Consequently, the no-action alternative does not satisfy provisions 2, 3, and 4 of NEPA's Section 101.

Alternative 2 – Appropriate Management Response and Integrated Fuels Management (Preferred Action). This alternative provides the greatest flexibility in responding to unplanned wildland fire and further provides the greatest opportunities for effective management of hazardous fuels. It provides the lowest risk to firefighters by utilizing an appropriate management response (i.e., the full range of suppression strategies) to wildland fires. It provides opportunities for selection of individual or composite treatments of hazardous fuels, and thus should be most effective in managing such fuels. This fuel reduction program would ultimately provide for better health and safety of visitors and employees and protection of natural and cultural resources for succeeding generations by reducing fuel loading and, thus, reducing the possibility of large unplanned wildland fires adversely impacting those resources and people. This alternative, with the inclusion of prescribed burning, further provides for limited treatments intended to contribute to the maintenance of long-term stability and diversity in fire-dependent vegetation communities. The alternative would protect people and cultural and natural resources by reducing the long-term potential for large unplanned wildland fires. This alternative would satisfy each of the provisions of the national environmental policy goals.

Alternative 3 – Appropriate Management Response and Non-fire Fuels Management. This alternative is intermediate between the no-action (Alternative 1) and preferred action (Alternative 2) alternatives. The ability to employ an appropriate management response brings some of the benefits associated with Alternative 2. Mechanical treatments would still be available for

hazardous fuel reductions, but their ecological contribution to maintaining the long-term stability and diversity of fire-dependent communities is less than that of prescribed burning. The inability to use prescribed fire, then, renders this alternative less effective in achieving resource management goals. Consequently, Alternative 3 does not satisfy provisions 2 and 4 of NEPA's Section 101 as well as the preferred alternative.

The ***environmentally preferable alternative*** is Alternative 2 – Preferred Action because it surpasses the no-action alternative and Alternative 3 in realizing the full range of national environmental policy goals as stated in §101 of the National Environmental Policy Act. Although the no-action alternative may result in the least immediate disturbance of natural resources, it does result in increased risk to firefighters in comparison with the other two alternatives and it does not provide opportunities for maintenance of fire-dependent vegetation communities. Alternative 3 more closely meets the criteria of §101, but it also foregoes opportunities for maintenance of fire-dependent vegetation communities.

Table 2: The Degree to Which Each Alternative Meets Objectives

Objective	Alt. 1 - No-Action	Alt. 2 – AMR and Integrated Fuels Management	Alt. 3 – AMR and Non-fire Fuels Management
Ensure public and employee safety from wildland fire. Reduce risk of adverse impacts to park neighbors.	Risk of adverse impacts to visitors, residential communities, park facilities, and employees is reduced by direct attack in fire suppression, though direct attack will have additional risks for firefighters. Implementing LCES, reviewing 10 Standard Firefighting Orders and 18 Watch Out Situations, using temporary closures, and increasing public awareness would increase public and firefighter safety during suppression of wildland fires. The inability to utilize appropriate management responses may elevate risk to firefighters.	Integrated management (prescribed fire and/or mechanical removal of hazardous fuels) would decrease danger to visitors, park neighbors, park facilities, and employees by reducing the likelihood of more intense wildland fires. Implementing LCES, reviewing 10 Standard Firefighting Orders and 18 Watch Out Situations, using temporary closures, and increasing public awareness would increase public and firefighter safety during suppression of wildland fires. Appropriate management response would allow greater flexibility in ensuring firefighter and public safety. Press releases, personal contacts, park entrance postings, local radio broadcasts, and/or other procedures would be used to notify adjacent landowners of hazardous fuels management activities.	Mechanical treatments of hazardous fuels would decrease danger to visitors, park neighbors, park facilities, and employees by reducing the likelihood of more intense wildland fires. Implementing LCES, reviewing 10 Standard Firefighting Orders and 18 Watch Out Situations, using temporary closures, and increasing public awareness would increase public and firefighter safety during suppression of wildland fires. Appropriate management response would allow greater flexibility in ensuring firefighter and public safety, though the inability to use prescribed fire would make reduction of hazardous fuels less effective. Press releases, personal contacts, park entrance postings, local radio broadcasts, and other procedures would be used to notify adjacent landowners of hazardous fuels management activities.

Objective	Alt. 1 - No-Action	Alt. 2 – AMR and Integrated Fuels Management	Alt. 3 – AMR and Non-fire Fuels Management
Protect facilities, natural resources, and cultural resources from wildland fire.	Initial attack would be used to protect facilities, natural resources, and cultural resources from wildland fire. Resources may be more vulnerable to fire as wildland fuels increase. Hazard tree removal would also serve to protect cultural resources from damage due to falling trees.	Appropriate management response (the full range of suppression strategies) would be used to protect facilities, natural resources, and cultural resources from wildland fire. Integrated management of hazardous fuels, using prescribed fire and mechanical treatments of fuels, would reduce both the likelihood and intensity of wildland fires thus decreasing the potential risk to facilities, sensitive natural resources, and cultural resources from wildland fire.	Appropriate management response (the full range of suppression strategies) would be used to protect facilities, natural resources, and cultural resources from wildland fire. Mechanical reduction of fuels would reduce both the likelihood and intensity of wildland fires thus decreasing the potential risk to facilities, sensitive natural resources, and cultural resources from wildland fire. Some resources may be more vulnerable to fire as wildland fuels increase.
Maintain long-term stability and diversity of natural resources.	Suppression would contribute little to maintaining long-term stability and diversity of natural resources. As communities age and change in the absence of frequent fire, the effects of an intense wildland fire could be outside the range of normal variability.	Prescribed burning and mechanical reduction of hazardous fuels would protect wildlands from exposure to unusually intense fires with fire effects potentially outside the range of normal variability. Prescribed fire would help maintain the long-term stability and diversity of those vegetation communities.	Mechanical reduction of hazardous fuels would protect wildlands from exposure to unusually intense fires with fire effects potentially outside the range of normal variability.
Reduce the level of hazardous fuels.	Hazardous fuels would not be reduced by the no-action alternative.	Prescribed fire and mechanical treatments would be used to reduce hazardous fuels.	Hazardous fuels in selected areas would be reduced by mechanical treatments.
Discourage introduction and proliferation of invasive nonnative species.	Cleaning of fire suppression equipment would help prevent the spread of invasive nonnative species to other portions of the park.	Some projects may use prescribed fire and mechanical treatments on invasive nonnative species that are also hazardous fuels. Cleaning of equipment used in fire and fuels management activities would help prevent the spread of invasive nonnative species to other portions of the park.	Some projects may use mechanical treatments on invasive nonnative species that are also hazardous fuels. Cleaning of equipment used in fire and fuels management activities would help prevent the spread of invasive nonnative species to other portions of the park.
Smoke production will not violate federal and state air quality standards.	Smoke production would be limited to that produced by unwanted wildland fires.	Prescribed fire burn plans would be designed to minimize smoke production. Smoke modeling would be included in prescribed fire	Smoke production would be limited to that produced by unwanted wildland fires. Mechanical treatments of hazard fuels may reduce

Objective	Alt. 1 - No-Action	Alt. 2 – AMR and Integrated Fuels Management	Alt. 3 – AMR and Non-fire Fuels Management
		planning to ensure smoke impacts are not unacceptable at sensitive receptors. Mechanical treatments of hazard fuels may reduce potential smoke production by reducing vegetation available for consumption.	potential smoke production by reducing vegetation available for consumption.
Manage fire cooperatively with adjacent agencies and landowners.	Suppression operations would be conducted cooperatively with other agencies.	All fire and fuels management activities would be coordinated with or conducted cooperatively with other agencies and landowners.	All fire and fuels management activities would be coordinated with or conducted cooperatively with other agencies and landowners.
No impairment will occur to park resources and values.	Fire suppression and hazard tree removal would not impair park resources and values in the immediate future.	Fire suppression and integrated management of hazardous fuels would not impair park resources and values. Use of prescribed fire in fire-dependent communities should help maintain the long-term stability and diversity of those communities.	Fire suppression and mechanical treatments of hazardous fuels would not impair park resources and values.

Table 3: Comparison of Alternatives

Issue	Alt. 1 – No- Action	Alt. 2 – Appropriate Management Response and Integrated Fuels Management.	Alt. 3 – Appropriate Management Response and Non-fire Fuels Management.
Fire management	Continue aggressive suppression of all wildland fires.	The appropriate management response would be applied to all wildland fires. The full range of suppression strategies will be available to fire managers.	The appropriate management response would be applied to all wildland fires. The full range of suppression strategies will be available to fire managers.
Hazardous fuels management	Hazard tree removal would not contribute substantially to reduction of hazardous fuels.	Prescribed fire and mechanical treatments will be used individually or in combination to reduce hazardous fuels.	Mechanical treatments will be used to reduce hazardous fuels.
Maintenance of fire-dependent vegetation communities	Hazard tree removal would not contribute to maintenance of fire-dependent vegetation communities.	Prescribed fire may be used in selected locations to maintain or restore fire-dependent vegetation communities. Monitoring of fire response may provide data	Mechanical treatments of hazardous fuels may reduce the potential for high-intensity fire and attendant abnormal fire effects, but will otherwise not contrib-

Issue	Alt. 1 – No- Action	Alt. 2 – Appropriate Management Response and Integrated Fuels Management.	Alt. 3 – Appropriate Management Response and Non-fire Fuels Management.
		which will later support wildland fire use. Mechanical treatment of hazardous fuels may reduce the potential for high-intensity fire and attendant abnormal fire effects, but will otherwise not contribute to maintenance of fire-dependent vegetation communities.	ute to maintenance of fire-dependent vegetation communities.

Table 4: Summary Comparison of Alternatives and Impacts

Impact Topic	Alt. 1 – No-Action	Alt. 2 – Appropriate Management Response and Integrated Fuels Management.	Alt. 3 – Appropriate Management Response and Non-fire Fuels Management.
Firefighter and Public Safety	Direct adverse impacts of aggressive initial attack on wildland fires, hazard tree removal, and mowing of herbaceous vegetation would be localized, short-term, and minor. Indirect adverse impacts would be localized, minor, and short-term to long-term. Cumulative impacts are localized and minor.	Direct adverse impacts of appropriate management response to wildland fire, prescribed burning, mechanical treatment of hazardous fuels would be localized, short-term, and minor. Indirect adverse impacts would be localized, minor, and short-term to long-term. Cumulative impacts are localized and minor.	Direct adverse impacts of appropriate management response to wildland fire and mechanical treatment of hazardous fuels would be localized, short-term, and minor. Indirect adverse impacts would be localized, minor, and short-term to long-term. Cumulative impacts are localized and minor.
Soils	Direct and indirect effects of aggressive initial attack on wildland fires and hazard tree removal would be adverse, localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of soils.	Direct and indirect effects of appropriate management response to wildland fire, prescribed burning, and mechanical treatment of hazardous fuels would be adverse, localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of soils.	Direct and indirect effects of appropriate management response to wildland fire and mechanical treatment of hazardous fuels would be adverse, localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of soils.
Air Quality	Direct and indirect adverse impacts of aggressive initial attack on wildland fires, hazard tree removal, and mowing of herbaceous vegetation	Direct and indirect adverse impacts of appropriate management response to wildland fire, prescribed burning, and mechanical treatment of hazardous fuels	Direct and indirect adverse impacts of appropriate management response to wildland fire and mechanical treatment of hazardous fuels would be short-term and

Impact Topic	Alt. 1 – No-Action	Alt. 2 – Appropriate Management Response and Integrated Fuels Management.	Alt. 3 – Appropriate Management Response and Non-fire Fuels Management.
	would be short-term and minor on a local scale and nearly negligible on a regional scale. Cumulative effects would be localized and minor. This alternative would not result in impairment of air quality.	would be short-term and minor on a local scale and nearly negligible on a regional scale. Cumulative effects would be localized and minor. This alternative would not result in impairment of air quality.	minor on a local scale and nearly negligible on a regional scale. Cumulative effects would be localized and minor. This alternative would not result in impairment of air quality.
Water Resources	The adverse direct impacts of aggressive initial attack and hazard tree removal would be localized, short-term, and negligible. Indirect effects would be adverse, localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of water resources.	The adverse direct impacts of appropriate management response to wildland fire, prescribed burning, and mechanical treatment of hazardous fuels would be localized, short-term, and negligible. Indirect effects would be adverse, localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of water resources.	The adverse direct impacts of appropriate management response to wildland fire and mechanical treatment of hazardous fuels would be localized, short-term, and negligible. Indirect effects would be adverse, localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of water resources.
Vegetation	The adverse direct impacts of aggressive initial attack, hazard tree removal, and mowing meadows would be localized, short-term, and minor. Indirect effects would be adverse, localized, short-term, and negligible. Cumulative effects would be localized and negligible to minor. Over a period of years, fire exclusion in fire-dependent communities would be moderately adverse. This alternative would not result in impairment of vegetation.	The adverse direct impacts of appropriate management response to wildland fire, prescribed burning, and mechanical treatment of hazardous fuels would be localized, short-term, and minor. Indirect effects would be adverse to beneficial, localized, long-term, and minor to moderate. Cumulative effects would be localized, and minor to moderate, and beneficial in an ecological context. This alternative would not result in impairment of vegetation.	The adverse direct impacts of appropriate management response to wildland fire and mechanical treatment of hazardous fuels would be localized, short-term, and minor. Indirect effects would be adverse, localized, short-term, minor, and adverse to beneficial. Cumulative effects would be localized and minor. Over a period of years, fire exclusion in fire-dependent communities would be moderately adverse. This alternative would not result in impairment of vegetation.
Floodplains and Wetlands	The adverse direct impacts of aggressive initial attack on wildland fires, hazard tree removal, and mowing herbaceous vegetation in visitor use areas	The adverse direct impacts of appropriate management response to wildland fire, prescribed burning, and mechanical treatment of hazardous fuels would be local-	The adverse direct impacts of appropriate management response to wildland fire and mechanical treatment of hazardous fuels would be localized, short-term, and

Impact Topic	Alt. 1 – No-Action	Alt. 2 – Appropriate Management Response and Integrated Fuels Management.	Alt. 3 – Appropriate Management Response and Non-fire Fuels Management.
	and old fields would be localized, short-term, and negligible. Indirect effects would be adverse, localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of floodplains or wetlands.	ized, short-term, and negligible to minor. Indirect effects would be adverse, localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of floodplains or wetlands.	negligible to minor. Indirect effects would be adverse, localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of floodplains or wetlands.
Wildlife	The adverse direct impacts of aggressive initial attack on wildland fires, hazard tree removal, and mowing herbaceous vegetation in visitor use areas and old fields would be localized, short-term, and minor. Indirect effects would be adverse, localized, short-term, and minor. Cumulative effects would be localized and negligible to minor. This alternative would not result in impairment of wildlife.	The adverse direct impacts of appropriate management response to wildland fire, prescribed burning, and mechanical treatment of hazardous fuels would be localized, short-term, and minor. Indirect effects would be localized and minor, but vary in duration from short-term to long-term, and in type from adverse to beneficial depending on the species involved. Cumulative effects would be localized, minor, and adverse to beneficial. This alternative would not result in impairment of wildlife.	The adverse direct impacts of appropriate management response to wildland fire and mechanical treatment of hazardous fuels would be localized, short-term, and negligible to minor. Indirect effects would be adverse, localized, short-term, and negligible to minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of wildlife.
Threatened, Endangered, and Sensitive Species	The identified threatened, endangered, and sensitive species occupy habitats that are not susceptible to fire, nor would their habitats be utilized in fire suppression operations, hazard tree removal, or mowing of herbaceous vegetation. No adverse direct and indirect impacts should accrue from the no-action alternative. Cumulative effects would be localized and negligible to moderate. The determination of the National Park Service is that the no-action alternative ranges from *no effect* to	The identified threatened, endangered, and sensitive species occupy habitats that are not susceptible to fire, nor would their habitats be utilized in fire suppression operations, hazard tree removal, mowing of herbaceous vegetation, mechanical reduction of hazard fuels, or prescribed burning. No adverse direct and indirect impacts should accrue from the preferred alternative. Cumulative effects would be localized and negligible to moderate. The determination of the National Park Service is that the preferred alternative	The identified threatened, endangered, and sensitive species occupy habitats that are not susceptible to fire, nor would their habitats be utilized in fire suppression operations, hazard tree removal, mechanical reduction of hazard fuels, or mowing of herbaceous vegetation. No adverse direct and indirect impacts should accrue from this alternative. Cumulative effects would be localized and negligible to moderate. The determination of the National Park Service is that Alternative 3 ranges from *no effect* to *may affect, but*

Impact Topic	Alt. 1 – No-Action	Alt. 2 – Appropriate Management Response and Integrated Fuels Management.	Alt. 3 – Appropriate Management Response and Non-fire Fuels Management.
	may affect, but is not likely to adversely affect threatened, endangered, or sensitive species. This alternative would not result in impairment of threatened, endangered, or sensitive species.	ranges from *no effect* to *may affect, but is not likely to adversely affect* threatened, endangered, or sensitive species. This alternative would not result in impairment of threatened, endangered, or sensitive species.	*is not likely to adversely affect* threatened, endangered, or sensitive species. This alternative would not result in impairment of threatened, endangered, or sensitive species.
Wilderness	The no-action alternative would have localized, short-term to long-term, adverse or beneficial, and negligible to minor direct and indirect impacts on wilderness characteristics. Cumulative effects would be localized and minor. This alternative would not result in impairment of wilderness characteristics.	The preferred alternative would have localized, short-term to long-term, adverse or beneficial, and negligible to minor direct and indirect impacts on wilderness characteristics. Cumulative effects would be localized and minor. This alternative would not result in impairment of wilderness characteristics.	Alternative 3 would have localized, short-term to long-term, adverse or beneficial, and negligible to minor direct and indirect impacts on wilderness characteristics. Cumulative effects would be localized and minor. This alternative would not result in impairment of wilderness characteristics.
Visitor Experience, Aesthetic Resources, Park Operations	The adverse direct and indirect impacts of aggressive initial attack on wildland fires, hazard tree removal, and mowing herbaceous vegetation in visitor use areas and old fields would be localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of visitor experiences and aesthetic resources.	The adverse direct impacts of appropriate management response to wildland fire, prescribed burning, and mechanical treatment of hazardous fuels would be localized, short-term, and negligible to minor. Indirect effects would be localized, short-term, minor to moderate, and adverse to beneficial. Cumulative effects would be localized, negligible to minor, and adverse to beneficial. This alternative would not result in impairment of visitor experiences and aesthetic resources.	The adverse direct impacts of appropriate management response to wildland fire and mechanical treatment of hazardous fuels would be localized, short-term, and negligible to minor. Indirect effects would be adverse, localized, short-term, and minor to moderate. Cumulative effects would be localized and minor. This alternative would not result in impairment of visitor experiences and aesthetic resources.
Cultural Resources	The direct impacts to cultural resources from aggressive initial attack on wildland fires, hazard tree removal, and mowing herbaceous vegetation in visitor use areas and old fields would be adverse, localized, short-term, and negligible to minor. Indirect impacts would be	The adverse direct impacts of appropriate management response to wildland fire, prescribed burning, and mechanical treatment of hazardous fuels would be localized, short-term, and negligible to minor. Indirect effects would be localized, short-term to long-term, negligible to minor, and	The adverse direct impacts of appropriate management response to wildland fire and mechanical treatment of hazardous fuels would be localized, short-term, and negligible to minor. The short-term indirect effects would be adverse, localized, and negligible to minor. Long-term indirect impacts

Impact Topic	Alt. 1 – No-Action	Alt. 2 – Appropriate Management Response and Integrated Fuels Management.	Alt. 3 – Appropriate Management Response and Non-fire Fuels Management.
	localized, short-term, minor, and adverse or beneficial. Cumulative effects would be localized and minor. This alternative would not result in impairment of cultural resources.	adverse or beneficial. Cumulative effects would be localized, minor, and adverse to beneficial. This alternative would not result in impairment of cultural resources.	would be beneficial. Cumulative effects would be localized, minor, and adverse or beneficial. This alternative would not result in impairment of cultural resources.

Chapter 3 – ENVIRONMENTAL CONSEQUENCES

Park management has reviewed cultural and natural resources that may be impacted by this project. Impact topics have been selected on the basis of the potential for beneficial or adverse effects on natural and cultural resources by each alternative as required by law, regulation, and National Park Service policy.

Methodology for Assessing Impacts

Applicable and available information on known natural and cultural resources was compiled. Alternatives were evaluated for their effects on the resources and values determined during the scoping process. The impact analyses were based on professional judgment using information provided by park staff, relevant references and technical literature citations, and subject matter experts. For each impact topic, the analysis includes a brief description of the affected environment and an evaluation of effects. Potential impacts are described in terms of type (are the effects beneficial or adverse?), context (are the effects site-specific, local, or even regional?), duration (are the effects short-term or long-term?), and intensity (are the effects negligible, minor, moderate, or major or would the effects constitute impairment of Fire Island NS's resources and values?). Because definitions of intensity (negligible, minor, moderate, or major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this environmental assessment/assessment of effect.

Direct, indirect, and cumulative effects are discussed in each impact topic. Predictions about direct and indirect effects are based on previous studies, monitoring information, wildland fire effects that have occurred in Fire Island NS or similar vegetation communities, and the expertise and judgment of resource management specialists.

When appropriate, mitigation measures have been identified that may be employed to offset or minimize potential adverse impacts.

Definitions of intensity levels vary by impact topic, but, for all impact topics, the following definitions were applied.

Beneficial: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.

Adverse: A change that moves the resource away from a desired condition or detracts from its appearance or condition.

Direct: An effect that is caused by an action and occurs in the same time and place.

Indirect: An effect that is caused by an action but is later in time or farther removed in distance but is still reasonably foreseeable.

Short-term: An effect that within a short period of time would no longer be detectable as the resource is returned to its predisturbance condition or appearance. Short-term impacts, depending on impact topic, may range from a few hours up to five years (see table below).

Long-term: A change in a resource or its condition that does not return the resource to predisturbance condition or appearance and for all practical purposes is considered permanent.

Intensity of Effects Defined

The following table defines impact thresholds, by impact topic, for each level of intensity included in this assessment.

Table 5. Impact Threshold Definitions

Impact Topic	Negligible	Minor	Moderate	Major	Duration of Impact
Firefighter and Public Safety	An action that could cause a change in level of risk to human safety, but the change would be so small that it would not be of any measurable or perceptible effect.	An action that could cause a change in risk level, but the change would be small and have a localized effect. Mitigation would be a standard procedure and highly effective in minimizing risk.	An action that would cause change to levels of risk; however, mitigation to offset adverse effects would generally be of moderate complexity and would be effective.	An action that would cause a severe change or exceptional benefit to human safety related values. The change would have a substantial and possible permanent effect, and mitigation to offset adverse effects is not assured.	Short-term would refer to the duration of a fire management incident. Long-term refers to duration extending beyond the specific incident.
Soils	Impacts to soils would not be measurable or of any perceptible consequence.	Changes to character of soils are detectable but small, localized, and of little consequence. Any mitigation	Changes to character of soils would be readily apparent and of consequence. Changes may be evident over large portion of park	Impacts to characteristics of soils would be severe or of exceptional benefit over a wide area. Mitigation to offset adverse	Short-term refers to durations of less than 5 years. Long-term refers to durations in excess of 5 years.

		needed to offset adverse effects would be standard, uncomplicated, and effective.	area. Mitigation measures to offset adverse effects would probably be necessary and likely successful.	effects would be needed, but its success not assured.	
Air Quality	Impact would be barely detectable and not measurable; if detected, would not be of any perceptible consequence.	Impact measurable but localized and of little consequence. No mitigation measures would be necessary.	Changes in air quality would have consequences to sensitive receptors, but effects would remain relatively local. Mitigation measures necessary and likely effective.	Changes in air quality would have substantial consequences to sensitive receptors. Mitigation measures necessary and success of measures not assured.	Short-term would refer to hours or days; i.e., the duration of the fire management incident. Long-term would refer to that substantially beyond the duration of the incident or action.
Water Resources	Neither water quality nor hydrology would be affected, or changes would be either nondetectable or if detected, would have effects that would be considered slight.	Changes in water quality or hydrology would be measurable, although the changes would be small and would likely be localized. No mitigation measure associated with water quality or hydrology would be necessary.	Changes in water quality or hydrology would be measurable but would be relatively localized. Mitigation measures associated with water quality or hydrology would be necessary and the measures would likely succeed.	Changes in water quality or hydrology would be readily measurable, would have substantial consequences, and would be noticed on a regional scale. Mitigation measures would be necessary and their success would not be guaranteed.	Short-term would refer to recovery in less than 5 years. Long-term would refer to recovery, following treatment, requiring longer than 5 years.
Floodplains and Wetlands	Impacts would be so small that they would not be of measurable or perceptible consequence. No substantial change to floodplain or wetland functions. A Section 404 permit from the U.S. Army Corps of Engineers would not be required.	Changes to floodplain or wetland functions would be measurable but small, localized, and of little consequence. Any adverse effects to function can be effectively mitigated. A Section 404 permit from the U.S. Army Corps of Engineers may or may not be required.	Changes to floodplain or wetland functions would be of consequence. Mitigation to offset adverse effects extensive but likely successful. A Section 404 permit from the U.S. Army Corps of Engineers would be required.	Changes to floodplain or wetland functions would be noticeable over a relatively large area and result in severely adverse or beneficial impacts. Loss of ecological function may be permanent. Mitigation to offset adverse effects is required and extensive, and success not assured. A Section 404 permit from the U.S. Army	Short-term refers to a period of 1-3 years. Long-term refers to a period longer than 3 years.

				Corps of Engineers would be required.	
Vegetation	The change in native vegetation communities would be so small that it would not be of any measurable or perceptible consequence.	Changes in populations of native vegetation would be small, localized, and of little consequence. Response to fire and/or other treatments would be within the range of normal fire effects. Any adverse effects can be effectively mitigated.	A large segment of one or more species populations would exhibit effects that are of consequence but would be relatively localized. Response to fire and/or other treatments would be within the normal expected range of normal fire effects. Mitigation could be extensive but likely effective.	Severely adverse and possibly permanent effects to native plant communities over a large area. Response to fire and/or other treatments would be outside the normal range of expected fire effects. Mitigation to offset adverse effects may be required and extensive, and success not assured.	Short-term refers to a period of less than 10 years. Long-term refers to a period longer than 10 years.
Wildlife	The change in wildlife populations and/or habitats would be so small that it would not be of any measurable or perceptible consequence.	Changes in wildlife populations or habitats would be measurable but small, localized, and of little consequence. Response to fire and/or other treatments would be within the range of normal fire effects. Any adverse effects can be effectively mitigated.	Changes in wildlife populations or habitats would be of consequence but would be relatively localized. Response to fire and/or other treatments would be within the normal expected range of normal fire effects. Mitigation to offset adverse effects to native species extensive but likely successful.	Severely adverse and possibly permanent effects to native wildlife populations or habitats. Response to fire and/or other treatments would be outside the normal range of expected fire effects. Mitigation to offset adverse effects may be required and extensive, and success not assured.	Short-term refers to a period of less than 10 years. Long-term refers to a period longer than 10 years.
Threatened, Endangered, or Sensitive species	Listed species would not be affected or the change would be so small as to not be of any measurable or perceptible consequence to the population. Negligible effect would equate with a "may effect, not likely to ad-	There would be a measurable effect on one or more listed species or their habitats, but the change would be small and relatively localized. Minor effect would equate with a "may effect" determination in U.S. Fish and	A noticeable effect to a population of a listed species. The effect would be of consequence to populations or habitats. Moderate effect would equate with a "may effect" determination in U.S. Fish and Wildlife Service terms and would	Noticeable effect with severe consequences or exceptional benefit to populations or habitats of listed species. Major effect would equate with a "may effect" determination in U.S. Fish and Wildlife Service terms and would	Short-term refers to a period of 1-3 years. Long-term refers to a period longer than 3 years.

	versely affect" determination in U.S. Fish and Wildlife Service terms.	Wildlife Service terms and would be accompanied by a statement of "likely" or "not likely to adversely affect" the species.	be accompanied by a statement of "likely" or "not likely to adversely affect" the species.	be accompanied by a statement of "likely" or "not likely to adversely affect" the species or habitat.	
Wilderness	Wilderness characteristics would not be affected or the change would be so small as to not be of any measurable or perceptible consequence.	There would be a measurable effect on one or more wilderness characteristics, but the change would be small and relatively localized. Mitigation would not be necessary.	A noticeable effect to wilderness characteristics. The effect would be readily apparent and likely long-term. The visitor would be aware of the effects associated with the alternative and would likely be able to express an opinion about the changes. Mitigation including education measures would probably be necessary to offset adverse effects and would likely be successful.	Noticeable effect with severe consequences or exceptional benefit to wilderness characteristics. The change would have substantial and possibly permanent effects on wilderness characteristics. Mitigation to offset adverse effects would be needed with success not assured.	Short-term refers to a period of 1-3 years. Long-term refers to a period longer than 3 years.
Visitor Experience; Aesthetic Resources	An action that could cause a change in visitors' activities, aesthetic resource values, and/or park operations, but the change would be so small that it would not be of any measurable or perceptible effect. Few visitors or employees would be affected.	An action that would affect some visitors' activities, aesthetic resources, and/or park operations, but the change would be small and localized. Mitigation would not be necessary. Other areas in the park would remain available for similar visitor experience and use.	Changes in visitor use and/or experience would be readily apparent and likely long-term. The visitor would be aware of the effects associated with the alternative and would likely be able to express an opinion about the changes. Mitigation including education measures would probably be necessary to offset adverse effects and would likely be successful. Other areas in the park would	An action that would cause a severe change or exceptional benefit to the activities of most park visitors. The change would have substantial and possibly permanent effects on visitor use. Aesthetic resources would be substantially degraded. Mitigation to offset adverse effects would be needed with success not assured. The change in visitor use and experi-	Short-term refers to a duration of days to a few months. Long-term refers to a duration in excess of a year.

			remain available for similar visitor experience, but visitor satisfaction might be measurably affected (visitors could be either satisfied or dissatisfied). Some visitors who desire to continue their use and enjoyment of the activity/visitor experience would be required to pursue their choice in other available local or regional areas.	ence proposed in the alternative would preclude future generations of some visitors from enjoying park resources and values. Some visitors who desire to continue their use and enjoyment of the activity/ visitor experience would be required to pursue their choice in other available local or regional areas.	
Cultural Resources	Impacts to archeological resources or historic properties, either beneficial or adverse, which are at the lowest levels of detection, barely perceptible, and not measurable. For purposes of Section 106, the determination of effect would be *no adverse effect*.	The impact affects an archaeological or historic site or feature with little data potential. The historic context of the affected site(s) would be local. The impact would not affect the contributing elements of a listed structure eligible for the National Register of Historic Places. For purposes of Section 106, the determination of effect would be *no adverse effect*.	The impact affects an archaeological or historic site with modest data potential. The historic context of the affected site(s) would be state. For a National Register eligible site, the adverse impact would affect some of the contributing elements of the site, but would not diminish the integrity of the resource and jeopardize its National Register eligibility. For purposes of Section 106, the determination of effect would be *adverse effect* or *no adverse effect*.	The impact affects an archaeological or historic site with high data potential. The historic context of the affected site(s) would be national. For a National Register eligible or listed site, the impact would affect the contributing elements of the site by diminishing the integrity to the extent that it is no longer eligible for listing on the National Register. For purposes of Section 106, the determination of effect would be *adverse effect*.	Short-term refers to a transitory effect, one that largely disappears over a period of days or months. The duration of long-term effects is essentially permanent.

Cumulative Effects Methodology

From CEQ regulations (1508.7), a "cumulative effect" is the effect on the environment that results from the incremental effect of the action(s) when added to other past, present, and reasona-

bly foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such action.

Cumulative impacts will be determined by combining the impacts of each alternative with other past, present, and reasonably foreseeable future actions. Therefore, it is necessary to identify other ongoing or reasonably foreseeable future projects on NPS lands of Fire Island NS and, if applicable, the surrounding area.

Other Past, Ongoing, and Proposed Projects in the Area

Fire Island NS is situated adjacent to metropolitan Long Island. A wide range of other activities and projects contribute to cumulative impacts within the park units and in the surrounding environs. Park units are adjacent to commercial and residential developments, each with infrastructure such as roads, paths, water systems, and electrical power systems. Vehicular and boat traffic is heavy with attendant impacts associated with accidents and petroleum spills. The immediate regional area is densely populated with attendant contributions to air pollution.

Compliance with Section 106, National Historic Preservation Act

In accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106 of the NHPA (36 CFR Part 800, *Protection of Historic Properties*), impacts to cultural resources and the cultural landscape will be identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the National Register of Historic Places; (3) applying the criteria of adverse effect to affected cultural resources which are unevaluated, listed in, or eligible to be listed in the National Register; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

CEQ regulations and the NPS's *Conservation Planning, Environmental Impact Analysis and Decision-making* (Director's Order #12) also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, for example, reducing the intensity of an impact from major to moderate or minor. However, any resultant reduction in intensity of impact resulting from mitigation is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by Section 106 is similarly reduced. Although adverse effects under Section 106 may be mitigated, the effect remains adverse.

Under the Advisory Council's regulations, a determination of either *adverse effect* or *no adverse effect* also must be made for affected National Register-eligible cultural resources. An *adverse effect* occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the National Register, e.g., diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by an alternative that would occur later in time, be farther removed in distance, or be cumulative (36 CFR Part 800.5, *Assessment of Adverse Effects*). As noted earlier, although adverse effects under Section 106 may be mitigated, the effect remains adverse. A determination of *no adverse effect* means there is an effect, but the

effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the National Register.

A Section 106 summary will be included for the preferred alternative in the impact analysis section for cultural resources. The Section 106 summary is intended to meet the requirements of Section 106 and is an assessment of the effect of the undertaking (implementation of the alternative) on cultural resources, based upon the criterion of effect and criteria of adverse effect found in the Advisory Council's regulations.

Impairment Methodology

National Park Service's *Management Policies* (2001) require analysis of potential effects to determine whether or not actions would impair park resources. The fundamental purpose of the National Park System, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within a park, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values. An impact to any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park; or
- identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. A determination on impairment is made in the Environmental Consequences section by resource topic.

FIREFIGHTER AND PUBLIC SAFETY

Affected Environment. Wildland fire management and fuels management programs have some level of inherent risk to both firefighters and the public. In the case of Fire Island NS, this issue becomes particularly important since the park units are adjacent to residences and commercial establishments and a number of local agencies respond to wildland fires within the Seashore.

Potential risks to firefighter and public safety can be reduced or eliminated by mitigation measures such as but not limited to:

- adhering to the 10 Standard Firefighting Orders (see Appendix 1),
- being aware of potential Watch Out Situations,
- employing LCES,
- completing risk analyses, and
- implementing temporary closures.

Methodology. Information on the number of acres annually treated by prescribed fire and mechanical reduction of hazard fuels was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence and potential fire return intervals. Intensity of effects is defined above in Table 5.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Firefighters and the public are protected from injury or undue threat from wildland fire management, prescribed burning, or fuels management projects.

Source – NPS *Management Policies*, D.O. 18, RM-18

Impacts of Alternative 1: No-Action
Impact Analysis: Suppression activities would continue on 1-2 fires per year with an average of 13-26 acres burned per year, primarily in NFFL fuel models 1, 3, 8, and 9. Over 80% of recent wildland fires have been contained at 10 acres or less; 40 acres would be considered a large fire. Fire in grass models may exhibit high rates of spread if influenced by higher winds. In timber models, fire behavior is characterized by relatively slow moving surface fires in leaf litter.

Mechanical removal of hazard trees and mowing of herbaceous vegetation would continue on 60-80 acres annually near structures, cultural resources, park boundaries, and visitor use areas and in old fields to reduce potential fire intensity, increase defensible space and human safety, minimize risk to private and public property, and facilitate visitor use activities. Mechanical treatment methods include cutting, mowing, chopping, limbing, chipping, sawing, and similar activities using hand-held tools.

The direct adverse effect of the no-action alternative is exposure of fire and fuels management personnel to the hazards typically associated with wildland fire suppression: burns, cuts, and abrasions from equipment, falls, smoke inhalation, and other injuries. Indirect adverse effects include long-term effects of smoke inhalation. Exposure to direct and indirect effects would be greatest with this alternative.

Although there have been several injuries and fatalities nationally under these burning conditions, direct and indirect adverse effects to firefighters would be mitigated by application of the Ten Standard Firefighting Orders, LCES, and other risk mitigation actions. Temporary closures

would be used to reduce exposure to park visitors and neighbors. Mechanical hazard fuels projects employ standard safety equipment and protocols.

The direct and indirect adverse impacts to firefighters and the public would be localized, short-term to long-term, and minor.

Cumulative Effects: Firefighters, visitors, and park neighbors are exposed regularly to hazards associated with vehicle use and other work activities. Cumulative effects of the no-action alternative include a slightly longer duration of exposure to hazards associated with fire suppression activities. The cumulative effects on wildland firefighter and public safety are localized and minor.

Conclusion: The direct and indirect adverse impacts to firefighters and the public would be localized, short-term to long-term, and minor. The no-action alternative would not substantially impact firefighter and public safety. Because there would be no major, adverse impacts to firefighter and public safety, there would be no impairment of visitor use.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management

Impact Analysis: Suppression activities would continue on 1-2 fires per year with an average of 13-26 acres burned per year, primarily in NFFL fuel models 1, 3, 8, and 9. Over 80% of recent fires have been contained at less than 10 acres. Fire in grass models may exhibit high rates of spread if influenced by higher winds. In timber models, fire behavior is characterized by relatively slow moving surface fires in leaf litter.

The preferred alternative would reduce risks to wildland firefighters and visitors, a beneficial impact, by allowing use of an appropriate management response to wildland fires. This response may include selecting control lines along natural or man-made barriers which reduces the exposure of firefighters in unburned fuels adjacent to a fire perimeter. Additional exposure for firefighters and visitors is created by prescribed burning and mechanical fuels reduction so the overall risks, particularly to firefighters, are slightly elevated from the no-action alternative.

Mechanical removal of hazard trees and herbaceous vegetation would continue on 60-80 acres annually near structures, cultural resources, park boundaries, and visitor use areas to reduce potential fire intensity, increase defensible space and human safety, minimize risk to private and public property, and facilitate visitor use activities. Mechanical treatment methods include cutting, mowing, chopping, limbing, chipping, sawing, and similar activities using hand-held tools.

Mechanical reduction of hazard fuels would be conducted on an additional 10-15 acres annually. These would occur primarily near residential subdivisions, park facilities, visitor use areas, and historic structures. Woody material would be scattered or hand-piled for later burning or removal.

Implementation of 2-5 prescribed fires in pitch pine, oak, shrub, salt marsh, grassland, and/or "old field" communities may total 100-200 acres over a typical 5-year period. Individual prescribed fires would seldom exceed 50 acres. Pile burning may occur in various locations during 2

or 3 years of a typical 5-year period to dispose of removed biomass from hazard fuels reduction projects.

The direct adverse effect of the preferred alternative is exposure of fire and fuels management personnel to the hazards typically associated with wildland fire suppression, hazardous fuel reduction, and prescribed burning: burns, cuts, and abrasions from equipment, falls, smoke inhalation, and other injuries. Indirect adverse effects include the long-term effects of smoke inhalation. Exposure to direct and indirect effects would be less with this alternative than the no-action alternative but greater than Alternative 3 because of the inclusion of prescribed burning.

Direct and indirect adverse effects to firefighters and hazard fuels reduction personnel would be mitigated by application of the Ten Standard Firefighting Orders, LCES, and other risk mitigation actions. Temporary closures may be used to reduce exposure to park visitors and neighbors. The risks associated with prescribed burning would be further mitigated by ensuring the burns are conducted within the approved prescription. Mechanical hazard fuel reduction activities would employ standard safety equipment and protocols.

With mitigation measures in place, the adverse impacts of the preferred alternative would be short-term, localized, and minor.

Cumulative Effects: Firefighters, visitors, and park neighbors are exposed regularly to hazards associated with vehicle use and other work activities. Cumulative effects of the preferred alternative include a slightly longer duration of exposure to hazards associated with fire suppression and prescribed burning activities. The potential for exposure to smoke and particulate matter is slightly elevated with inclusion of prescribed burning in this alternative, but such exposure is readily mitigated by ignition patterns and minimizing the time individual firefighters spend in smoky conditions. The cumulative effects on wildland firefighter, hazard fuels reduction personnel, and public safety are localized and minor.

Conclusion: With mitigation measures in place, the adverse impacts of the preferred alternative would be short-term, localized, and minor. The preferred alternative would not substantially impact firefighter and public safety. Because there would be no major, adverse impacts to firefighter and public safety, there would be no impairment of visitor use.

Impacts of Alternative 3: Appropriate Management Response and Non-fire Fuels Management

Impact Analysis: The direct and indirect adverse impacts to wildland firefighter, hazardous fuels reduction personnel, and public safety with Alternative 3 are intermediate because risk on wildland fires is reduced by using an appropriate management response and there would be no prescribed burning. Exposure to direct and indirect adverse effects would be least with this alternative. The mitigations for risk would be similar to those described above under the preferred alternative. Overall, the impacts of Alternative 3 to firefighters and the public would be short-term, localized, and minor.

Cumulative Effects: Firefighters, visitors, and park neighbors are exposed regularly to hazards associated with vehicle use and other work activities. Cumulative effects of Alternative 3 are

similar to but slightly less than the preferred alternative. The cumulative effects on wildland firefighter and public safety are localized and minor.

Conclusion: The impacts of Alternative 3 to firefighters, hazardous fuels reduction personnel, and the public would be short-term, localized, and minor. Alternative 3 would not substantially impact firefighter and public safety. Because there would be no major, adverse impacts to firefighter and public safety, there would be no impairment of visitor use.

SOILS

Affected Environment. Soils of the barrier island of Fire Island NS are Dune sand (Du), Beach sand (Bc), Tidal marsh (Tm), and Fill land (Fd). Soils of the William Floyd Estate are Warham loamy sand (We), Walpole sandy loam (Wd), Sudbury sandy loam (Su), Deerfield sand (De), Riverhead sandy loam (RdA), Carver and Plymouth sands (CpA), Plymouth loamy sands (PIA, PIB), and Tidal marsh (Tm) (Warner et al. 1975). Riverhead sandy loam and Carver and Plymouth sands are the most widespread on the Estate. The erosion hazard is slight on all the Estate lands (Warner et al. 1975). Soils within the Estate have been classified by the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Corp) as "prime farmlands." Prime farmlands are those "whose values derives from their general advantage as cropland due to soil and water conditions." Substrates are deep and moderately drained in many areas. Except during extreme drought, the soils within the Seashore are generally moist. Fire intensity, ambient temperature, vegetation type, and soil moisture influence the effects of fire on the soil. High-intensity fires can alter soil nutrients; nitrogen and sulfur can be lost due to ash convection.

Methodology. Information on the number of acres annually treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence and potential fire return intervals. Intensity of effects is defined above in Table 5.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Soil stability and fertility are perpetuated. Soil stability and fertility in the long-term are not decreased as a result of fire management programs and practices.

Source – NPS Organic Act; NPS *Management Policies* (2001)

Impacts of Alternative 1: No-Action

Impact Analysis: Fires of high severity can cause substantial adverse effects to soils. High soil temperatures can kill mycorhirizae and microbes involved in nutrient cycling. Severe fires may cause the loss of nitrogen, calcium, and organic matter from the soil. Recovery is not rapid after severe fires (Stanturf et al. 2002). In steep areas, erosion may be accelerated and soil loss after severe burns can be considerable. Changes in soil infiltration can occur (Stanturf et al. 2002). Low-severity wildfires could have short-term, negligible to minor, beneficial effects on soil. These effects would include increased activity of nitrogen-fixing soil microorganisms after the fire (Stanturf et al. 2002). Prime farmlands are located in the William Floyd Estate. These soils

are deep and have good infiltration. They rarely dry completely and fires would not be expected to mineralize these soils. Only negligible adverse effects to these soils would be expected under an intense wildfire.

Most fires in the fuel models represented in the Seashore would exhibit surface spread and relatively low severity. The effects of unplanned wildland fires on soils in Fire Island NS would be well within the range of normal fire effects; i.e., release of soil nitrogen, localized short-term sterilization of soils under heavy fuels, and retention of soil structure. Effects outside the range of normal effects, e.g., destruction of soil structure over wide areas, would not be anticipated. Because fire severity is generally low with grass fuel models and surface burning in leaf litter layers, the direct effect to soils by wildland fire itself is regarded as negligible. Therefore, the impacts of fire on soils would be adverse, minor, short-term, and limited to the area burned. Indirect adverse impacts, such as erosion, would be localized, short-term, and minor.

Direct impacts of fire suppression include soil surface disturbance from handline construction, dozer line construction, and localized use of water. Fire retardants used to fight wildfires generally can help soil as they contain fertilizer-like materials. However, heavy equipment could compact soils altering plant regrowth. Construction of firelines would disturb soils exacerbating erosion, though the soils on the Estate are not erosive. Since the average size of wildland fires is about 13 acres, the direct adverse impacts of fire suppression are considered localized, short-term, and negligible to minor. Indirect effects could include erosion on firelines, soil compaction, and increased sedimentation, but that potential will be mitigated by rehabilitation of firelines in areas of erosive soils.

Hazard tree removal and mowing of herbaceous fuels also has the potential to disturb soil surfaces. These activities will occur on an average of 60-80 acres annually. The type and magnitude of potential disturbance is substantially reduced by use of hand-held tools and rubber-tired vehicles. Most projects are 5 acres or less; no projects exceed 10 acres. With reasonable care to minimize ground disturbance during these projects, the potential adverse impact would be localized, short-term, and negligible to minor.

Regrowth after fire in oak, shrub, old field, and pitch pine communities is expected to be rapid – within the year and no later than the next spring. With such rapid regrowth, the likelihood of erosion problems is low. The expected erosion impact would be localized, short-term, and minor.

Cumulative Effects: The direct and indirect effects of the no-action alternative on soils would be adverse, localized, short-term, and minor. No major construction projects or other soil disturbing activities are planned within the park in the foreseeable future which would compound the minimal soil disturbance attributed to wildland fire suppression, hazard tree removal, and mowing of herbaceous vegetation in visitor use areas. The loss of soil due to construction activities off the park contributes to soil loss and sedimentation in streams and rivers in the region, though these impacts would be localized and minor. Cumulative effects on soils, then, are anticipated to be localized and minor.

Conclusion: The direct and indirect effects of the no-action alternative on soils would be adverse, localized, short-term, and minor. Alternative 1 would not produce any major adverse impacts or impairment of soil resources or values whose conservation is necessary to the purpose of the establishment of Fire Island NS, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management

Impact Analysis: Under Alternative 2, approximately 30-50 acres of soil would be affected annually by fire and hazard fuel management treatments associated with the proposed project.

The effects of unplanned wildland fires on soils in Fire Island NS would be well within the range of normal effects (see description under Alternative 1). As such, the impacts of fire on soils would be adverse, minor, short-term, and limited to the area burned. Indirect adverse impacts, such as erosion, would be localized, short-term, and minor.

Direct adverse impacts to soils from fire suppression operations include surface disturbance from firelines and localized erosion associated with water use. Use of an appropriate management response to unwanted wildland fires may result in a slight increase in acres burned. However, the use of existing barriers under this scenario should result in less fireline construction, subsequently less ground disturbance, and fewer direct impacts to soils than under the no-action alternative. Implementation of an appropriate management response is therefore a beneficial, localized, and minor impact. Indirect adverse effects could include erosion on firelines, soil compaction, and increased sedimentation, but that potential can be mitigated by not placing firelines on steep slopes or by rehabilitating firelines in those areas.

Hazard tree removal and mowing of herbaceous fuels also has the potential to disturb soil surfaces. These activities will occur on an average of 60-80 acres annually. The type and magnitude of potential disturbance is substantially reduced by use of hand-held tools and rubber-tired vehicles. Most projects are 10 acres or less; no projects exceed 50 acres. With reasonable care to minimize ground disturbance during these projects, the potential adverse impact would be localized, short-term, and negligible to minor.

Mechanical reduction of hazard fuels would be conducted on an additional 10-15 acres annually. Management activities include thinning trees and shrubs, felling snags and dispersing logs over a wide area, and removing invasive nonnative species, thus exposing soils. These activities would occur primarily near residential subdivisions, park facilities, visitor use areas, and historic structures. Woody material would be scattered or hand-piled for later burning or removal.

Thinning or felling operations may disturb the soil surface. Harvesting with heavy equipment may compact and rut the soil. The ability of the site to rebound depends on soil type. Wet sites with clays that shrink and swell tend to rebound more rapidly after heavy equipment traffic than more silty soils (Baker and Hunter 2002). Since the soils on the Seashore are primarily sands and sandy loams with some silty loams in areas, the effects will vary. The direct adverse impact on soils would be minor soil surface disturbance from rubber-tired vehicles in portions of the immediate project areas. Indirect effects include the potential for erosion on disturbed areas. Thinning and scattering of slash would have negligible, short-term, and localized direct adverse ef-

fects on soil. Accessing work sites and dragging slash and downed timber would have negligible to minor local effects on soil disturbance and compaction. Dispersal of slash would have negligible to minor beneficial short-term effects on soil resources. Decomposition rates are rapid and fine to medium fuels on the ground would decompose within 5 years. Large woody logs would decompose less rapidly. The direct and indirect adverse impacts attributable to this aspect of the preferred alternative would be short-term, localized, and minor. Mitigation such as use of rubber-tire skidders, working when soils are dry, not dragging logs, and restricting use of heavy equipment near riparian areas would reduce the magnitude of adverse effects to negligible to minor.

Pile burning would occur in the mechanical fuels treatment areas a year or two following the mechanical treatments during periods when soils were moist and cool. Although there would be increased heating of soils directly below the piles, the adverse impact to soils should be short-term, minor, and localized.

Two to five prescribed fires may be conducted in pitch pine, oak, shrubland, salt marsh, grassland, and/or "old field" communities during a typical 5-year period. These low-intensity, low-severity fires may total 100-200 acres. Individual prescribed fires would seldom exceed 50 acres. Pile burning may occur in various locations during 2 or 3 years of a typical 5-year period to dispose of removed biomass from hazard fuels reduction projects.

Planning for such burns can utilize natural barriers and other mitigation measures to minimize ground disturbance. Regrowth after fire in oak, shrubland, pine, salt marsh, grassland and old field communities is expected to be rapid – within the year and no later than the next spring. With such rapid regrowth, the likelihood of erosion problems is low. Further, the soils on the William Floyd Estate are not erosive.

Low-intensity prescribed fires have few, if any, adverse effects on soil properties even on steep slopes (Baker and Hunter 2002). Losses of nitrogen are often offset by increased activity of nitrogen-fixing soil microorganisms after the fire (Baker and Hunter 2002). Low-intensity, prescribed fire would have direct, minor, local, beneficial impacts on soil fertility. Prescribed burns will not be conducted if soils are too dry as increased erosion could occur. Areas with grasslands could generate intense fast-moving fire. High-intensity prescribed fires in these areas could have a short-term negligible to minor adverse local effect on soil nutrients due to volatilization of nitrogen and sulfur, plus some cation loss due to ash convection. However, burning when soils are moist would help mitigate this.

Other direct effects of prescribed burning may include more elevated soil temperatures as the result of consumption of dead and down woody material. In many cases, the surface fuels – often only leaf litter – will be consumed with no effect to the soil itself. Indirect effects may include a slightly increased potential for local erosion. All of these impacts would have occurred multiple times on the landscape. Given the areas proposed for burning, the likelihood of fire effects within the normal range of variability, and the low frequency of burning, the direct and indirect adverse impacts of prescribed burning on soil characteristics would be localized, short-term, and negligible to minor.

Overall, the direct and indirect impacts of the preferred alternative would be localized, short-term, adverse or beneficial, and negligible to minor.

Cumulative Effects: The direct and indirect effects of the preferred alternative on soils would be adverse or beneficial, localized, short-term, and minor. No major construction projects or other soil disturbing activities are planned within the park in the foreseeable future which would compound the minimal soil disturbance attributed to wildland fire suppression, hazard tree removal, and mowing of herbaceous vegetation in visitor use areas. The loss of soil due to construction activities off the park contributes to soil loss and sedimentation in streams and rivers in the region, though these impacts would be localized and minor. Cumulative effects on soils, then, are anticipated to be localized and minor.

Conclusion: The direct and indirect effects of the preferred alternative on soils would be adverse or beneficial, localized, short-term, and minor. Alternative 2 would not produce any major adverse impacts or impairment of soil resources or values whose conservation is necessary to the purpose of the establishment of Fire Island NS, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 3: Appropriate Management Response and Non-fire Fuels Management

Impact Analysis: Use of an appropriate management response to unwanted wildland fires may result in a slight increase in acres burned. However, the use of existing barriers under this scenario should result in less fireline construction and subsequently less ground disturbance. Removal of hazard trees and mowing of herbaceous vegetation near visitor use sites would continue as described in Alternatives 1 and 2. Prescribed fires would not be conducted. Mechanical treatment of hazardous fuels would differ from Alternative 2 only in the removal rather than burning of woody fuels. The impacts of this alternative would then be similar to the preferred alternative except for impacts attributed to prescribed fire. Both the direct and indirect adverse impacts on soils are, therefore, regarded as short-term, localized, and minor.

Cumulative Effects: The direct and indirect effects of Alternative 3 on soils would be adverse, localized, short-term, and minor. No major construction projects or other soil disturbing activities are planned within the park in the foreseeable future which would compound the minimal soil disturbance attributed to wildland fire suppression, hazard tree removal, and mowing of herbaceous vegetation in visitor use areas. The loss of soil due to construction activities off the park contributes to soil loss and sedimentation in streams and rivers in the region, though these impacts would be localized and minor. Cumulative effects on soils, then, are anticipated to be localized and minor.

Conclusion: The direct and indirect effects of Alternative 3 on soils would be adverse or beneficial, localized, short-term, and minor. Alternative 3 would not produce any major adverse impacts or impairment of soil resources or values whose conservation is necessary to the purpose of the establishment of Fire Island NS, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

AIR QUALITY

Affected Environment. The Clean Air Act, as amended, recognizes the need to protect visibility and air quality in national parks. However, the NPS cannot control air quality within the metropolitan New York area regional airshed that encompasses the park. Increasing development in the region adversely affects air quality. Standards for levels of ozone are sometimes exceeded.

The Clean Air Act provides that a federal land manager has an affirmative responsibility to protect air quality related values (including visibility, plants, animals, soils, water quality, cultural resources, and visitor health) from adverse pollution impacts. During a wildland fire, carbon monoxide, other gases, and particulate matter can be released affecting air quality. These emissions have potential adverse health effects. In addition to health effects, smoke from wildland fires could affect visibility on roads within and in the vicinity of the park.

The Clean Air Act established national ambient air quality standards (NAAQS) to protect the public health and welfare from air pollution. The act also established the prevention of significant deterioration (PSD) of air quality program to protect the air in relatively clean areas. One purpose of this program is to preserve, protect, and enhance air quality in areas of special national or regional natural, recreational, scenic, or historic values (42 USC 7401 et seq.).

The Resource Management Plan (NPS 1998) states the following with regard to air resources:

> The US Environmental Protection Agency classifies the National Seashore as a category #2. This category includes all of Suffolk and Nassau counties. New York State, in addition to the EPA classification of air quality, has further divided the State in four levels. The William Floyd Estate is a component of Level 1, which includes farm and rural land east of the William Floyd Parkway. Fire Island (except for 6 miles east of Smith Point; approximately 1/5 of the island), including the Wilderness Area, is classified as Level 1, which includes all of Suffolk County west of the William Floyd Parkway to the Nassau-Suffolk County line.
>
> Minimal monitoring of air quality has been conducted on the south shore of Long Island. It is known, however, the ambient ozone levels in Suffolk County exceed federal EPA standards. Acid rain is not monitored on Long Island.

National Park Service planned fire management activities which result in discharge of pollutants are subject to, and must comply with, all applicable federal, state, interstate, and local air pollution control requirements. The State of New York requires that a permit for open burning be obtained prior to any prescribed burning. The National Park Service would submit an application that includes plans to manage emissions, shows model results of predicted air quality impacts in the area, and identifies smoke mitigation techniques.

Particulate matter, a mixture of soot, tars, and volatile organics, is the major pollutant in the smoke from prescribed burning (see review in Stanturf 2002). Particulates are not the only emissions from fire. Besides carbon dioxide and water vapor, gaseous hydrocarbons, carbon monoxide, and nitrous oxides are also released (Chi et al. 1979). However, only a small proportion

(less than 3 percent) of the total national emissions of particulates, carbon monoxide, and hydrocarbons can be attributed to prescribed burning. By burning under atmospheric conditions that encourage rapid mixing, the problems of high carbon monoxide levels can be eliminated (Stanturf 2002). Unsaturated hydrocarbons result from the incomplete combustion of organic fuels. Because of their high affinity for oxygen, these compounds may form photochemical smog in the presence of sunlight and oxygen-donating compounds. Methane, ethylene, and hundreds of other gases are released in prescribed burning. Most of the hydrocarbons released during prescribed fires are quite different from those released in internal combustion engines (Stanturf 2002). Nitrogen oxides are not likely to be released in significant quantities during prescribed burning (Stanturf 2002). Nitrogen is volatilized with the amount released varying with the temperature. Sulfur dioxide emissions from prescribed fires are of minor importance since the sulfur concentration of most forest fuels is less than 0.2 percent (Stanturf 2002).

Methodology. Air pollution sources from the proposed project were compared with existing pollution sources to determine potential for impacts. Information on the number of acres annually treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence and fire return intervals. Available resource information from the park and cooperating agencies was also considered in the analysis. Intensity of effects is defined above in Table 5.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Air quality related values would be protected from pollution sources emanating from within and outside park boundaries. Park management activities do not violate federal and State air quality standards.

Source – Clean Air Act; NPS Organic Act; NPS *Management Policies* (2001).

Impacts of Alternative 1: No-Action

Impact Analysis: Wildland fires would be suppressed at as small an acreage as possible. Although it is not possible to accurately predict the number of acres burned and amount of smoke generated, recent history suggests that only 13-26 acres would burn in an average year. Direct adverse impacts to air quality from wildland fire under the no-action alternative would include release of particulates and smoke into airshed and the potential for a slight increase in fugitive dust from suppression activities. On a local basis, there may be an intermittent and short-term exceeding of air quality standards (especially particulates) resulting in short-term, localized, negligible to minor adverse impacts to air quality and visibility. Mitigation would include rapid suppression and extinguishing of remaining smoke from heavy fuels. On a regional basis, effects to air quality would generally include minor short-term adverse impacts as quantities of pollutants, primarily particulates, are released to the atmosphere and travel beyond park boundaries. Indirect adverse effects from these air emissions would include reduced visibility along roadways, reductions in recreation values due to visibility limitations, smoke and odors, and possible health effects to sensitive residents and visitors. These adverse indirect effects would be short-term, localized, and minor.

This alternative does not alter the quantities of fuel loads in the wildland – urban interface within and along the boundaries of the park. As fuel loads increase over time, the risk of wildfire would increase. Air quality may be impacted by smoke production related to wildland fire. Few if any reasonable methods exist for mitigating smoke and air quality impacts during suppression events. A large fire would produce short-term, adverse, minor to moderate, regional effects to air quality as large quantities of pollutants were released. Indirect effects would include impaired visibility along roadways, reductions in recreational values, and potential health effects to residents and visitors with respiratory difficulties. This alternative would not control when the burning occurred to time it when smoke could be dispersed.

Under the no-action alternative, power equipment would be used for hazard tree removal and management of herbaceous vegetation near visitor use areas. The direct effects on air quality would be the release of pollutants from power equipment. However, the small amount of acres treated would result in a negligible impact to air quality. Indirect effects would include associated smoke and odors. The direct and indirect impacts of hazard tree removal and management of herbaceous vegetation near visitor use areas would be localized, short-term, and negligible to minor.

Thus the direct and indirect adverse impacts of the no-action alternative would be short-term and minor on a local scale and nearly negligible on a regional scale.

Cumulative Effects: Primary contributions to cumulative impacts are from the metropolitan area. Growth in the Long Island/New York City metropolitan area may result in moderate air pollution increases over time. Lack of comprehensive public transportation may result in moderate long-term increases in air pollution. Fires of debris and woody material by homeowners, fireplaces, and other sources can result in minor to moderate increases in air pollution regionally. Air quality in the park would continue to be impacted from daily vehicle emissions and management activities. Current and expected future visitor and employee use patterns and levels as well as external sources such as traffic on major highways, recreational user traffic, aircraft overflights, and the local residential communities would continue to impact air quality in the park over the long-term. Both direct and indirect adverse impacts of the no-action alternative would be short-term and minor on a local scale and nearly negligible on a regional scale. The cumulative effects on air quality, coming primarily from vehicle emissions, would be localized and minor to moderate.

Conclusion: Adverse impacts to air quality and air quality-related values result from emissions of air pollutants, smoke, and odors. Since recent wildland fire occurrence is so low and fire size so small, the direct and indirect adverse impacts of the no-action alternative to air quality would be localized, short-term, and minor. The no-action alternative would not produce any major adverse impacts or impairment of air quality or values whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management

Impact Analysis: Under Alternative 2, the preferred alternative, the additional sources of air pollution would come from prescribed burning, from less aggressive suppression of some unwanted wildland fires, and from mechanical treatment of hazardous fuels.

Wildland fires would be suppressed using an appropriate management response. Some additional smoke would be generated from utilization of the appropriate management response, though the additional acres burned would likely be small. Although it is not possible to accurately predict the number of acres burned and amount of smoke generated, recent history suggests that only 13-26 acres would burn in an average year. Direct adverse impacts to air quality from wildland fire under the preferred alternative would include release of particulates and smoke into airshed and the potential for a slight increase in fugitive dust from suppression activities. On a local basis, there may be an intermittent and short-term exceeding of air quality standards (especially particulates) resulting in short-term, localized, negligible to minor adverse impacts to air quality and visibility. Mitigation would include rapid suppression and extinguishing of remaining smoke from heavy fuels. On a regional basis, effects to air quality would generally include minor short-term adverse impacts as quantities of pollutants, primarily particulates, are released to the atmosphere and travel beyond park boundaries. Indirect adverse effects from these air emissions would include reduced visibility along roadways, reductions in recreation values due to visibility limitations, smoke and odors, and possible health effects to sensitive residents and visitors. These adverse indirect effects would be short-term, localized, and minor.

Under the preferred alternative, power equipment would be used for hazard tree removal and management of herbaceous vegetation near visitor use areas. The direct effects on air quality would be the release of pollutants from power equipment. However, the small amount of acres treated would result in a negligible impact to air quality. Indirect effects would include associated smoke and odors. The direct and indirect impacts of hazard tree removal and management of herbaceous vegetation near visitor use areas would be localized, short-term, and negligible to minor.

The pollutant generated by mechanical fuel reduction projects would add a negligible amount of air pollution above the no-action alternative since an additional 10-15 acres would be treated. Some pollutants would be generated by use of gasoline-powered equipment in mechanical fuel reduction projects. The direct adverse effect of these pollutants on air quality, given the small size of the projects and infrequency of activity, would be localized, short-term, and negligible to minor. The indirect and longer-term adverse impacts would be negligible.

Prescribed fire would likely burn only 100-200 acres during a typical 5-year period. Prescribed burns tend to leave a mosaic of burned and unburned patches within a burn unit. The acres noted above are for the burn units; actual burned acreage would be smaller. Smoke events associated with the burns would be short-lived – in the order of hours to a few days. Ignition design and timing can minimize smoke production, though burning in these fuel models will not generate much smoke. Pile burning in the mechanical fuels treatment area would be scheduled for the winter or spring and conducted on days of good smoke dispersion. The direct adverse impacts of the preferred alternative on air quality include short episodes of increased particulates and de-

creased visibility. These direct adverse impacts would be short-term, localized, and negligible to minor. Indirect and longer-term adverse impacts include contributions to regional haze and the possibility of wind-blown dust (e.g., from dust devils) near the burned areas. The indirect long-term adverse impacts on air quality are regarded as short-term and negligible in a regional context.

The park would comply with all federal, state, and local air quality laws and regulations, specifically the U.S. Clean Air Act and State of New York regulations. Smoke modeling using SASSEM or similar models will be completed to ensure sensitive receptors are not unduly impacted. Permits would be obtained, as required, for all prescribed burning. Park staff would notify the New York State Department of Environmental Conservation regarding the date and location of the proposed burn and comply with any state burning restrictions. If the state suspends burning because of poor air quality on the scheduled burn date, the park would not ignite any fuels. The influence of smoke on health and safety and the scenic viewshed would be kept to a minimum by following smoke management prescriptions listed in the Fire Management Plan.

The adverse impact of the preferred alternative to air quality would be temporary, localized, and negligible to minor. Mitigation would probably not be needed, but could be applied in the form of altered ignition design on prescribed fires.

Cumulative Effects: Primary contributions to cumulative impacts are vehicle emissions from the metropolitan area. Growth in the Long Island/New York City metropolitan area may result in moderate air pollution increases over time. Lack of comprehensive public transportation may result in moderate long-term increases in air pollution. Fires of debris and woody material by homeowners, fireplaces, and other sources can result in minor to moderate increases in air pollution regionally. Air quality in the park would continue to be impacted from daily vehicle emissions and management activities. Current and expected future visitor and employee use patterns and levels as well as external sources such as traffic on major highways, recreational user traffic, aircraft overflights, and the local residential communities would continue to impact air quality in the park over the long-term. Prescribed fires, if done during times of stable air, could contribute to adverse regional air quality effects. With the proper scheduling of prescribed fires to coincide with maximum atmospheric instability and rigid burn parameters, the contribution of prescribed burning to cumulative effects on regional air quality would be adverse, short-term, and negligible to minor. Both direct and indirect adverse impacts of the preferred alternative would be short-term and minor on a local scale and nearly negligible on a regional scale. The cumulative effects on air quality would be localized and minor to moderate. Combining all the external sources of pollution with a major wildland fire in the park could, however, result in short-term moderately adverse effects on regional air quality.

Conclusion: Adverse impacts to air quality and air quality-related values result from emissions of air pollutants, smoke, and odors. The direct impacts to air quality would be temporary, localized, and minor. Indirect impacts to air quality would be negligible. The preferred alternative would not produce any major adverse impacts or impairment of air quality or values whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 3: Appropriate Management Response and Non-fire Fuels Management

Impact Analysis: Under Alternative 3, the impacts would be similar to those described under the preferred alternative, except that there would be no impacts attributable to prescribed fire. The direct adverse impact of Alternative 3, therefore, would be localized, short-term, and negligible to minor. Longer-term, indirect adverse impacts from Alternative 3 would be negligible.

Cumulative Effects: Primary contributions to cumulative impacts are vehicle emissions from the metropolitan area. Growth in the Long Island/New York City metropolitan area may result in moderate air pollution increases over time. Lack of comprehensive public transportation may result in moderate long-term increases in air pollution. Fires of debris and woody material by homeowners, fireplaces, and other sources can result in minor to moderate increases in air pollution regionally. Air quality in the park would continue to be impacted from daily vehicle emissions and management activities. Current and expected future visitor and employee use patterns and levels as well as external sources such as traffic on major highways, recreational user traffic, aircraft overflights, and the local residential communities would continue to impact air quality in the park over the long-term. Both direct and indirect adverse impacts of Alternative 3 would be short-term and minor on a local scale and nearly negligible on a regional scale. The cumulative effects on air quality would be localized and minor to moderate. Combining all the external sources of pollution with a major wildland fire in the park could, however, result in short-term moderately adverse effects on regional air quality.

Conclusion: Adverse impacts to air quality and air quality-related values result from emissions of air pollutants, smoke, and odors. The direct impacts to air quality would be temporary, localized, and minor. Indirect impacts to air quality would be negligible. Alternative 3 would not produce any major adverse impacts or impairment of air quality or values whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

WATER RESOURCES

Affected Environment. Park ocean and bayside water quality levels (e.g. fecal coliform) are generally acceptable. Pollution from the park and community marinas may be seriously impacting the bayside ecosystem. While the park has had small surveys to examine the present water quality conditions, the chemical and biological condition of saltwater estuaries is unknown at this time (NPS 1998).

The William Floyd Estate has four tidal ponds and one freshwater pond. There are fresh/brackish water areas in several locations on Fire Island (Lighthouse, Fire Island Pines, Sunken Forest, and artesian well sites). There is little visible evidence of stress in these systems (NPS 1998).

Physical and chemical postfire effects may occur in smaller water sources one to two years after fires (Swanson 1991, Minshall and Brock 1991). Short-term effects of wildland fire can include sedimentation which would be exacerbated by rain on areas for which no erosion control was instituted. Increased temperatures due to greater amounts of sunlight hitting the water source

also occur. This can have indirect effects on the food chain as more green or blue-green algae are likely to grow in the sunlit areas. These algae can be less nutritious than diatoms found under shaded conditions. Nitrogen and phosphorus in retardant chemicals can cause temporary eutrophication.

Burning can change hydrologic processes. Thinning of vegetation can alter the spatial distribution of water on the ground, the amount intercepted or evaporated by foliage, the amount of water that can be stored in the soil or transpired from the soil by vegetation, and the physical structure of the soil that governs the rate and pathways by which water moves to stream channels. Catastrophic fire would burn roots, may uncover highly erodible soils, and generally increase erosion and resulting sedimentation (Chamberlin et al. 1991). Overland flows potentially would increase peaking, moving water more quickly during rain events.

Most prescribed fires burn less intensely than uncontrolled wildfires (Fuller 1991). Low-intensity prescribed fires have no major impact on storm flow or soil-solution nutrient levels. Research from western states documented several cases where slash burning increased nitrate-N levels in stream water. In no case, however, did burning cause nitrate-N levels to exceed the recommended U.S. Environmental Protection Agency standard of 10 parts per million for drinking water (Stanturf 2002). Phosphorus and major cations often increased in stream water and the soil solution, but the effects were of short duration and of a magnitude not considered damaging to surface water or site productivity (Stanturf 2002). Low-intensity prescribed fire may temporarily increase suspended and nutrient concentrations in nearby surface waters.

Chemistry of groundwater or surface runoff may be altered by wildland fire (Tiedemann et al. 1979). Changes in water chemistry can include increased nitrate concentrations, reductions in phosphate concentration, and variable patterns in other nutrients. These changes would have direct effects on bacteria, fungi, and algae; and indirect effects on insect or grazing fishes.

Fuels management activities that disturb vegetation, such as burning, can alter the pathways water takes to stream channels, and hence can increase (or decrease) the volume of peak streamflows. The principal water quality variables that may be influenced by vegetation treatments are temperature, suspended sediments, dissolved oxygen, and nutrients (Chamberlin et al., 1991). If streamside vegetation is not altered for 35-50 feet from the banks, stream chemistry and degree of shading should not be altered. Most studies in the South indicate that effects of prescribed fire on water quality are minor and of short duration compared with those resulting from mechanical methods of site preparation (Stanturf 2002). Even intense broadcast burns may disturb the root mat very little, leaving its soil-holding properties intact. The root mat, residual forest floor materials, and incompletely consumed slash form debris dams that trap much of the sediment moving downslope (Stanturf 2002). Also rapid regrowth of vegetation quickly protects sites (Stanturf 2002).

Methodology. Information on the number of acres annually treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence and potential fire return intervals. Available resource information from the park and cooperating agencies was also considered in the analysis. Intensity of effects is defined above in Table 5.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Water resources are maintained sufficient to fulfill the purposes of Fire Island NS. Fire and fuels management activities do not contribute to the degradation of water quality.

Source – Clean Water Act; NPS Organic Act; NPS *Management Policies.*

Impacts of Alternative 1: No-Action

Impact Analysis: Unwanted wildland fires have the potential to degrade water quality if ash, nutrients, and partially consumed organic matter that result from fire are carried into water sources by surface runoff. With the no-action alternative, an average of 13-26 acres may be burned annually. Only occasionally would a portion of burned area be immediately adjacent to water sources; most burned areas would be buffered by live vegetation and undisturbed surface materials. These surface materials will serve to filter ash and other runoff materials before they reach water sources, thus mitigating any direct effects. The direct adverse effects of fire itself on water resources – such as interrupting or otherwise modifying water flows and water chemistry – would be negligible. Indirect adverse effects may include slight increases in water temperature if shading vegetation is burned, slight increases in sediment if fire removes vegetation immediately adjacent to water sources, and slightly increased surface flow since there would be less vegetation and thus less transpiration on the burned areas. This may be a beneficial effect by inhibiting *Phragmites* (with burning and herbicide) and therefore promoting *Spartina*. These indirect impacts would be localized, short-term, and negligible to minor.

With the no-action alternative, aggressive initial attack would be made on every wildland fire. The direct adverse effect of fire suppression efforts would be negligible unless water was drawn from springs and ponds for firefighting. If this occurred, the direct adverse effects of diminished flow or storage would be localized, short-term (hours), and negligible to minor. Indirect adverse effects could include destabilizing pond shores due to off-road travel with fire engines and other equipment. Suppression activities that disturb the soil surface have the potential to contribute to pollution through erosion of exposed surfaces. Control lines that present this potential would be rehabilitated immediately after fire control. These indirect impacts would be localized, short-term, and minor.

Removal of hazard trees and mowing of herbaceous vegetation near visitor use areas would have negligible adverse effects on hydrology or water quality.

The adverse direct and indirect impacts of the no-action alternative on water resources would be localized, short-term, and negligible to minor.

Cumulative Effects: The direct adverse effects of the no-action alternative would be localized, short-term, and negligible to minor. The potential indirect adverse effects would be localized, short-term, and minor. Water quality in the park may be affected by trails near water sources. Construction and a lack of storm water controls in the watersheds contribute to sedimentation.

Impermeable surfaces in areas adjacent to the William Floyd Estate have altered surface flow and caused sedimentation and alterations of surface hydrology. The adverse effects of these activities range in magnitude from negligible to moderate. The cumulative effect of the no-action alternative on water resources, then, would be minor to moderate.

Conclusion: Direct adverse effects of the no-action alternative would be localized, short-term, and negligible to minor. Indirect effects would be short-term, localized, and minor. The no-action alternative would not produce any major adverse impacts or impairment of water resources or values whose conservation is necessary to the purpose of the establishment of Fire Island NS, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management

Impact Analysis: The preferred alternative, in employing an appropriate management response to unwanted wildland fire, may result in a slight increase in acres burned but less surface disturbance since managers may chose to utilize natural and man-made barriers rather than aggressive suppression of fires. As with the no-action alternative, little of this acreage would be immediately adjacent to water sources so there would be little increase in potential runoff as a result of the appropriate management response. The direct adverse effects of fire itself on water resources would be negligible. Indirect adverse effects may include slight increases in water temperature if shading vegetation is burned, slight increases in sediment if fire removes vegetation immediately adjacent to water sources, and slightly increased runoff since there would be less vegetation and thus less transpiration on the burned areas. This may be a beneficial effect by inhibiting *Phragmites* (with burning and herbicide) and therefore promoting *Spartina*. These indirect impacts would be localized, short-term, and negligible to minor.

In fire suppression, engines are often driven off-road to control the fire perimeter. With implementation of an appropriate management response, there would be less fireline constructed and a lowered likelihood of off-road use of engines as natural barriers are used to confine wildland fires. The direct adverse effect of fire suppression efforts would be negligible unless water was drawn from springs and ponds for firefighting. If this occurred, the direct adverse effects of reduced flow or storage would be localized, short-term (hours), and minor. Indirect adverse effects could include destabilizing pond shores due to off-road travel with fire engines and other equipment. They would be mitigated by reduced off-road travel and rehabilitation of any damaged pond banks. The indirect adverse effects would also be localized, short-term, and minor.

Removal of hazard trees and mowing of herbaceous vegetation near visitor use areas would have negligible adverse effects on hydrology or water quality.

Prescribed burning will not ordinarily occur in areas immediately adjacent to freshwater sources, and associated control lines can be quickly rehabilitated as part of the prescribed burn plan implementation. The direct adverse effects of prescribed burning would be negligible; fire would not itself affect water resources. The potential indirect adverse effects may include slight increases in water temperature if shading vegetation is burned, slight increases in sediment if fire removes vegetation immediately adjacent to water sources, slight changes in water chemistry,

and slightly increased runoff since there would be less vegetation and thus less transpiration on the burned areas. Prescribed fire would be managed to avoid or minimize the potential indirect impacts by maintaining, wherever possible, an unburned strip along the water source. These indirect adverse impacts on water quality and hydrology would be localized, short-term, and negligible to minor.

Hazardous fuels reduction activities would involve the use of mechanical treatments to reduce the woody, shrubby, and/or herbaceous vegetation on treatment areas. The potential direct adverse impacts of mechanical fuel reductions include trampling of pond banks or similar disturbances by felled and/or dragged trees. These effects can be mitigated by avoidance, where possible, and immediate rehabilitation as part of the project. These direct adverse impacts would be localized, short-term, and negligible to minor.

Storm events following treatment could result in increases in sediment, turbidity, and possible nutrient loading in areas where soils were disturbed. Thinning activities would have local adverse effects on water quality unless care was taken to re-cover soils with duff from surrounding areas to promote germination. Over the long-term, the reestablishment of native shrubs or herbaceous plants would stabilize soils and improve water quality. Other indirect adverse effects of this type of project may be slight increases in water temperature if shading vegetation is removed and slightly increased runoff since there would be less vegetation and thus less transpiration on the treated area. These indirect impacts would be localized, short-term, adverse or beneficial, and negligible to minor.

The direct adverse impacts of the preferred alternative on water resources would be localized, short-term, and negligible. The indirect adverse impacts would be short-term, localized, and negligible to minor.

Cumulative Effects: The direct adverse effects of the preferred alternative would be localized, short-term, and negligible to minor. The potential indirect effects would be localized, short-term, adverse or beneficial, and minor. Water quality in the park may be affected by trails near freshwater sources. Construction and a lack of storm water controls in the watersheds contribute to sedimentation. Impermeable surfaces in the watersheds adjacent to the William Floyd Estate have altered runoff and caused sedimentation and alterations of surface hydrology. The adverse effects of these activities range in magnitude from negligible to moderate. The cumulative effect of the preferred alternative on water resources, then, would be minor to moderate.

Conclusion: Direct adverse effects of the preferred alternative would be localized, short-term, and negligible to minor. Indirect effects would be short-term, localized, and minor. The preferred alternative would not produce any major adverse impacts or impairment of water resources or values whose conservation is necessary to the purpose of the establishment of Fire Island NS, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 3: Appropriate Management Response and Non-fire Fuels Management

Impact Analysis: Under Alternative 3, the impacts would be similar to those described under the preferred alternative, except that there would be no impacts attributable to prescribed fire. The direct adverse impact of Alternative 3, therefore, would be localized, short-term, and negligible to minor. Longer-term, indirect adverse impacts from Alternative 3 would be adverse or beneficial and negligible to minor.

Cumulative Effects: The direct adverse effects of Alternative 3 would be localized, short-term, and negligible to minor. The potential indirect effects would be localized, short-term, adverse or beneficial, and minor. Water quality in the park may be affected by trails near freshwater sources. Construction and a lack of storm water controls in the watersheds contribute to sedimentation. Impermeable surfaces in the watersheds adjacent to the William Floyd Estate have altered runoff and caused sedimentation and alterations of surface hydrology. The adverse effects of these activities range in magnitude from negligible to moderate. The cumulative effect of Alternative 3 on water resources, then, would be minor to moderate.

Conclusion: Direct adverse effects of Alternative 3 would be localized, short-term, and negligible to minor. Indirect effects would be short-term, localized, and minor. Alternative 3 would not produce any major adverse impacts or impairment of water resources or values whose conservation is necessary to the purpose of the establishment of Fire Island NS, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

FLOODPLAINS AND WETLANDS

Affected Environment: Seventy-three distinct freshwater wetland sites were identified in 8 separate regions of Fire Island National Seashore (Caldecutt 1997). Caldecutt's report states:

> The freshwater wetland habitats of Fire Island National Seashore are extremely variable among regions. The western end (from Robert Moses State Park to Kismet) is characterized by inland cranberry bogs that may or may not be contiguous with brackish wetland. The central portion (Sunken Forest, Fire Island Pines, and Watch Hill) contains extensive low-lying Holly forests with associated freshwater wetlands dominated by plants such as Water Smartweed, Marsh St. John's wort, and Narrow-leaf Cattail. The eastern Wilderness area has numerous small, isolated patches of cranberry and sundew-dominated wetland among inland dunes. These sites are all completely free of brackish influence. Flowing fresh water can be found in several places where uncapped artesian wells run on to the ground. Common to all of Fire Island National Seashore is the occurrence of salt marshes along the north shore that reach inland far enough to escape the influences of salt water and give rise to freshwater wetlands. Thus, these sites are, to some degree, influenced by brackish water and are usually dominated by Narrow-leaf cattail, Three-square rush, Marsh St. John's-wort, and various ferns.

Wetland types dominated by herbaceous vegetation benefit from wildfire (Kirby et al. 1988). If native vegetation returned after wildland fire and invasive nonnative species were controlled, a

net benefit to the wetlands would occur from burning. Cross (1983) found dalapon controlled *Phragmites* after midsummer burning. A combination of burning and chemical control (under separate NEPA compliance) may favor *Spartina* over *Phragmites*.

Methodology. Information on the number of acres annually treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence. Other information was gathered from Fire Island NS documents and staff knowledge. Intensity of effects is defined in Table 5 above.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Long-term stability and diversity of floodplain and wetland communities are maintained through protection from the effects of unwanted wildland fire.

Source – NPS Organic Act; NPS *Management Policies*, E. O. 11988 (Floodplain Management), E.O. 11990 (Protection of Wetlands).

Impacts of Alternative 1: No-Action

Impact Analysis: With the no-action alternative, some potential exists for wildland fires in floodplain and wetland communities. The direct impacts of fire itself on floodplains and wetlands would vary with fire intensity and size. Fires would not have direct adverse impacts on floodplain and wetland structure or function. Fire would reduce aboveground vegetation. Resultant indirect impacts may include increased runoff into floodplains and wetlands. These impacts would be localized, short-term, and negligible to minor.

Aggressive initial attack would minimize the acres burned. Recent fire history suggests that 1-2 fires per year may burn 13-26 acres. Direct adverse impacts of suppression operations include physical disturbance of floodplains and wetlands. Any such physical disturbance should be minor and readily mitigated by common fire rehabilitation activities. Indirect adverse impacts would include potential new drainage routes from firelines or vehicle tracks. These also would be readily mitigated by common fire rehabilitation activities. The direct and indirect adverse impacts of wildland fire suppression would be localized, short-term, and negligible to minor.

The direct adverse impact of mechanical removal of hazard trees would be slight physical disturbances of floodplain and wetland surfaces due to foot or vehicle activity. Indirect adverse impacts would include potential new drainage routes from vehicle use. The indirect adverse impacts to floodplains and wetlands from hazard tree removal would be localized, short-term, and negligible.

Mowing of old fields on the William Floyd Estate avoids wetlands and therefore has no impact on these resources.

Cumulative Effects: The direct adverse impacts of wildland fire and fire suppression under the no-action alternative would be localized, short-term, and negligible to minor. The indirect adverse impacts would be localized, short-term, and negligible to minor. The direct and indirect

impacts of hazard tree removal would be localized, short-term, and negligible. Activities which contribute to cumulative effects on floodplains and wetlands within the park include: residential development on adjacent areas, storm runoff from roads and other areas with reduced infiltration capacity, and hazard waste spills. Some wetlands have already been modified by commercial or residential development. No construction or other substantial ground-disturbing activities are proposed on floodplains or wetlands. The cumulative impact on floodplains and wetlands would be localized and negligible to moderate.

Conclusion: The direct adverse impacts of the no-action alternative on floodplains and wetlands would be localized, short-term, and minor. The indirect impacts would be localized, short-term, and negligible to moderate. The no-action alternative would not produce any major adverse impacts or impairment of floodplains and wetlands whose conservation is necessary to the purpose of the establishment of Fire Island NS, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management

Impact Analysis: Some potential exists for wildland fires in floodplain and wetland communities. The direct impacts of fire itself on floodplains and wetlands would vary with fire intensity and size. Fires would not have direct adverse impacts on floodplain and wetland structure or function. Fire would reduce aboveground vegetation. Resultant indirect impacts may include increased runoff into floodplains and wetlands. These impacts would be localized, short-term, and negligible to minor.

Use of an appropriate management response for suppression of unwanted wildland fire under the preferred alternative should reduce the potential impact of suppression activities on floodplains, wetlands, and their plant communities. In some cases, aggressive initial attack will reduce impact; in other cases, impact may be reduced by locating control lines and subsequent ground-disturbing activities outside the floodplain or wetland community. In either case, the impact of an appropriate management response to wildland fire would be localized, short-term, and negligible to minor.

The direct adverse impact of mechanical removal of hazard trees would be slight physical disturbances of floodplain and wetland surfaces due to foot or vehicle activity. Indirect adverse impacts would include potential new drainage routes from vehicle use. The indirect adverse impacts to floodplains and wetlands from hazard tree removal would be localized, short-term, and negligible.

Wetland areas would generally not be the object of hazard fuels treatment projects, though small wetlands may be entered in projects focused on wildland-residential interfaces. Given that only 10-15 acres may be treated annually, the likelihood and area of wetland treated would be very small. The direct adverse impact of mechanical removal of hazard fuels would be slight physical disturbances of floodplain and wetland surfaces due to foot or vehicle activity. The potential for these impacts would be mitigated by avoiding wetlands with machinery and avoiding wetlands in piling material for later removal or burning. The direct adverse impacts of mechanical reduction of hazardous fuels would be localized, short-term, and negligible to minor. Indirect adverse im-

pacts would include potential new drainage routes from vehicle use. The indirect adverse impacts to floodplains and wetlands would be localized, short-term, and negligible.

Some wetlands and floodplains within treatment areas may be burned by prescribed fire. Prescribed fire itself would not impact wetland and floodplain hydrologic functions. Removal of vegetation may result in secondary effects such as increased sedimentation. This would probably invigorate native species resulting in a more stable community. Most salt marsh species respond vigorously to low severity burns. High severity burns may kill or depress root systems, especially if fire occurs when marshes are dry. A combination of burning and chemical control (under separate NEPA compliance) may favor *Spartina* over *Phragmites*. Thus the indirect effects on wetland and floodplain function would be localized, short-term to long-term, minor, and mainly beneficial.

As with all three alternatives, all activities (other than prescribed burn) will not be conducted in any wetlands, except that activities, such as clearing live or dead plants, or driving in the wetlands, would only occur in emergency situations. Potential impacts would only occur if the activities were necessary to ensure public safety, protect the resources of the park, or reduce a significant fire hazard. Prescribed burns that include wetland areas would be ecologically beneficial to the wetland ecosystems by helping to control invasives and improving regeneration. If impacts to wetlands cannot be avoided, these impacts will be minimized as described in Chapter 2 and mitigated by common fire rehabilitation activities to restore impacted areas.

Cumulative Effects: The direct adverse impacts of wildland fire and fire suppression under the preferred alternative would be localized, short-term, and negligible to minor. The indirect adverse impacts would be localized, short-term, and negligible to minor. The direct and indirect impacts of hazard tree removal would be localized, short-term, and negligible. The direct impacts of integrated management of hazardous fuels would be localized, short-term, adverse, and negligible to minor. Indirect impacts would be localized, short-term to long-term, usually minor, and adverse or beneficial. Activities which contribute to cumulative effects on floodplains and wetlands within the park include: residential development on adjacent areas, storm runoff from roads and other areas with reduced infiltration capacity, and hazard waste spills. Some wetlands have already been modified by commercial or residential development. No construction or other substantial ground-disturbing activities are proposed on floodplains or wetlands. The cumulative impact on floodplains and wetlands would be localized and negligible to moderate.

Conclusion: The direct adverse impacts of the preferred alternative on floodplains and wetlands would be localized, short-term, and minor. The indirect impacts would be localized, short-term, adverse or beneficial, and negligible to minor. The preferred alternative would not produce any major adverse impacts or impairment of floodplains and wetlands whose conservation is necessary to the purpose of the establishment of Fire Island NS, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 3: Appropriate Management Response and Non-fire Fuels Management

Under Alternative 3, the impacts would be similar to those described under the preferred alternative, except that there would be no impacts attributable to prescribed fire. The direct adverse im-

pact of Alternative 3, therefore, would be localized, short-term, and negligible to minor. Longer-term, indirect impacts from Alternative 3 would be adverse or beneficial and negligible to minor.

Cumulative Effects: The direct adverse impacts of wildland fire and fire suppression under the preferred alternative would be localized, short-term, and negligible to minor. The indirect adverse impacts would be localized, short-term, and negligible to minor. The direct and indirect impacts of hazard tree removal would be localized, short-term, and negligible. The direct impacts of mechanical treatment of hazardous fuels would be localized, short-term, adverse, and negligible to minor. Indirect impacts would be localized, short-term to long-term, usually minor, and adverse or beneficial. Activities which contribute to cumulative effects on floodplains and wetlands within the park include: residential development on adjacent areas, storm runoff from roads and other areas with reduced infiltration capacity, and hazard waste spills. Some wetlands have already been modified by commercial or residential development. No construction or other substantial ground-disturbing activities are proposed on floodplains or wetlands. The cumulative impact of Alternative 3 on floodplains and wetlands would be localized and negligible to moderate.

Conclusion: The direct adverse impacts of Alternative 3 on floodplains and wetlands would be localized, short-term, and minor. The indirect impacts would be localized, short-term, adverse or beneficial, and negligible to minor. Alternative 3 would not produce any major adverse impacts or impairment of floodplains and wetlands whose conservation is necessary to the purpose of the establishment of Fire Island NS, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

VEGETATION

Affected Environment. Five major vegetation communities occur on Fire Island and the William Floyd Estate: salt marshes, dune grasslands, dune shrublands, interdunal swales, and forests/shrublands (Klopfer et al. 2002). Vegetation of the barrier island is closely associated with position on the island – elevation, distance from the ocean, and exposure to wind.

Klopfer et al. (2002) described the geomorphic situation and vegetation as follows (common names of plants have been added in [ ]):

> "The dune morphology of Fire Island is typical of a barrier island. There are several zones, each with different edaphic conditions (Figure 2a.). Vegetation patterns often follow these zones. The primary vegetation gradient extends from the Atlantic Ocean towards the Great South Bay (Figure 2b) roughly parallel to both along the entire island. Several zones can be readily identified along this gradient. Immediately adjacent to the open ocean is non-vegetated sand extending to the base of the primary dune. Sparse herbaceous plants can be found at the base of the primary dune and the dune face exposed to the ocean. Grass vegetation typically increases in cover from the crest of the primary dune and into the interdune (or swale) area. These swales are often a mosaic of shrub and grass types. Here, many different types of grass, dwarf-shrub, woody shrub, vine, and tree communities begin to appear. Occasionally depressions are present with near-

surface water available to the vegetation. Shrubs tend to increase in density towards the secondary dune and the Bay salt marshes, although many areas of Fire Island do not have a well-defined secondary dune. When a well-formed secondary dune is present, larger trees often replace shrubs. These trees can be over 10 m in height. Most of the Bay-side of the island is salt marsh which gradually tapers into the shallows of the Great South Bay."

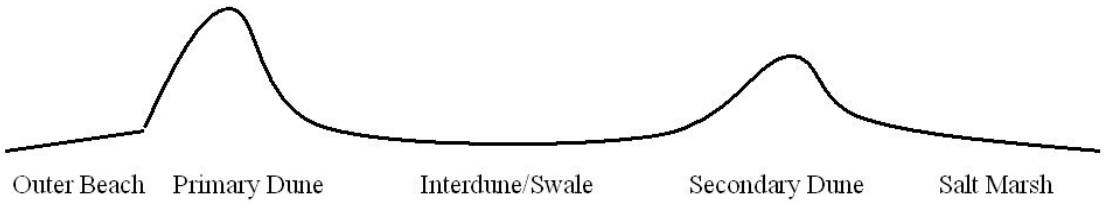

Figure 2a. Cross-section of Fire Island extending from the Atlantic Ocean (left) to the Great South Bay (right**)**

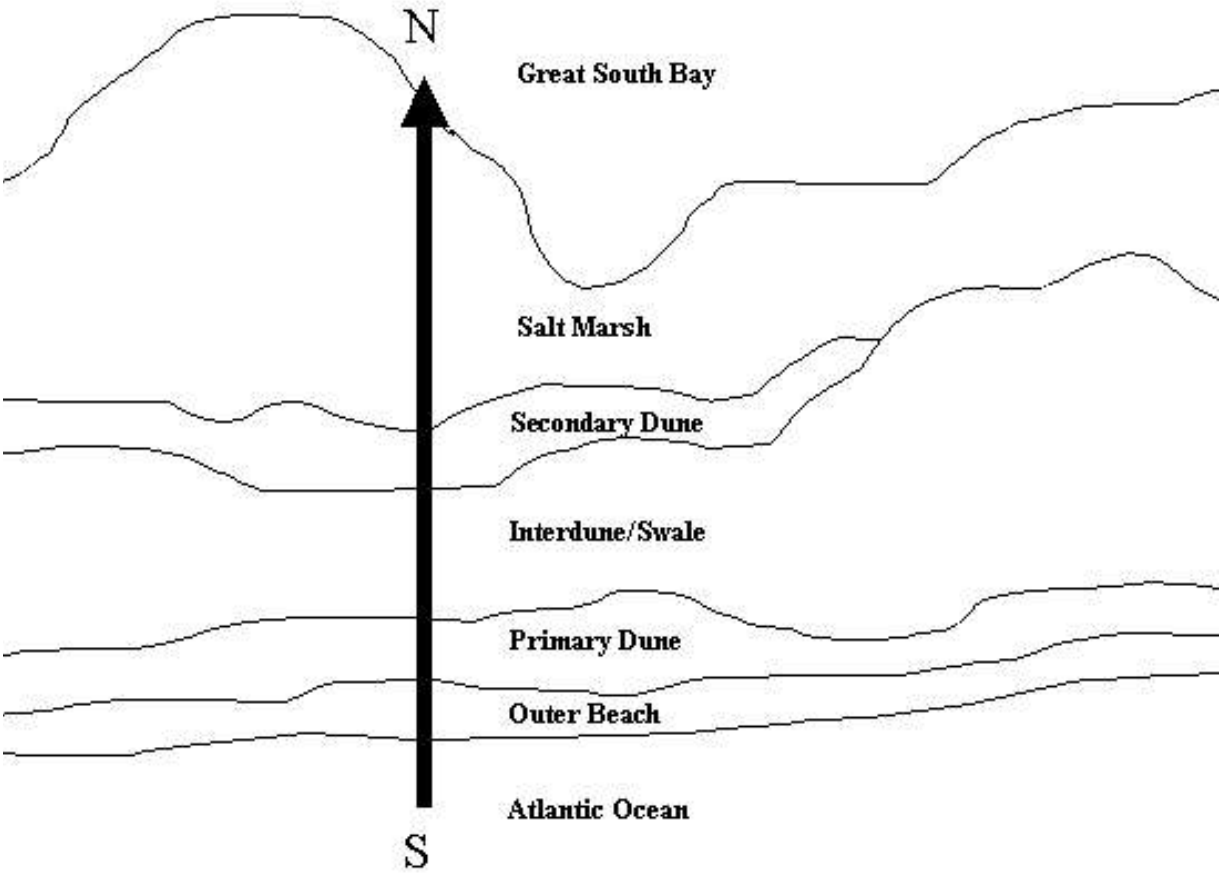

Figure 2b. The vegetation zones observed on Fire Island (from above).

"The lee side of the fore dune and the inter-dune area is dominated by *Ammophila brevigulata* [American beachgrass], *Hudsonia tometosa* [woolly beachheather], and *Prunus maritime* [beach plum]. These types were found in patches varying in size and interspersion. Some polygons of *Ammophila* were especially large where it was planted, presumably for beach stabilization. Some stands of planted *Pinus thunbergii* [Japanese black pine] were found at the foot of the fore dune in communities attempting dune stabilization."

"As distance from the primary dune increases, so does the dominance of shrubland types. *Prunus maritime* [beach plum] and *Myrica pennsylvanica* [northern bayberry] were most common, but *Vaccinium corymbosum* [highbush blueberry] and *Vaccinium macrocarpon* [cranberry]were found in wetter, freshwater areas. *Baccharis halimifolia* [eastern baccharis] was found in some wetland areas with higher salinity along with *Phragmites australis* [common reed].

"Herbaceous wetlands, or swales, were also scattered throughout the inter-dune zone. Like the shrubland types, hydrology and salinity affected these vegetation associations. These wetlands were typically small, although larger wetlands were found in some parts of the island. These swales were usually dominated by *Phragmites australis*, but also included *Scirpus pungens* [three-square bulrush], *Eleocharis parvula* [small spikerush], and other wetland plants."

"The ecological separation of types was, as expected, due mostly to freshwater hydrology and relative position on the island. Distinct zones of Herbaceous, Dwarf-Shrubland, Shrubland, Maritime Forest, and salt marsh were the norm from the ocean northward to the Bay. Within these general zones surface water, salinity, and disturbance accounted for most of the observed differences in vegetation community within these zones."

"The vegetation on the upland areas of the Floyd Estate differs from that of Fire Island in most cases. The property is predominantly forested with *Quercus velutina* [black oak], *Quercus coccinea* [scarlet oak], *Carya* spp. [hickory] and *Pinus rigida* [pitch pine]. There are some forests of *Juniperus virginiana* [eastern redcedar], *Quercus stellata* [post oak], *Acer rubrum* [red maple], and *Amelanchior canadensis* [oblong-leaf serviceberry] but these types collectively make up less than 10% of the area. There are several fields on the Estate that have historically been seeded with a mix of native and non-native grasses. Some of these fields are succeeding with *Robinia pseudoacacia* [black locust] and other hardwoods emerging. The salt marsh on the Floyd Estate is similar to those found on Fire Island with the majority of the area in either *Spartina patens* [saltmeadow cordgrass] or *Spartina alterniflora* [smooth cordgrass]. The mosquito ditches on the Floyd Estate have been plugged recently, so changes in the plant communities on these marshes can be expected."

The reader is directed to Klopfer et al. (2002) for much greater detail on the vegetation of Fire Island and a complete species list.

The Sunken Forest is of special interest (see fire history section above). It is dominated by holly (*Ilex opaca*), sassafras (*Sassafras albidum*), shadbush or oblong-leaf serviceberry (*Amelanchier canadensis*), and black gum (*Nyssa sylvatica*). Based on pollen cores, it once contained a substantial component of pitch pine (*Pinus rigida*) (Backman and Patterson 1984). Today this vegetation community is considered globally rare by the New York Natural Heritage Program.

The William Floyd Estate has a long history of vegetative manipulation to improve habitat for deer, small game, and other wildlife. The Floyd descendants planted, mowed and/or cultivated several scattered fields. Some of these areas were planted annually in rye grass. Hedgerows were planted with multifora rose (*Rosa multiflora)* and other shrubs to improve wildlife cover. The fields are interspersed among upland forests, lowland forests, and thickets.

Klopfer et al. (2002) note that nearly 70% of the vegetated portions of Fire Island are occupied by beachgrass, shrub, marsh, and scrub forest communities; the dominant vegetation community on the William Floyd Estate is coastal oak-heath forest.

Four invasive nonnative species are of special concern on the William Floyd Estate. These are multiflora rose (*Rosa multiflora*), autumn olive (*Elaeagnus umbellate*), tree of heaven (*Ailanthus altissima*), and black locust (*Robinia pseudoacacia*).

Plants in fire-prone ecosystems have adapted to fire in various ways, including thickening of bark, ability to resprout from below the soil surface, and dispersing seeds. Fire effects are related to intensity and duration of exposure. Fireline intensity and duration of exposure (residence time) are important considerations in prescribed fire. Living tissue can be instantly killed at a temperature of 147°F; it also can be killed by prolonged exposure to lower temperatures. Backing fires of low intensity can be lethal to small stems because the slow speed of the burning front enables lethal cambium temperatures to be reached just aboveground (Conner and Hartsell 2002).

Many of the native trees, shrubs, grasses, and marsh plants have adaptations to periodic fire. The following information concerning fire ecology and fire effects on native Fire Island species is drawn from the Fire Effect Information System (FEIS)(http://www.fs.fed.us/database/feis). More information is available at the website.

- Black and post oak are moderately resistant to fire. Small trees are easily top-killed but will sprout readily from the root crown. Larger trees can survive low-severity surface fires because of moderately thick basal bark. Scarlet oak has thin bark and is easily top-killed by even low-severity surface fires, though the species sprouts vigorously after fire.
- Hickories are also fire adapted. Though fire may kill stems, especially of small trees, most species can sprout from the stump, root crown, or roots following fire.
- Pitch pine is considered fire resilient. It has thick bark, rapidly growing sprouts, and extensive root systems. It not only survives fire easily, but has a high rate of regeneration after fire. It produces viable seed at an early age which further allows the species to withstand frequent fires. Some plants have serotinous cones. Natural fire frequency in pitch pine habitats is 12-25 years.

- Red maple is readily top-killed by fire but sprouts vigorously following fire. It also colonizes by seed. Red maple may replace oaks in the absence of fire for an extended period.
- Eastern redcedar is very susceptible to fire kill due to its short bole, thin bark, shallow roots, and inability to resprout. Larger tress may survive a low-severity fire.
- Holly is thin-barked and easily killed even by low-severity fire. It may sprout from basal buds following fire but growth is usually slow.
- Sassafras, particularly larger tress, is moderately resistant to fire. It also sprouts vigorously after top-kill, even after repeated fires. Normal fire return intervals in black oak-sassafras may be as short as 10-15 years.
- Black gum or black tupelo is well adapted to fire. Older trees have thick bark and readily survive fire. Though small trees may be top-killed, they can sprout from the root crown. They also colonize readily from seed carried by animals or water.
- The oblong-lead serviceberry (shadbush) and beach plum are not listed in FEIS, but most species of the respective genuses sprout readily from root crowns or stumps following fire.
- Information is mixed on highbush blueberry; some researchers report sprouting after fire, others suggest the species is not a vigorous sprouter.
- Fire probably removes eastern baccharis until off-site seed sources could provide regeneration.
- *Phragmites*, bulrushes, spikerush, and native bunchgrasses generally respond vigorously to fire, sprouting from foot crowns and/or rhizomes. *Phragmites*, while a native cosmopolitan species is often regarded as undesirable in dense stands. The FEIS website cites various authors indicating *Phragmites* density can be reduced by a combination ofburning and chemical treatments.

The following information concerning fire ecology and fire effects on invasive nonnative species is drawn from the Fire Effect Information System (FEIS)(http://www.fs.fed.us/database/feis). More information is available at the website.

- Information about multiflora rose and fire is lacking. Many native *Rosa* species survive low- to moderate-severity fires by sprouting from rhizomes or root crowns and may germinate from on-site or off-site seed sources. Native *Rosa* species are typically top-killed by fire, and with increasing fire severity, may be subject to root crown and rhizome damage sufficient to inhibit sprouting. While a single prescribed fire is unlikely to eradicate multiflora rose, some evidence suggests that periodic burning may control its spread and eventually reduce its presence, especially if used in conjunction with herbicide treatments.
- Autumn olive may sprout from the root crown following low- to moderate-severity fire. It is probably an off-site colonizer of burned sites because it produces abundant seed which is dispersed by animals.
- Tree of heaven stems are easily killed by fire, but it sprouts vigorously from the bole, root crown, and roots. Fire is not recommended as a control measure.
- Black locust may be top-killed by fire when it is young, but it sprouts readily from either the bole or roots. Frequent fire would favor this species.

Methodology. Information on the number of acres treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire

occurrence and fire return intervals. Available resource information from the park and cooperating agencies was also considered in the analysis. Other information was gathered from the professional literature. Intensity of effects is defined above in Table 5.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Vegetation communities in Fire Island NS will maintain long-term ecological diversity and stability, with fire-dependent communities sustained by fire and fire intolerant communities protected for unwanted wildland fire.

Source – NPS Organic Act; NPS *Management Policies* (2001).

Impacts of Alternative 1: No-Action

Impact Analysis: Under this alternative, wildland fires would be suppressed at the smallest reasonable acreage. Given recent fire incidence, an estimated 1-2 fires a year would burn 13-26 acres annually. With relatively continuous fuel beds the potential exists for considerably larger fires, especially under drought conditions and/or as fuel accumulations increase.

The direct adverse impacts of wildland fire include removal of aboveground biomass. In most William Floyd Estate fuel types, consumption may be limited to surface materials such as fallen leaves and branches. On Fire Island itself, fire behavior would likely result in consumption of most aboveground parts. Some mortality of grass, shrub, and tree species would result, especially if the residence time of fire is extended and the severity (downward heat pulse) is subsequently increased. Response of native species, except holly and maple, to surface fires is usually rapid and vigorous. The direct adverse impacts in an ecological sense of the no-action alternative on vegetation, given typical surface fire behavior in these fuel models, are localized, short-term, and negligible to minor.

Indirect adverse effects of wildland fire on these vegetation community types is varied, depending on species affected (whether they sprout or not in response to fire) and the degree of immediate impact (whether individual plants are killed or not). The response of communities would be expected to be within the normal range of response where those communities are already dominated by native species. Resprouting by grass and many shrubs would be expected during the same year as burning or, if the year is particularly dry, no later than the next spring. Burning on the dunes has the potential to facilitate erosion as aboveground vegetation is removed (less wind protection) or if root systems are destroyed. The timing and intensity of burning may result in an indirect effect – a slight shift in species composition, though the degree of shift would be minor. The long-term indirect effect of burning in native fire-dependent plant communities is to invigorate the community, resulting in robust growth and increased seed production. This would be considered a long-term, minor to moderate, beneficial impact of fire.

The direct adverse impacts of fire suppression on vegetation include removal and/or damage of plants during construction of firelines. Indirect adverse impacts to vegetation communities may include the introduction of nonnative species carried to fire sites on firefighting equipment. Fire suppression chemicals can have a variable effect on vegetation. Increased plant nutrients or toxicity of other ingredients could affect plant communities. However, these effects should disap-

pear by the end of a growing season and be minor compared to the effects of fire (Larson et al. 1999). Both the direct and indirect impacts of fire suppression are generally short-term, localized and minor, though the spread of nonnative species may have long-term implications.

Falling and/or removal of hazard trees would insignificantly lessen the potential for large or unusually intense fires as well as damage to high-value resources. Hazard tree removal would focus around visitor use areas, park boundaries, and historic structures. The direct beneficial effect of these actions would be reduced vegetation density. The indirect beneficial effect would be to reduce the vulnerability of historic structures and the visitor use areas to a high-severity wildland fire. Both the direct and indirect impacts, then, are regarded as beneficial, localized, short-term, and minor.

The direct effect of mowing old fields and areas near park facilities and historic structures would be to reduce fuel loading and suppress invading woody species. The indirect beneficial effect would be to reduce the vulnerability of historic structures and the visitor use areas to a high-severity wildland fire. Both the direct and indirect impacts, then, are regarded as beneficial, localized, short-term, and minor.

The no-action alternative with its general exclusion of fire from the park has potential long-term indirect adverse effects. Suppression of wildland fire has led to changes within vegetation communities in the park. Successional patterns have been altered as fewer types of early successional habitats remain (e.g., pitch pine). Long-term impacts of exclusion of fire would include a change in the distribution of early to late successional habitats.

With exclusion of fire, fuel loads accumulate due to fire suppression. The abundance of dead trees increases the risk of falling trees and may increase the intensity of fire behavior. Unnatural accumulations of litter, debris, understory plants, and invasive nonnative species may compromise natural processes resulting in long-term, minor to moderate adverse effects to vegetation resources. A dense understory would continue to develop in edge areas and gaps within the closed canopy oak stands on the William Floyd Estate, increasing the potential for high-intensity fire when it does occur. An altered fire regime, with less frequent and more severe fires, may become established. These indirect effects would be adverse, localized in the regional area but widespread in the park, long-term, and moderate in magnitude.

The impacts of the no-action alternative on vegetation, then, are beneficial or adverse, short-term and long-term, localized, and minor to moderate.

Cumulative Effects: The direct adverse impacts of wildland fire and fire suppression under the no-action alternative would be localized, short-term, and minor. The indirect adverse impacts would be localized, short-term, and minor. The direct and indirect impacts of hazard tree removal and mowing herbaceous vegetation are beneficial, localized, short-term, and minor. Vegetation management actions that contribute to cumulative effects on vegetation at Fire Island NS include treatments of invasive nonnative species. Visitor use patterns, forest parasites and pathogens, agriculture, highway construction, and commercial, residential, and recreational developments all contribute to cumulative effects. Over a period of years, fire exclusion in fire-

dependent vegetation communities could be moderately adverse. The cumulative effects of the no-action alternative would be localized to widespread and minor to moderate.

Conclusion: The direct adverse impacts of the no-action alternative on vegetation communities would be localized, short-term, and minor. The indirect impacts would be localized, short-term to long-term, negligible to moderate, and adverse to beneficial. The no-action alternative would not produce any major adverse impacts or impairment of vegetation communities whose conservation is necessary to the purpose of the establishment of Fire Island NS, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park. Nonetheless, continued exclusion of fire from fire-dependent communities would result in changes in species composition and distribution which may render those communities more susceptible to high-severity fire. With high-severity fire, subsequent fire effects may be outside the normal range of variation (e.g., rather than the existing community regenerating itself, an entirely new community may result).

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management

Impact Analysis: Under the preferred alternative, a slightly larger acreage may be burned annually when the appropriate management response is applied to wildland fires. Because suppression activities could be avoided in sensitive communities, the net effect of reducing such disturbance even with larger acreages would be a negligible to minor beneficial impact. Overall, the direct and indirect impacts of wildland fire, fire suppression, and removal of hazard trees would be similar to those described above for the no-action alternative. The impacts of this aspect of the preferred alternative on vegetation, then, are beneficial or adverse, short-term, localized, and minor to moderate.

Under this alternative, 2-5 prescribed fires in pitch pine, oak, shrub, salt marsh, grassland, and/or "old field" communities totaling 100-200 acres may be conducted over a typical 5-year period for purposes of hazard fuel reduction, maintenance of fire-dependent vegetation communities, and research on local fire effects. Individual prescribed fires would seldom exceed 50 acres. Prescribed burns tend to leave a mosaic of burned and unburned patches within a burn unit. The acres noted above are for the burn units; actual burned acreage would be smaller.

The direct adverse effects of prescribed burning (low-severity fires) are reduction of understory density, consumption of accumulated litter, removal of small trees, and limited mortality to mature trees. These impacts would be localized, generally short-term, and minor.

The indirect effect of such burning in pitch pine, oak, shrub, salt marsh, grassland, and/or "old field" communities includes rejuvenation of the burned stands. Regeneration of fire-dependent species such as pitch pine would be expected together with an increase in mast production from oaks and hickories. Long-term effects of fire on vegetation would include producing early successional habitats that were historically present in the area. Fire-intolerant species would diminish in abundance. Low-severity surface burns would also render the communities less vulnerable to a high-intensity fire. The indirect effects would therefore be localized, longer-term, beneficial, and minor to moderate.

The direct impacts of burning on nonnative species are less certain and may range from suppression of some nonnative species to stimulation of others. Prescribed fire would probably have a short-term minor beneficial to minor adverse impact on invasive nonnative species. Each prescribed fire burn plan, which involves patches of nonnative species, should consider the species present and design the burn to discourage nonnative species and encourage native species. Further investigation and monitoring of initial prescribed burns may refine prescriptions for use of fire in management of invasive nonnative species and the native, but sometimes undesirable, *Phragmites*.

Mechanical treatment of hazardous fuels would be conducted on 10-15 acres annually to lessen the potential for large or unusually intense fires as well as damage to high-value resources. Hazard fuels reduction projects would focus on reducing fuel loading around the visitor use areas, park boundaries, and historic structures. The direct beneficial effect of these actions would be reduced vegetation density. The indirect beneficial effect would be to reduce the vulnerability of historic structures, visitor use areas, and adjacent residential developments to a high-intensity wildland fire. Both the direct and indirect impacts, then, are regarded as beneficial, localized, short-term, and minor.

Overall, then, the direct impacts of the preferred alternative would be adverse to individual plants, localized, short-term, and minor. Indirect impacts would be adverse or beneficial, localized, short-term to long-term, and minor to moderate.

Cumulative Effects: The direct adverse impacts of wildland fire and fire suppression under the preferred alternative would be localized, short-term, and minor. The indirect adverse impacts would be localized, short-term, and minor. The direct and indirect impacts of hazard tree removal and mowing herbaceous vegetation are beneficial, localized, short-term, and minor. The direct impacts of integrated fuels management (prescribed burning and mechanical treatments) would be adverse to individual plants, localized, short-term, and minor. Indirect impacts would be adverse or beneficial, localized, short-term to long-term, and minor to moderate. Vegetation management actions that contribute to cumulative effects on vegetation at Fire Island NS include treatments of invasive nonnative species. Visitor use patterns, forest parasites and pathogens, agriculture, highway construction, and commercial, residential, and recreational developments all contribute to cumulative effects. The cumulative effects of the preferred alternative would be localized to widespread, adverse or beneficial, and minor to moderate.

Conclusion: The direct adverse impacts of the preferred alternative on vegetation communities would be localized, short-term, and minor. The indirect impacts would be localized, short-term to long-term, negligible to moderate, and adverse to beneficial. The preferred alternative would not produce any major adverse impacts or impairment of vegetation communities whose conservation is necessary to the purpose of the establishment of Fire Island NS, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 3: Appropriate Management Response and Non-fire Fuels Management

Impact Analysis: Alternative 3 would have the same impacts as the preferred alternative with the exception of those impacts attributed to prescribed fire. Thus the direct adverse impacts of Alternative 3 are localized, short-term, and negligible to minor. The indirect impacts are localized, short-term, minor to moderate, and adverse to beneficial.

Cumulative Effects: The direct adverse impacts of Alternative 3 are localized, short-term, and negligible to minor. The indirect impacts are localized, short-term, minor to moderate, and adverse to beneficial. Vegetation management actions that contribute to cumulative effects on vegetation at Fire Island NS include treatments of invasive nonnative species. Visitor use patterns, forest parasites and pathogens, agriculture, highway construction, and commercial, residential, and recreational developments all contribute to cumulative effects. The cumulative effects of Alternative 3 would be localized to widespread, adverse or beneficial, and minor to moderate.

Conclusion: The direct adverse impacts of Alternative 3 are localized, short-term, and negligible to minor. The indirect impacts are localized, short-term, minor to moderate, and adverse to beneficial. Alternative 3 would not produce any major adverse impacts or impairment of vegetation communities whose conservation is necessary to the purpose of the establishment of Fire Island NS, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park. Nonetheless, continued exclusion of fire from fire-dependent communities would result in changes in species composition and distribution which may render those communities more susceptible to high-severity fire. With high-severity fire, subsequent fire effects may be outside the normal range of variation (e.g., rather than the existing community regenerating itself, an entirely new community may result).

WILDLIFE

Affected Environment. Among the mammals in the Seashore are white-tailed deer (*Odocoileus virginianus*), fox (*Vulpes vulpes, Urocyon cinereoargenteus*), muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), eastern cottontail rabbit (*Sylvilagus floridanus*), and several species of small mammals. Large predatory mammals have been extirpated from the area. Deer and rabbits are common throughout the park.

White-tailed deer are a particular problem on the seashore. Populations have increased from fewer than 5 deer/km² in the late 1960s to more than 80 deer/km² by the late 1990s. This increase is attributed to two primary factors: (a) virtually no mortality due to predators, hunting, and vehicle collisions and (b) widespread access to artificial food sources (ornamental vegetation in residential areas, feeding by residents, etc.). With the increase in deer has come a similarly drastic increase in deer ticks and lyme disease.

Marine mammals, though inhabiting park waters, will not be discussed in this document because they would not be affected by fire (however severe) and fire management activities.

Raptors observed on the Seashore include peregrine falcon (*Falcon peregrinus*), kestrel (*Falco sparvarius*), Merlin (*Falco columbarius*), sharp-shinned hawk (*Accipiter striatus*), northern harrier (*Circus cyaneus*), osprey (*Pandion haliaetus*), and Cooper's hawk (*Accipiter cooperii*). Mi-

grating and wintering short-eared owls (*Asio flammeus)* and snowy owls (*Nyctea scandiaca*) forage over the salt marshes on the northern margin of the island (Fabre, et al. undated). The upland grassland community of the William Floyd Estate provides habitat for breeding American woodcock (*Scolopax minor*) (Fabre, et al. undated). Songbird species potentially include a wide variety of both residents and neotropical migrants.

Waterfowl and shorebirds are common, as are sea ducks, hulls, terns, sandpipers, and other pelagic species. These water-associated species will also not be discussed since they would be affected by fire and fire management activities.

Caldecutt (1997) identified eight species of reptiles and amphibians in Fire Island National Seashore: eastern garter snake (*Thamnophis sirtalis sirtalis*), black racer (*Coluber constrictor constrictor*), common snapping turtle (*Chelydra serpentina*), diamondback terrapin (*Malaclemys terrapin*), eastern box turtle (*Terrapene carolina carolina*), eastern mud turtle (*Kinosternon subrubrum subrubrum*), spotted turtle (*Clemmys guttata*), and Fowler's toad (*Bufo woodhousii fowleri*). The Fowler's toad was the only amphibian species found on FIIS. Adult toads were commonly found in all habitats, both upland and wetland with approximately equal frequency. Fowler's toads breed in freshwater in spring. Larvae were found in the large pond near the Visitor's Center and a low area on Burma Road in the Wilderness Area. Larvae were also found in several slightly brackish wetlands (Fabre et al. undated). Due to urbanization, recolonization of suitable areas can be problematic for some reptiles and amphibians, especially those that are habitat specialists (Trani-Griep 2002a).

Marine turtles, because they would not be affected by fire and fire management activities, are not discussed in this document.

Fish, also, are not identified and discussed in this document because they would not be affected by fire and fire management activities. Although ephemeral changes in water chemistry could have direct effects on grazing fishes in small water bodies, the dilution effect in large bodies of water would result in no effect. Fire Island does not have habitats that support freshwater fishes throughout their life cycles.

Forest or grassland fragmentation may affect birds, but is more important for other wildlife species less able to widely disperse. These other factors include: (1) increased mortality of individuals moving between patches, (2) lower recolonization rates of empty patches, and (3) reduced local population sizes resulting in increased susceptibility of species to regional extirpation (Baker and Hunter 2002).

Increasing urbanization has fragmented forest and grassland habitats into smaller and more isolated tracts. Many birds and mammals have minimum area requirements and have experienced major loss of habitat (Trani-Greip 2002b). The continuing urbanization and conversion of fields or natural areas to asphalt or housing in the region increases the relative value of habitats within the park.

Changes in land use, particularly reductions in the use of fire, have altered forests and associated wildlife communities. Retaining structural elements, such as a few snags, in young stands pro-

vides many benefits for a variety of wildlife species (Baker and Hunter 2002). Fauna vary with the age of stands, percent of deciduous trees, proximity to openings, and presence of bottomland forest types and water.

Methodology. Information on the number of acres annually treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence. Other information was gathered from Fire Island NS documents and staff knowledge. Intensity of effects is defined above in Table 5.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Most species present in the mid-1800s are still represented in the park fauna. Diversity and abundance of wildlife populations are robust, within the carrying capacity of the area. Population fluctuations remain within the normal range of variability.

Source – NPS Organic Act; NPS *Management Policies* (2001).

Impacts of Alternative 1: No-Action

Impact Analysis: Under this alternative, wildland fires would be suppressed at the smallest reasonable acreage. Given recent fire incidence and typical fire return intervals, an estimated 1-2 wildland fires would burn 13-26 acres annually (5-10 fires and 65-130 acres during a typical 5-year period).

Direct adverse impacts of fire itself would include limited loss of habitat for short periods following fire and possible mortality to individuals of species that are not mobile enough to escape or obtain belowground shelter. Birds and larger mammals would easily escape fire. Fires during nesting season, although uncommon, may consume bird nests, particularly those on the ground, or cause abandonment of nests. These direct impacts would be localized, short-term, and negligible to minor from a population perspective.

Localized, short-term indirect adverse impacts would include temporary displacement of individuals. Fire effects would also create new or renewed habitats for amphibians, small mammals, and birds. Vegetation community structure may be more open after fire and, therefore, more amenable for some large mammals and avian predators. Other indirect effects may include an increase in mast and other forage. Thus the indirect effects would be localized, short-term, negligible to minor from a population standpoint, and adverse or beneficial.

The direct adverse impacts of fire suppression would include very limited disturbance to small mammals, some reptiles and amphibians, and ground-nesting birds due to fireline construction and/or off-road vehicle use. Indirect adverse impacts would include temporary displacement of individuals. Both direct and indirect impacts would be localized, short-term, and negligible to minor.

The direct adverse impacts of hazard tree removal and mowing herbaceous vegetation in old fields and near facilities would include very limited disturbance to small mammals, some reptiles

and amphibiams, and nesting birds due to human presence, vegetation removal, and/or off-road vehicle use. Loss of nest trees would have minimal effect from a population standpoint since hazard tree removal would be concentrated only along park boundaries, near historic sites, and in visitor use areas. Indirect adverse impacts would include temporary displacement of individuals. Both direct and indirect impacts would be localized, short-term, and negligible.

From the standpoint of a suite of wildlife populations, the direct and indirect adverse impacts would be of short duration and small magnitude. Therefore, the direct and indirect adverse impacts of the no-action alternative on wildlife would be localized, short-term, and minor. In the long-term, the indirect effect of fire exclusion on wildlife would be minor and adverse with habitat senescence and a loss of habitat diversity.

Cumulative Effects: The direct and indirect impacts of the no-action alternative on wildlife would be localized, short-term, beneficial or adverse, and negligible to minor. Factors that contribute to cumulative effects on wildlife and their habitats are agriculture, habitat fragmentation, industrial and residential development, hunting, and other recreational activities. Vegetation management practices may enhance or diminish the availability of forage and cover. The cumulative impacts of the no-action alternative would be localized and minor to moderate.

Conclusion: The no-action alternative would have localized, short-term, and minor direct adverse impacts on wildlife. The indirect impacts would be localized, short-term, adverse or beneficial, and minor. In the long-term, the indirect effect of fire exclusion on wildlife would be minor and adverse with a loss of habitat diversity. The no-action alternative would not produce any major adverse impacts or impairment of wildlife whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management

Impact Analysis: The preferred alternative would result in an incremental increase of acreage burned from slightly larger wildland fires suppressed under an appropriate management response (i.e., holding fires at existing barriers rather than constructing firelines), but ground disturbance and sedimentation would be lessened in comparison with the no-action alternative. Direct adverse impacts of fire and fire suppression under an appropriate management response would be similar to those described above for the no-action alternative. The direct and indirect adverse impacts of this aspect of the preferred alternative would be localized, short-term, and negligible to minor.

The direct adverse impacts of hazard tree removal and mowing herbaceous vegetation in old fields and near facilities would include very limited disturbance to small mammals, some reptiles and amphibians, and nesting birds due to human presence, vegetation removal, and/or off-road vehicle use. Felling hazard trees removes potential nest cavities and habitat for woodpeckers, bats, and other species that use dead standing trees. Loss of nest trees would have minimal effect from a population standpoint since hazard tree removal would be concentrated only along park boundaries, near historic sites, and in visitor use areas. Indirect adverse impacts would include

temporary displacement of individuals. Both direct and indirect impacts would be localized, short-term, and negligible.

Under this alternative, 2-5 prescribed fires in pitch pine, oak, shrub, salt marsh, grassland, and/or "old field" communities totaling 100-200 acres may be conducted over a typical 5-year period for purposes of hazard fuel reduction, maintenance of fire-dependent vegetation communities, and research on local fire effects. Individual prescribed fires would seldom exceed 50 acres. Prescribed burns tend to leave a mosaic of burned and unburned patches within a burn unit. The acres noted above are for the burn units; actual burned acreage would be smaller.

Direct adverse impacts of prescribed burning would include limited loss of habitat for short periods following fire, possible disruption of ground nests and dens due to fireline construction, and possible mortality to individuals of species that are not mobile enough to escape or obtain belowground shelter. Birds and larger mammals would escape prescribed fires. Fires during nesting season may consume bird nests, particularly those on the ground, or cause abandonment of nests. These direct impacts would be localized, short-term, and negligible to minor from a population perspective.

Localized, short-term indirect adverse impacts of prescribed fire would include temporary displacement of individuals. Longer-term indirect effects on small mammals and birds would be minor to moderate and beneficial as habitats become more diverse in age and stand structure. Fire effects would also create new or renewed habitats for amphibians, small mammals, and birds. Forest structure may be more open after fire and, therefore, more amenable for some large mammals and avian predators. Other indirect effects may include an increase in mast and other forage. Thus the indirect effects would be localized, short-term, negligible to minor from a population standpoint, and adverse or beneficial.

Mechanical treatments of hazardous fuels would be conducted on 10-15 acres annually to lessen the potential for large or unusually intense fires as well as damage to high-value resources. Hazard fuels reduction projects would focus on reducing fuel loading around the visitor use areas, park boundaries, and historic structures. The direct adverse impacts of mechanical fuel reduction projects would include very limited disturbance to small mammals, some reptiles and amphibians, and ground-nesting birds due to human presence, vegetation removal, and/or off-road vehicle use. The use of heavy equipment for mowing old fields or grasslands would be timed so as not to cause ground disturbance or disturbance to nesting birds. If amphibians are locally abundant and mobile, aboveground surveys prior to mowing would reduce the adverse effects on the populations. Indirect adverse impacts would include temporary displacement of individuals. Both direct and indirect impacts would be localized, short-term, and negligible.

From the standpoint of a suite of wildlife populations, the direct and indirect adverse impacts of the preferred alternative on wildlife would be localized, short-term, and minor. In the long-term, prescribed burning and hazard fuels reductions would be locally beneficial by increasing and restoring native plant communities and habitat diversity.

Cumulative Effects: The direct and indirect impacts of the preferred alternative on wildlife would be localized, short-term, beneficial or adverse, and negligible to minor. Factors that con-

tribute to cumulative effects on wildlife and their habitats are agriculture, habitat fragmentation, industrial and residential development, hunting, and other recreational activities. Vegetation management practices may enhance or diminish the availability of forage and cover. The cumulative impacts of the preferred alternative would be localized and minor to moderate.

Conclusion: The preferred alternative would have localized, short-term, and minor direct adverse impacts on wildlife. The indirect impacts would be localized, short-term, adverse or beneficial, and minor. The preferred alternative would not produce any major adverse impacts or impairment of wildlife whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 3: Appropriate Management Response and Non-fire Fuels Management

Impact Analysis: Alternative 3 would have the same impacts as the preferred alternative with the exception of those impacts attributed to prescribed fire. Thus the direct adverse impacts of Alternative 3 are localized, short-term, and negligible to minor. The indirect impacts are localized, short-term, minor, and adverse or beneficial.

Cumulative Effects: The direct and indirect impacts of Alternative 3 on wildlife would be localized, short-term, beneficial or adverse, and negligible to minor. Factors that contribute to cumulative effects on wildlife and their habitats are agriculture, habitat fragmentation, industrial and residential development, hunting, and other recreational activities. Vegetation management practices may enhance or diminish the availability of forage and cover. The cumulative impacts of Alternative 3 would be localized and minor to moderate.

Conclusion: Alternative 3 would have localized, short-term, and minor direct adverse impacts on wildlife. The indirect impacts would be localized, short-term, adverse or beneficial, and minor. Alternative 3 would not produce any major adverse impacts or impairment of wildlife whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

THREATENED, ENDANGERED, AND SENSITIVE SPECIES

Affected Environment. Several federal- and State-listed species occur in Fire Island National Seashore. By policy (NPS 2001) the National Park Service affords protection to State-listed and sensitive species similar to that of federal-listed species.

Some of the following descriptions of endangered, threatened, and sensitive species are drawn directly from a NPS (1998) Environmental Assessment on management of endangered species habitats. Not all of the species description information included in the 1998 EA is presented here, but that which is presented is often copied verbatim. Other information is drawn from FEIS and various agency websites.

Common Tern: (*Sterna hirundo*) – This shorebird is listed as threatened in New York State and as a species of concern with the Federal Government. These white and black seabirds breed in colonies, primarily on wetlands adjacent to, or on islands within, the Great South Bay. They forage on the ocean beaches. Chicks can leave the nest soon after hatching, but continue to be fed and cared for by the adults. Adult terns feed primarily on fish and may often be observed standing on the Atlantic berm crest or intertidal zone facing the ocean. Young, flightless birds tend to congregate on sandy beaches and sandflats from late July to the middle of August. In late summer, the birds fledge and leave the New York beaches for the winter.

Least Tern: (*Sterna antillarum*) – This shorebird is listed as an endangered species and a species of concern in New York State. This small white and black seabird also breeds in colonies, usually on the supratidal beach habitat. Least terns have similar nesting requirements to piping plovers, but tend to require wider beaches and use larger areas of sparsely vegetated dunes.

Northeast Beach Tiger Beetle: (*Cicindela dorsalis dorsalis*) – The northeast beach tiger beetle's historic range includes portions of the Atlantic Coast, from Cape Cod, Massachusetts to central New Jersey, and along the Chesapeake Bay beaches of Maryland and Virginia (Hill and Knisley 1993). Today, this species is restricted to Chesapeake Bay beaches, two sites in Massachusetts, and one site on Sandy Hook, New Jersey. In 1990, the northeast beach tiger beetle was designated as threatened by the USF&WS (USF&WS 1990).

The northeast beach tiger beetle is a small (approximately 13 mm), light-colored beetle with a bronze-green head (Hill and Knisley 1993). Larvae live for two years in burrows along the beach, fastening themselves with abdominal hooks to the tops of the burrows. They extend rapidly out of the burrow to catch passing prey.

Northeast beach tiger beetle larvae are found in a narrow band along the beach, in and above the high-tide zone (Hill and Knisley 1993). The beetles may be found in a wider zone when washover areas are present or where the upper beach is flat and periodically is overwashed by high tides. As the tide rises, the beetle larvae plug their burrows with sand. They reopen their borrows as the tide recedes. Although this intertidal location subjects the larvae to flooding, larvae close to the water's edge tend to develop faster than those in drier areas because prey are more abundant here (Hill and Knisley 1993).

Northeast beach tiger beetle larvae have been noted migrating to higher ground on the upper beach or gently sloping foredune in winter, possibly to avoid being washed away by winter storms (Nothnagle and Simmons 1990). The beetles emerge in summer as winged adults and search for food in the sand of the intertidal zone.

A key to northeast beach tiger beetle larval survival appears to be a protected burrow in the intertidal zone (Nothnagle and Simmons 1990). Survival is highest where beaches are wide with gradually sloping beaches and foredunes. The wide and gentle slopes allow larvae to migrate up the beach when burrows are threatened by beach erosion or storm

overwash. The beetle typically is not found on narrow, eroding beaches with steep dunes (Hill and Knisley 1993).

Northeast beach tiger beetles normally experience dramatic fluctuations in population (Hill and Knisley 1993). Long-term persistence of the species in a given area may depend on the presence of multiple, adjacent subpopulations that exchange individuals at high enough rates to counteract the localized changes in habitat quality (Nothnagle et al. 1994).

The extirpation of *C.d.dorsalis* from most of its range has been attributed primarily to destruction and disturbance of natural beach habitat from shoreline developments, beach stabilization structures, and high recreational use (Hill and Knisley 1994), all of which may affect the larval stage (Knisley et al. 1987). This species was last identified on Fire Island in the 1920's. This was about the time vehicles were introduced to Fire Island. The threatened tiger beetle may be on Fire Island, but it may not be identified due to its rarity, the limited numbers of people capable of identification, and the limited amount of time devoted to identification of this species.

Piping Plover: (*Charadrius melodus*) – Piping plovers are small light-colored shorebirds that breed on the northern Great Plains, along the Great Lakes, and along the Atlantic Coast from Newfoundland to South Carolina (Dyer et al. 1988). The Atlantic Coast population is listed as threatened (USFWS 1985).

Piping plovers breed along the Atlantic Coast from March through August (Dyer et al. 1988). They nest from mid-April through late July with a typical clutch size of four eggs and an incubation period that averages from 27 to 28 days. Nests are shallow depressions in sand, mixed with pebbles or shells in areas with little or no vegetation. Nesting locations are on sandy beaches and spits above the high tide line, on gently sloping dunes, in blowout areas behind dunes, in washover areas between dunes, and on sandy dredge material (Dyer et al. 1988).

Piping plovers typically fledge only one brood per season, but may renest if initial nests are destroyed (Dyer et al. 1988). Chicks are precocious, moving about shortly after hatching. The flightless chicks remain with one or both adults for about 25 to 35 days until they fledge. During this time, adults and chicks feed on invertebrates (such as marine worms and fly larvae [Bent 1929]) found on sandflats, mudflats, the wracklines, and on upper beaches and dunes. Access to high-quality feeding areas is especially important for plover chicks (Cairns 1982). The chicks depend on walking access to feeding areas and to survive must increase their weight at least five-fold in the first 20 days of life.

On Fire Island, adults forage on the ocean and bay beaches, in overwash areas, swale areas with sparse vegetation, and in vernal pool habitats. The primary habitat for breeding is along wide ocean beaches and overwash areas. Due to its rarity, available data identified only two to four nests per year in the late 1980's, with the numbers declining in the 1990's. During this same period at Cape Cod National Seashore in Massachusetts (which

has similar habitat), the plover nests increased from 15 to 20 in a year in the late 1980's to from 60 to 110 per year in the 1990's.

Roseate Tern: (*Sterna dougallii*) - Roseate terns are also black and white shorebirds, but are larger than least terns. The northeastern population of the roseate tern is listed as endangered. These terns occur/nest within larger common tern colonies on coastal islands and barrier beaches. Large sandflat areas next to dunes provide important feeding and staging areas for recently fledged young and birds preparing for fall migration. Recent Long Island Colonial Waterbird Survey counts have placed the roseate at approximately 1,668 pairs. Due to its rarity and lack of easily identifiable markings, it is a difficult bird to verify. Fire Island sightings of roseate terns foraging and staging have been verified by experienced observers from 1993 through 1995.

Great egret: (*Casmerodius albus*) – Great egrets inhabit freshwater and saltwater marshes, streams, ponds, lakes, and mud flats. The great egret usually nests in colonies with other heron species in wooded swamps and wetlands. Nests are typically built 20 to 40 feet above ground in medium-sized trees. Occasionally they are built in bushes or cattails, 1 to 4 feet above water. The nest is a large, flat platform, constructed of sticks and twigs and usually lined with small pieces of plant material.

Snowy egret: (*Egretta thula*) – Snow egrets inhabit freshwater, mudflats, tidal shallows, marshes, and salt marshes. Nests are composed of small sticks and twigs situated 4 to 10 feet above water.

Black skimmer: (*Rynchops niger*) – Black skimmers prefer to nest in colonies on coastal beaches and dredge spoil islands. They nest on open sandy beaches, inlets, sandbars, offshore islands, and dredge disposal islands that are sparsely vegetated and contain shell fragments. The growth of dense vegetation may cause colony relocation. Skimmers also frequently nest on wrack mats (deposits of dead sea grasses and other vegetation) on marsh islands in the back bays; however, these colonies are typically much smaller than the beach colonies. Black skimmers forage in shallow-water tidal creeks, inlets, and ponds. There are apparently no records of black skimmer on Fire Island NS.

Eastern mud turtle: (*Kinosternon subrubrum*) – Eastern mud turtles prefer shallow, soft-bottomed, slow-moving water with abundant vegetation. If the habitat dries up, they may move over land to another body of water, or burrow into the mud and aestivate (pass the summer in a state of stupor). This species occupies habitats in the William Floyd Estate.

Seabeach Amaranth: (*Amaranthus pumilus*) - Seabeach amaranth is an annual herb once found along the Atlantic Coast from Massachusetts to South Carolina. This plant has been eliminated from six states in its historical range and is found today in only New York and North and South Carolina (USFWS 1993). In 1993, seabeach amaranth was listed as threatened under the Endangered Species Act.

Seabeach amaranth is a low-growing plant with fleshy pink or reddish stems and small rounded leaves (Bucher and Weakley 1990; Weakley and Bucher 1992). It flowers from mid-summer to late fall and produces seeds from July or August until the plant dies. As

the growing season progresses, the plant acts as a sandbinder and forms a mound of sand. As the sand mound grows higher, earlier leaves are buried, with the plant often growing to three feet in diameter. The species' primary habitat is on barrier beaches, on overwash fans at ends of islands where new material may be deposited, and on lower foredunes of noneroding beaches (Bucher and Weakley 1990). Its growth is concentrated in the wrack line of material deposited by the highest spring tides. The seeds, which float, are presumably deposited by tidal action. Smaller, temporary populations may be established in blowouts in foredunes.

Seabeach amaranth is seldom found in well-vegetated areas. It appears to need extensive areas of barrier beaches where seeds can be dispersed across the landscape and germinate in suitable habitat as it becomes available.

Seabeach amaranth on Fire Island tends to germinate and grow on the ocean beach, in bare or sparsely vegetated swales, and along overwash zones. It is valuable in natural beach stabilization. Each year the plant may put out hundreds of seeds. Approximately half of the seeds remain on the plant to reseed its habitat. The remaining seeds are dropped to move with the wind and water to new locations. Every beach area with a supratidal zone is habitat for seabeach amaranth throughout the year. Studies note beach driving buries the seeds and prevents germination. Beach development and nourishment tend to bury viable seeds**.**

Seabeach Knotweed: (*Polygonum glaucum*) - This New York State listed rare plant is found on the bare or sparsely vegetated sections of the beach, swale, and overwash zones. Its low-lying stems hold sand and assist in building beach and dune areas. It has been historically found on Fire Island, often on the foredune. In December 1993, seabeach knotweed was found growing on the foredune on the beach at Sailors Haven.

Swamp sunflower: (*Helianthus angustifolius*) – This New York State threatened species is a perennial forb that grows in swamps, wet pinelands, coastal salt marshes and moist disturbed sites. It is often common along roadside ditches and fence lines. No fire effects information was found on this species, those species of the same genus are generally tolerant of fire. Plants may be top-killed by fire during the growing season, but survive by resprouting from persistent rhizomes.

Slender marsh-pink: (*Sabatia campanulata*) – This New York State endangered species, occupies salt marshes. No information was available on the fire ecology and fire effects of this species. Given its habitat, it is likely that the species has experienced periodic fire and has adaptations for survival.

Graceful sedge: (*Carex venusta var. minor*) – This New York State endangered perennial forb occupies meadows and wet woods. Though little is know of the fire ecology of this species, other species within the genus survive fire by resprouting from rhizomes.

Rough rush-grass: (*Sporobolus clandestinus*) – This New York State endangered perennial grass grows on dry sandy or rocky soils. Little is know of the fire ecology of this species. Other species of the genus may have above ground parts consumed by fire but

re-grow from the root crown or re-establish by seed. Severe fires may kill individual plants.

Narrow-leaf sea-blite: (*Suaeda linearis*) - This New York State endangered species is known only from historical records at Fire Island NS; there is no recent documentation of its presence on the Seashore. This species occurs in hypersaline poorly drained depressions of salt marshes the substrate is generally poorly drained peat. This habitat occurs on maritime beaches that are subject to irregular tidal flooding, generally spring or storm tides in maritime settings. Vegetation cover is variable, depending on the amount of exposure to wave and wind action, but is usually sparse. The substrate is typically unvegetated sand.

Golden dock: (*Rumex maritimus* var. *fueginus*) – This New York State endangered species is known only from historical records at Fire Island NS; there is no recent documentation of its presence on the Seashore. The species prefers deep moderately heavy soils. It can grow in semi-shade (light woodland) or no shade. It requires moist or wet soil. No information was available on the fire ecology and fire effects of this species. Given its habitat, it is likely that the species has experienced periodic fire and has adaptations for survival.

Retrorse flatsedge: (*Cyperus retrorsus*) – This New York State endangered species is known only from historical records at Fire Island NS; there is no recent documentation of its presence on the Seashore. The species occupies stream banks and other damp areas. No information was available on the fire ecology and fire effects of this species. Given its habitat, it is likely that the species has experienced periodic fire and has adaptations for survival.

Methodology. Information on the number of acres annually treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence. Other information was gathered from Fire Island NS documents and staff knowledge. Intensity of effects is defined above in Table 5.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Federal-and state-listed threatened and endangered species and their habitats are sustained.

Source – Endangered Species Act; NPS Organic Act; NPS Management Policies.

Impacts of Alternative 1: No-Action

Impact Analysis: With the no-action alternative, all wildland fires are aggressively suppressed, thus minimizing the potential disturbance of listed species and their habitats. Recent fire history and typical fire return intervals suggest this may involve 5-10 fires totaling 65-130 acres during a typical 5-year period. Average fire size over recent years has been about 13 acres and maximum fire size around 150 acres.

The common tern, least tern, piping plover, roseate tern, black skimmer, and northeast beach tiger beetle occupy habitats where vegetation is absent or too sparse and discontinuous to support fire. Therefore, wildland fire would have no direct or indirect adverse effects on these species. The potential direct adverse effects of fire suppression operations may include disturbance of nests, burrows (beetle), or young by firefighting vehicles. Indirect effects of fire suppression operations then could conceivably include loss of individuals. However, off-road travel by firefighting vehicles is prohibited except in extreme emergencies. Further, there would also be no need to take firefighting vehicles along these beaches since fire itself, even under the most extreme conditions, would stop when it reached the edge of continuous fuels. Finally, the park flags the location of known piping plover nests. Any potential travel in areas occupied by these species would also employ the protocols established in the Endangered Species Habitat Management Environmental Assessment (NPS 1998). Therefore, since the potential impacts noted immediately above can be avoided, wildland fire suppression activities would have no direct or indirect adverse impacts on these species. In the context of the Endangered Species Act, the impacts of wildland fire and fire suppression operations on common tern, least tern, piping plover, roseate tern, black skimmer, and northeast beach tiger beetle would be *no effect.*

The great egret and snowy egret occupy habitats that may be susceptible to fire under dry or late season conditions. Young would likely be already fledged during periods when fire may occur. Thus the potential direct adverse effect of wildland fire would be loss of unoccupied nests. Fire suppression operations would likely have no effect since nests are usually built over water. Given the small number of fires in salt marshes, the adverse impacts of wildland fire and fire suppression on the great egret and snowy egret would be localized, short-term, and negligible to minor. In the context of the Endangered Species Act, the impacts of wildland fire and fire suppression operations on the great egret and snowy egret would be *may affect, but not likely to adversely affect.*

The eastern mud turtle occupies shallow, soft-bottomed, slow-moving water with abundant vegetation. When these habitats are dry and vulnerable to fire, the turtles would typically have moved or aestivated. There would be no direct adverse impacts of wildland fire itself. The potential direct adverse effects of fire suppression operations may include disturbance of burrows by firefighting vehicles. Indirect effects of fire suppression operations then could conceivably include loss of individuals. However, off-road travel by firefighting vehicles is prohibited except in extreme emergencies. Further, there would also be no need to take firefighting vehicles into these habitats since fire itself, even under the most extreme conditions, would stop when it reached the edge of continuous fuels. Therefore, since the potential impacts noted immediately above can be avoided, wildland fire suppression activities would have no direct or indirect adverse impacts on these species. In the context of the Endangered Species Act, the impacts of wildland fire and fire suppression operations on eastern mud turtle would be *no effect.*

The seabeach amaranth and seabeach knotweed occupy habitats where vegetation is too sparse and discontinuous to support fire. Therefore, wildland fire would have no direct or indirect adverse effects on these species. The potential indirect adverse effects may include disturbance by firefighting vehicles. Indirect effects of fire suppression operations then could conceivably include loss of individuals. However, off-road travel by firefighting vehicles is prohibited except in extreme emergencies. Further, there would also be no need to take firefighting vehicles along

these beaches since fire itself, even under the most extreme conditions, would stop when it reached the edge of continuous fuels. Any potential travel in areas occupied by these species would also employ the protocols established in the Endangered Species Habitat Management Environmental Assessment (NPS 1998). Therefore, since the potential impacts noted immediately above can be avoided, wildland fire suppression activities would have no direct or indirect adverse impacts on these species. In the context of the Endangered Species Act, the impacts of wildland fire and fire suppression on seabeach amaranth and seabeach knotweed would be: *no effect.*

Swamp sunflower, slender marsh-pink, graceful sedge, rough rush-grass, narrow-leaf sea-blite, golden dock, and retrorse flatsedge all occupy habitats where wildland fire may occur under dry conditions. Direct adverse impacts of wildland fire may include consumption of above ground biomass. Although no information is recorded in common sources (e.g. FEIS) concerning the fire ecology of these species, other species of the same genuses have developed adaptations to survive fire (e.g. sprouting from rhizomes). Indirect impacts may also be beneficial as competing vegetation is reduced following fire. The potential indirect adverse effects of wildland fire suppression may include disturbance by firefighting vehicles. Indirect effects of fire suppression operations then could conceivably include loss of individuals. However, off-road travel by firefighting vehicles is prohibited except in extreme emergencies. Thus the direct and indirect impacts of wildland fire and fire suppression on these species would be localized, short-term, adverse or beneficial, and negligible to minor. In the context of the Endangered Species Act, the impacts of wildland fire and fire suppression operations on swamp sunflower, slender marsh-pink, graceful sedge, rough rush-grass, narrow-leaf sea-blite, golden dock, and retrorse flatsedge would be *may affect, but not likely to adversely affect.*

Removal of individual hazard trees and mowing old fields and areas near park facilities and historic structures would have no direct or indirect adverse impacts on these species since the areas treated are unsuitable habitat for the species. In the context of the Endangered Species Act, the impacts of hazard tree removal and mowing on these identified species would be: *no effect.*

Cumulative Effects: The direct and indirect impacts of the no-action alternative on threatened, endangered, and sensitive species in Fire Island NS range from no impacts on some species to localized, short-term, adverse or beneficial, and negligible to minor impacts on other species. Factors that contribute to cumulative effects on threatened, endangered, and sensitive species are agriculture, commercial and residential development, hunting and fishing, and other recreational activities inside and outside the park. Land use patterns are expected to continue relatively unchanged across most of the park. Potential impacts of increasing human use on the Seashore are mitigated by the actions proposed in the Endangered Species Habitat Management Environmental Assessment. The cumulative impacts of the no-action alternative on threatened, endangered, and sensitive species would be localized and negligible to moderate.

Conclusion: The direct and indirect impacts of the no-action alternative on threatened, endangered, and sensitive species in Fire Island NS range from no impacts on some species to localized, short-term, adverse or beneficial, and negligible to minor impacts on other species. The no-action alternative would not produce any major adverse impacts or impairment of threatened, endangered, and sensitive species whose conservation is necessary to the purpose of the estab-

lishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management

Impact Analysis: The preferred alternative would result in an incremental increase of acreage burned from slightly larger wildland fires suppressed under an appropriate management response (i.e., holding fires at existing barriers rather than constructing firelines), but ground disturbance would be lessened in comparison with the no-action alternative. Wildland fire and fire suppression under an appropriate management response would have similar, but lessened, impacts on the threatened, endangered, or sensitive species as those identified above. In the context of the Endangered Species Act, the impacts of wildland fire and fire suppression under the preferred alternative on the identified species would range from *no effect* to *may affect, but unlikely to adversely affect*.

Removal of hazard trees and mowing herbaceous vegetation in and near visitor use areas and historic sites would not change from the no-action alternative (about 60-80 acres annually). Therefore, the direct and indirect impacts of this aspect of the preferred alternative would be indistinguishable from the same aspect of the no-action alternative. In the context of the Endangered Species Act, the impacts of hazard tree removal and mowing on all the identified species would be: *no effect.*

The other aspect of the preferred alternative includes integrated management of wildland fuels. Components include prescribed burning and mechanical reduction of hazardous fuels. The components may be employed individually or combined with other components in a sequential integrated treatment program, depending on the needs of the treatment site. Mechanical reduction of hazard fuels would be conducted on 10-15 acres annually (50-75 acres in a typical 5-year program). These would occur primarily near residential subdivisions, park facilities, visitor use areas, and historic structures. Woody material would be scattered or hand-piled for later burning or removal. Two to five prescribed fires may be conducted in pitch pine, oak, oak-hickory, salt marsh, grassland, and/or "old field" communities totaling up to 100-200 acres over a typical 5-year period. Individual prescribed fires would seldom exceed 50 acres. Prescribed burns tend to leave a mosaic of burned and unburned patches within a burn unit. The acres noted above are for the burn units; actual burned acreage would be smaller.

Of the threatened, endangered, or sensitive species identified above, the common tern, least tern, piping plover, roseate tern, black skimmer, northeast beach tiger beetle, seabeach amaranth and seabeach knotweed would not occur in areas which may be treated with prescribed fire or mechanical reduction of hazard fuels. Therefore, no direct or indirect adverse impacts from prescribed fire or mechanical reduction of hazard fuels would occur to these species or their habitats. In the context of the Endangered Species Act, the impacts of prescribed fire or mechanical reduction of hazard fuels under the preferred alternative on these species would be *no effect.*

Of the threatened, endangered, or sensitive species identified above, the great egret, snowy egret, eastern mud turtle, swamp sunflower, slender marsh-pink, graceful sedge, rough rush-grass, nar-

row-leaf sea-blite, golden dock, and retrorse flatsedge may potentially occur in areas selected for prescribed burning and/or mechanical reduction of hazard fuels.

Timing of management actions would avoid periods when young egrets may still be in nest, thus avoiding loss or disturbance of the young egrets. Thus the potential direct adverse effect of prescribed fire would be loss of unoccupied nests. Nests would be evident and could be avoided or otherwise protected prior to (e.g. clearing flammable fuels from around nest trees) or during the management actions. Indirect impacts may include potential changes in habitat, which would probably be beneficial (more open marshes, better access to prey). The potential impacts, therefore, or prescribed fire and mechanical treatment of hazard fuels on great and snowy egrets would be localized, short-term, adverse or beneficial, and negligible.

When eastern mud turtle habitats are dry and accessible to prescribed fire, the turtles would typically have moved or aestivated. There would be no direct adverse impacts of prescribed fire itself. The potential direct adverse effects of prescribed fire and hazard fuels operations may include disturbance of burrows by firefighting vehicles. Planning for these operations in eastern mud turtle habitat would include provisions for avoiding or closely monitoring vehicle use in areas that may be occupied by turtles. The potential adverse impacts, therefore, or prescribed fire and mechanical treatment of hazard fuels on eastern mud turtles would be localized, short-term, and negligible.

As noted above, swamp sunflower, slender marsh-pink, graceful sedge, rough rush-grass, narrow-leaf sea-blite, golden dock, and retrorse flatsedge may also potentially occur in areas selected for prescribed burning and/or mechanical reduction of hazard fuels. Direct adverse impacts of prescribed fire may include consumption of above ground biomass. Although no information is recorded in common sources (e.g. FEIS) concerning the fire ecology of these species, other species of the same genuses have developed adaptations to survive fire (e.g. sprouting from rhizomes). Indirect impacts may also be beneficial as competing vegetation is reduced following fire. The potential indirect adverse effects of prescribed fire may include disturbance by firefighting vehicles. Indirect effects of prescribed fire operations then could conceivably include loss of individuals. Planning for prescribed fire and/or mechanical reduction of hazard fuels would include avoidance, actions designed to minimize potential adverse impacts, and/or monitoring of plant responses to fire (and subsequent modification of additional prescribed fire burn plans to adaptively incorporate actions which would protect or enhance these rare plant populations). The potential impacts, therefore, or prescribed fire and mechanical treatment of hazard fuels on swamp sunflower, slender marsh-pink, graceful sedge, rough rush-grass, narrow-leaf sea-blite, golden dock, and retrorse flatsedge would be localized, short-term, adverse or beneficial, and negligible to minor.

In the context of the Endangered Species Act, the impacts of prescribed fire and mechanical reduction of hazard fuels under the preferred alternative on the great egret, snowy egret, eastern mud turtle, swamp sunflower, slender marsh-pink, graceful sedge, rough rush-grass, narrow-leaf sea-blite, golden dock, and retrorse flatsedge would be *may affect, but unlikely to adversely affect*.

Overall, then, the direct and indirect impacts of the preferred alternative on threatened, endangered, and sensitive species in Fire Island range from no impacts on some species to localized, short-term, adverse or beneficial, and negligible to minor impacts on other species. In the context of the Endangered Species Act, the impacts of the preferred alternative on all the identified species would be *no effect* or *may affect, but unlikely to adversely affect*.

Cumulative Effects: The direct and indirect impacts of the preferred alternative on threatened, endangered, and sensitive species in Fire Island NS range from no impacts on some species to localized, short-term, adverse or beneficial, and negligible to minor impacts on other species. Factors that contribute to cumulative effects on threatened, endangered, and sensitive species are agriculture, commercial and residential development, hunting and fishing, and other recreational activities inside and outside the park. Land use patterns are expected to continue relatively unchanged across most of the park. Potential impacts of increasing human use on the Seashore are mitigated by the actions proposed in the Endangered Species Habitat Management Environmental Assessment. The cumulative impacts of the preferred alternative on threatened, endangered, and sensitive species would be localized and negligible to moderate.

Conclusion: The direct and indirect impacts of the preferred alternative on threatened, endangered, and sensitive species in Fire Island NS range from no impacts on some species to localized, short-term, adverse or beneficial, and negligible to minor impacts on other species. The preferred alternative would not produce any major adverse impacts or impairment of threatened, endangered, and sensitive species whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 3: Appropriate Management Response and Non-fire Fuels Management

Impact Analysis: The direct and indirect effects of Alternative 3 on identified threatened, endangered, and sensitive species would be the same as those which would occur under the preferred alternative, except that any impacts attributable to prescribed burning would not occur. Therefore, Alternative 3 would have no direct or indirect adverse impacts on some of the threatened, endangered, and sensitive species identified above. With other species, the direct and indirect impacts would be localized, short-term, adverse or beneficial, and negligible to minor. In the context of the Endangered Species Act, the impacts of Alternative 3 on threatened, endangered, or sensitive species would range from *no effect* to *may affect, but unlikely to adversely affect*.

Cumulative Effects: The direct and indirect impacts of Alternative 3 on threatened, endangered, and sensitive species in Fire Island NS range from no impacts on some species to localized, short-term, adverse or beneficial, and negligible to minor impacts on other species. Factors that contribute to cumulative effects on threatened, endangered, and sensitive species are agriculture, commercial and residential development, hunting and fishing, and other recreational activities inside and outside the park. Land use patterns are expected to continue relatively unchanged across most of the park. Potential impacts of increasing human use on the Seashore are mitigated by the actions proposed in the Endangered Species Habitat Management Environmental Assessment. The cumulative impacts of Alternative 3 on threatened, endangered, and sensitive species would be localized and negligible to moderate.

Conclusion: The direct and indirect impacts of Alternative 3 on threatened, endangered, and sensitive species in Fire Island NS range from no impacts on some species to localized, short-term, adverse or beneficial, and negligible to minor impacts on other species. Alternative 3 would not produce any major adverse impacts or impairment of threatened, endangered, and sensitive species whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

WILDERNESS

Affected Environment. The Otis Pike Fire Island High Dune Wilderness, consisting of 1363 acres located between Smith Point and Watch Hill at the eastern end of the Seashore, was designated by Congress in 1980. It is the one of a very few NPS wilderness area in the Northeast Region and the only wilderness area of any designation in the State of New York. The center of the wilderness is divided by the nonfederal parcel of Bellport Beach. All residential type structures were removed by 1993. Boardwalks are found at the Smith Point and Old Inlet Areas. Minimal facilities (dock and restrooms) remain at Old Inlet. High dunes, swale, marsh, and estuary animal and vegetation species are found in the wilderness. Phragmites continues to increase in the marsh areas of the wilderness.

The Wilderness Management Plan (1983) directs that the wilderness area be managed in such a manner as to encourage the activity of natural processes.

Methodology. Information on the number of acres annually treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence. Other information was gathered from Fire Island NS documents and staff knowledge. Intensity of effects is defined above in Table 5.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – The wilderness characteristics of the Otis Pike Fire Island High Dune Wilderness are not diminished by wildland fire management activities.

Source – NPS Organic Act; NPS *Management Policies*; Wilderness Act.

Impacts of Alternative 1: No-Action
Impact Analysis: The no-action alternative would continue initial attack on an average of 1 or 2 wildland fires annually within the Seashore; only a small fraction of wildland fires occurs in the wilderness. The impacts of fire itself in the wilderness – burned areas, blackened scenes, new successional stages – are considered neutral or beneficial to wilderness characteristics. They should be expected in an area where the action of natural processes is encouraged. Therefore, no direct adverse effects are attributed to wildland fire itself. The direct impacts mentioned above may be considered beneficial to wilderness characteristics since they would give evidence of the action of natural processes; these may be long-term with the establishment of young vegetation communities following fire. The potential exists for indirect adverse impacts if invasive nonna-

tive species colonize burned areas. These impacts would be localized, negligible to minor, and short-term to long-term.

Temporary closures during wildland fire suppression operations to ensure visitor safety would displace some visitors, but the displacement would probably not extend beyond several hours at most. Noise from power equipment, such as chainsaws and portable pumps, may diminish wilderness character (solitude) for a few hours. Smoke from fires may restrict visibility and impact scenic views or become heavy enough to become a nuisance for short periods of time. Given the infrequency and small size of wildland fires, these direct adverse impacts of the no-action alternative on wilderness characteristics would be localized, short-term, and negligible to minor.

Potential direct adverse effects on wilderness characteristics would include evidence of fire suppression activities (tire tracks, firelines, aircraft use). Most of these evidences would be removed during rehabilitation concurrent with or immediately following fire suppression activities. Indirect adverse impacts of the no-action alternative would include a continued build-up of fuels, especially in fire-dependent vegetation communities, with a consequently increased risk of a larger, more intense wildland fire. These direct and indirect adverse impacts on wilderness characteristics would be localized, negligible to minor, and short-term.

Hazard tree removal and mowing of herbaceous vegetation would be conducted primarily in old fields and near park boundaries, park facilities, historic structures, and areas of high visitor use. Removal of hazard trees and mowing of herbaceous vegetation would not occur in the wilderness, so no direct or indirect adverse impacts would accrue from this aspect of the no-action alternative.

The overall direct and indirect impacts of the no-action alternative on wilderness characteristics in the Otis Pike Fire Island High Dunes Wilderness would be localized, short-term to long-term, adverse or beneficial, and negligible to minor.

Cumulative Effects: The direct and indirect impacts of the no-action alternative would be localized, short-term to long-term, adverse or beneficial, and negligible to minor. Other factors which contribute to cumulative impacts on wilderness characteristics include: visitor use, land management activities on adjacent nonwilderness lands, and the proximity of the wilderness to populated areas. A continued buildup of wildland fuels would increase the probability of larger fires and greater fire intensity, with subsequent impacts on wilderness characteristics being somewhat magnified. No other projects are proposed within the park that would contribute to cumulative impacts on wilderness characteristics. The cumulative effect of the no-action alternative would be localized and minor.

Conclusion: The no-action alternative would have localized, short-term to long-term, and negligible to minor, adverse to beneficial direct impacts on wilderness characteristics. The indirect impacts would be localized, short-term to long-term, adverse or beneficial, and negligible to minor. The no-action alternative would not produce any major adverse impacts or impairment of wilderness characteristics whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management

Impact Analysis: The preferred alternative would result in an incremental increase of acreage burned from slightly larger wildland fires suppressed under an appropriate management response (i.e., holding fires at existing barriers rather than constructing firelines). There would be a minor increase in smoke production and temporarily blackened acres from (a) potentially small increases in burned acreage by wildland fires managed under an appropriate management response and (b) prescribed burns. Direct and indirect impacts of wildland fire and fire suppression under an appropriate management response would be nearly indistinguishable from the no-action alternative. Thus the direct and indirect impacts on wilderness characteristics from managing wildland fire under an appropriate suppression response would be localized, short-term to long-term, adverse or beneficial, and negligible to minor.

Hazard tree removal and mowing of herbaceous vegetation would be conducted primarily in old fields and near park boundaries, park facilities, historic structures, and areas of high visitor use. Removal of hazard trees and mowing of herbaceous vegetation would not occur in the wilderness, so no direct or indirect adverse impacts would accrue from this aspect of the preferred alternative.

The other aspect of the preferred alternative is integrated management of wildland fuels. Components include prescribed burning and mechanical reduction of hazardous fuels. Mechanical removal of hazard fuels would not occur within the wilderness. Two to five prescribed fires may be conducted in pitch pine, oak, shrub, salt marsh, grassland, and/or "old field" communities on the Seashore totaling up to about 100-200 acres over a typical 5-year period. Individual prescribed fires would seldom exceed 50 acres. Prescribed burns tend to leave a mosaic of burned and unburned patches within a burn unit. The acres noted above are for the burn units; actual burned acreage would be smaller. Prescribed burning may be proposed at some time within the wilderness to maintain natural processes or reduce hazard fuels that would threaten to carry wildland fire into areas outside the wilderness.

Direct adverse impacts of prescribed burning on wilderness characteristics may include the presence of fire management personnel and equipment within the wilderness. If prescribed burning is conducted in the wilderness, these activities would occur quite infrequently (perhaps once or less in a typical 5-year period) and for very short periods of time (a few hours to a few days). Temporary closures may displace wilderness users for a few hours to a few days. Indirect impacts of prescribed burning would generally be beneficial to wilderness characteristics by creating greater diversity of vegetation communities and bearing evidence of the activity of natural processes. The direct and indirect impacts of this portion of the preferred alternative would be localized, short-term to long-term, adverse or beneficial, and negligible to minor.

Therefore, the direct impacts of the preferred alternative on wilderness characteristics would be localized, adverse or beneficial, short-term to long-term, and negligible to minor. The indirect impacts would be short-term, localized, negligible to minor, and adverse to beneficial.

Cumulative Effects: The direct and indirect impacts of the preferred alternative would be localized, short-term to long-term, adverse or beneficial, and negligible to minor. Other factors which contribute to cumulative impacts on wilderness characteristics include: visitor use, land management activities on adjacent nonwilderness lands, and the proximity of the wilderness to populated areas. No other projects are proposed within the park that would contribute to cumulative impacts on wilderness characteristics. The cumulative effect of the preferred alternative would be localized and minor.

Conclusion: The preferred alternative would have localized, short-term to long-term, adverse or beneficial, and negligible to minor direct impacts on wilderness characteristics. The indirect adverse impacts would be localized, short-term to long-term, adverse or beneficial, and negligible to minor. The preferred alternative would not produce any major adverse impacts or impairment of wilderness characteristics whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 3: Appropriate Management Response and Non-fire Fuels Management

Impact Analysis: The direct and indirect effects of Alternative 3 on wilderness characteristics would be the same as those which would occur under the preferred alternative, except that both the adverse and beneficial impacts of prescribed burning would not occur. Thus both the direct and indirect impacts of Alternative 3 would be localized, short-term to long-term, adverse to beneficial, and negligible to minor for wilderness characteristics.

Cumulative Effects: The direct and indirect impacts of Alternative 3 would be localized, short-term to long-term, adverse or beneficial, and negligible to minor. Other factors which contribute to cumulative impacts on wilderness characteristics include: visitor use, land management activities on adjacent nonwilderness lands, and the proximity of the wilderness to populated areas. A continued buildup of wildland fuels would increase the probability of larger fires and greater fire intensity, with subsequent impacts on wilderness characteristics being somewhat magnified. No other projects are proposed within the park that would contribute to cumulative impacts on wilderness characteristics. The cumulative effect of Alternative 3 would be localized and minor.

Conclusion: Alternative 3 would have localized, short-term to long-term, adverse or beneficial, and negligible to minor direct impacts on wilderness characteristics. The indirect adverse impacts would be localized, short-term to long-term, adverse or beneficial, and negligible to minor. Alternative 3 would not produce any major adverse impacts or impairment of wilderness characteristics whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

VISITOR EXPERIENCE, AESTHETIC RESOURCES, PARK OPERATIONS

Affected Environment. Fire Island National Seashore receives very heavy seasonal visitation. Activities include camping, picnicking, hiking, boating, fishing, clamming, hunting (in permitted areas in accordance with State laws), sunbathing, and swimming. A total of nearly 630,000 rec-

reational visitors entered Fire Island National Seashore in 2003; 72% of that visitation occurred from June through September, with over 52% of the annual recreational visits occurring in July and August.

The Robert Moses Causeway provides access to the western end of Fire Island. This is also the off-season vehicle access point for the Fire Island Lighthouse, Sailors Haven, and Sunken Forest. Vehicle access to the eastern end of the Island is via the William Floyd Parkway. The Seashore sites of Watch Hill and Talisman are reachable only by vessel. Vehicle access on Fire Island is attained by driving the beach and by very low standard access ways and dune crossings. A permit system regulates vehicle use. Visitors to Fire Island usually travel by boat from ferry terminals located on Long Island.

There are 17 communities within the boundaries of the park. There are approximately 4,100 homes on Fire Island, all within the park's authorized boundary, including two incorporated villages which have their own governing bodies. Approximately 350-500 people are year-round residents. Visitation on a peak season weekend day can be as high as 100,000 within the park areas and the communities combined.

Several of these communities, and those adjacent to the William Floyd Estate on Long Island, together with park staff typically provide the first response to wildland fire.

Values of the land are usually thought to derive from the visual qualities of landscapes, although they may also arise from appreciation for ecosystem integrity and health (Tarrant et al. 2002). Aesthetic values have an important place in this region due to the high human population density. Fire Island National Seashore is one of the few places in the area where residents and visitors can find a large, relatively undisturbed expanse of natural processes in action. The park administers the federal zoning standards for the seventeen communities to ensure the continuation of aesthetic values of the barrier island ecology for which the park was created.

Park staff provides the full scope of functions and activities to accomplish most management goals and meet requirements in law enforcement, emergency services, public health and safety, science, resource protection and management, visitor services, interpretation and education, community services, utilities, housing, fee collection, and management support.

Fire management activities that have the potential to affect park operations, visitor uses, and visitor experiences include suppression, prescribed burning, hazard tree removal, and hazard fuels projects. Suppression and prescribed fire would involve having additional personnel, engines, and other equipment in the area. Temporary closures may be imposed restricting access to visitors. Hazard fuels projects would also involve additional fire personnel in the area as well as use of chainsaws and vehicles.

Methodology. Information on the number of acres annually treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence. Other information was gathered from Fire Island NS documents and staff knowledge. Intensity of effects is defined above in Table 5.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Visitor activities and park operations are not substantially disrupted by fire management activities. The quality of visitor experiences is not adversely impacted by smoke or other fire management activities.

Source – NPS Organic Act; NPS *Management Policies*; Americans with Disabilities Act.

Impacts of Alternative 1: No-Action

Impact Analysis: The no-action alternative would continue initial attack on an average of 1 or 2 wildland fires annually. Removal of hazard trees and mowing of herbaceous vegetation would continue as funding permits. Depending on the location of a wildland fire, park operations and visitor uses may be temporarily disrupted, but the disruption would probably not extend beyond several hours at most. Temporary closures of roads and trails to ensure visitor safety would displace some visitors. Noise from power equipment such as chainsaws and portable pumps may diminish visitor experience. Smoke from fires may restrict visibility and impact scenic views or become heavy enough to become a nuisance for short periods of time. Other direct effects of the no-action alternative are a commitment of staff time to detection and initial attack. Given the infrequency and small size of wildland fires, these direct adverse impacts of the no-action alternative would be localized, very short-term, and negligible to minor.

Indirect adverse effects would include the presence of burned areas within views but that would also lend another aspect to the natural scene. Most burned areas would "green up" during the same season or, at the latest, the next spring. Other indirect adverse impacts of the no-action alternative would include a continued build-up of fuels, especially in fire-dependent vegetation communities, with a consequently increased risk of a larger, more intense wildland fire. These indirect adverse impacts on park operations, visitor experiences, and aesthetic resources would be localized, minor, and short-term to long-term.

Hazard tree removal and mowing of herbaceous vegetation would be conducted primarily in old fields and near park boundaries, park facilities, historic structures, and areas of high visitor use. Visitor access to the park facilities and historic resources may be curtailed in some locations for very short times during felling of hazardous trees. The direct adverse impacts to visitor use would be localized, very short-term, and negligible to minor.

Indirect adverse effects would include the sound of chainsaws for very short periods of time and a somewhat changed scene as hazard trees near park facilities and historic structures are reduced. Park neighbors may sense reduced risk to their properties and families as hazard trees are removed along park boundaries, a beneficial impact. The indirect impacts of hazard tree removal and mowing herbaceous vegetation would be localized, short-term, adverse or beneficial, and negligible to minor.

Cumulative Effects: The direct and indirect adverse impacts of the no-action alternative would be localized, short-term to long-term, and negligible to minor. Some indirect impacts may be beneficial. Other activities which contribute to cumulative impacts on visitor experiences, aes-

thetic resources, and park operations include: commercial and residential development, highway traffic and associated noise, other workloads, and other land management activities. The adverse impact of these activities is somewhat nullified since the expectation of solitude and quiet is diminished near a metropolitan area. Park roads and park facilities intrude on the visual scene, though they are situated so as to minimize the intrusion. A continued buildup of wildland fuels would increase the probability of larger fires and greater fire intensity, with subsequent impacts on visitor experiences, aesthetic resources, and park operations being somewhat magnified. No other projects are proposed within the park that would contribute to cumulative impacts on visitor experiences and aesthetic resources. The cumulative effect of the no-action alternative would be localized and minor.

Conclusion: The no-action alternative would have localized, short-term, and negligible to minor direct adverse impacts on visitor experiences, aesthetic resources, and park operations. The indirect adverse impacts would be localized, short-term, and minor. The no-action alternative would not produce any major adverse impacts or impairment of visitor experiences or aesthetic resources whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management

Impact Analysis: The preferred alternative would result in an incremental increase of acreage burned from slightly larger wildland fires suppressed under an appropriate management response (i.e., holding fires at existing barriers rather than constructing firelines). There would be a minor increase in smoke production and temporarily blackened acres from (a) potentially small increases in burned acreage by wildland fires managed under an appropriate management response and (b) prescribed burns. Smoke production would be of very limited duration in these fuels. Blackened areas usually green up within weeks to months (and no later than the following spring). Direct and indirect impacts of wildland fire and fire suppression under an appropriate management response would be nearly indistinguishable from the no-action alternative. Thus the direct adverse impacts on visitor experience, aesthetic resources, and park operations of managing wildland fire under an appropriate suppression response would be localized, short-term, and negligible to minor. The indirect impacts would be localized, short-term to long-term, negligible to minor, and adverse or beneficial.

Removal of hazard trees and mowing herbaceous vegetation in old fields and near visitor use areas and historic sites would not change from the no-action alternative (about 60-80 acres annually). Therefore, the direct and indirect impacts of this aspect of the preferred alternative would be indistinguishable from the same aspect of the no-action alternative. The direct and indirect impact would be localized, adverse or beneficial, short-term to long-term, and negligible to minor.

The other aspect of the preferred alternative is integrated management of wildland fuels. Components include prescribed burning and mechanical reduction of hazardous fuels. The components may be employed individually or combined with other components in a sequential integrated treatment program, depending on the needs of the treatment site. Mechanical reduction of

hazard fuels would be conducted on 10-15 acres annually (50-75 acres in a typical 5-year program). These would occur primarily near residential subdivisions, park facilities, visitor use areas, and historic structures. Woody material would be scattered or hand-piled for later burning or removal. Two to five prescribed fires may be conducted in pitch pine, oak, and/or "old field" communities totaling up to about 100-200 acres over a typical 5-year period. Individual prescribed fires would seldom exceed 50 acres. Prescribed burns tend to leave a mosaic of burned and unburned patches within a burn unit. The acres noted above are for the burn units; actual burned acreage would be smaller.

Direct adverse impacts may include minor displacement of some visitor activities during prescribed burn operations but that effect should be limited to a few hours each year. Other direct adverse impacts of increased burning on visitor experiences and aesthetic resources would include smoke in scenic views, temporary restrictions in access to some areas, and the presence of blacked areas within natural vistas. The potential direct adverse impact to visitor experiences, aesthetic resources, and park operations is localized, short-term, and negligible to minor. The low frequency and small size of these fires further reduces the potential adverse impacts. The indirect effect of prescribed burning would be the presence of blackened areas for short periods (days to a few months). Some visitors might find this displeasing; others may find the presence of burned areas pleasing. The presence of fire, smoke, and blackened areas presents an opportunity for interpretation of natural values and processes which may provide a minor, long-term, beneficial impact. The indirect effects of this portion of the preferred alternative would be localized, short-term, minor, and adverse or beneficial.

Mechanical removal of hazardous fuels would be conducted (a) during periods of low visitation or (b) in areas of restricted public access and managed to create little visual impact or change in scenic vistas. An average of no more than 10-15 acres would be treated annually, depending on availability of funds. Visitor access to the park would not be curtailed; consequently, there would be no direct adverse impacts to visitors. Indirect adverse effects would include the sound of chainsaws for very short periods of time and a somewhat changed scene as fuels near park facilities and historic structures are reduced. These effects are somewhat ameliorated by the location of the park near a metropolitan area where there is less expectation of quiet and solitude. Therefore, the adverse direct impacts of the preferred alternative on visitor experiences would be short-term, localized, and minor. Longer-term indirect impacts would include a reduced potential for large fires and subsequent reduced potential for substantive modifications of scenic vistas; these indirect impacts would be minor and beneficial.

Many of the hazard fuels projects under the preferred alternative would be adjacent to private property and homes. Completion of these projects would reduce the risk of wildland fire crossing park boundaries by reducing potential fire intensity at the interface. This long-term beneficial effect would be minor to moderate in magnitude.

Therefore, the direct adverse impacts of the preferred alternative would be localized, short-term, and minor. The indirect impacts would be short-term, localized, negligible to moderate, and adverse to beneficial.

Cumulative Effects: The direct adverse impacts of the preferred alternative would be localized, short-term, and negligible to minor. The indirect impacts would be localized, short-term, and minor adverse to moderately beneficial. Other activities which contribute to cumulative impacts on visitor experiences, aesthetic resources, and park operations include: commercial and residential development, highway traffic and associated noise, other workloads, and other land management activities. The adverse impact of these activities is somewhat nullified since the expectation of solitude and quiet is largely foregone near a metropolitan area. The park roads and park facilities intrude on the visual scene, though they are situated so as to minimize the intrusion. A continued buildup of wildland fuels would increase the probability of larger fires and greater fire intensity, with subsequent impacts on visitor experiences, aesthetic resources, and park operations being somewhat magnified. No other projects are proposed within the park that would contribute to cumulative impacts on visitor experiences and aesthetic resources. The cumulative effect of the preferred alternative would be localized and minor.

Conclusion: The preferred alternative would have localized, short-term, and negligible to minor direct adverse impacts on visitor experiences, aesthetic resources, and park operations. The indirect adverse impacts would be localized, short-term, and minor to moderate. The preferred alternative would not produce any major adverse impacts or impairment of visitor experiences or aesthetic resources whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 3: Appropriate Management Response and Non-fire Fuels Management

Impact Analysis: The direct and indirect effects of Alternative 3 on visitor experience, aesthetic resources, and park operations would be the same as those which would occur under the preferred alternative, except that both the adverse and beneficial impacts of prescribed burning would not occur. Thus the direct adverse impacts of Alternative 3 would be localized, short-term, and negligible to minor for visitor experience, aesthetic resources, and park operations. The indirect impacts would be localized, short-term, minor to moderate, and adverse or beneficial.

Cumulative Effects: The direct adverse impacts of Alternative 3 would be localized, short-term, and negligible to minor. The indirect impacts would be localized, short-term, and minor adverse to moderately beneficial. Other activities which contribute to cumulative impacts on visitor experiences, aesthetic resources, and park operations include: commercial and residential development, highway traffic and associated noise, other workloads, and other land management activities. The adverse impact of these activities is somewhat nullified since the expectation of solitude and quiet is largely foregone near a metropolitan area. The park roads and park facilities intrude on the visual scene, though they are situated so as to minimize the intrusion. A continued buildup of wildland fuels would increase the probability of larger fires and greater fire intensity, with subsequent impacts on visitor experiences, aesthetic resources, and park operations being somewhat magnified. No other projects are proposed within the park that would contribute to cumulative impacts on visitor experiences and aesthetic resources. The cumulative effect of Alternative 3 would be localized and minor.

Conclusion: Alternative 3 would have localized, short-term, and negligible to minor direct adverse impacts on visitor experiences, aesthetic resources, and park operations. The indirect adverse impacts would be localized, short-term, and minor to moderate. Alternative 3 would not produce any major adverse impacts or impairment of visitor experiences or aesthetic resources whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

CULTURAL RESOURCES

Affected Environment. Cultural resources can be categorized as archeological resources, historic structures, cultural landscapes, ethnographic resources, and museum objects.

Museum objects and submerged archeological resources would not be affected by any of the alternatives.

Archeological Resources: There are archeologically sensitive areas, features, and sites throughout the park. These include both pre-European contact and post-European contact resources. The William Floyd Estate contains extensive areas of archeological sensitivity, from pre-contact to mid-twentieth century. Numerous features and sites were identified by McCormick (1977). Additional features have been located and identified by park staff in the course of land management activities. For the most part, the identified features are considered stable (NPS 1998). An archeological overview is ongoing as part of the preparation for a new General Management Plan.

Historic resources: The William Floyd manor house is a two-story, 25-room, historic structure located in the northern part of the Estate. In addition to the main house, there are several historic out buildings, a cemetery, and lawns and gardens. There is a maintenance area including one permanent structure and two barns. The historic buildings are clumped in a 2-acre section of the 33-acre core historic district. Mowed and cultivated lawns are adjacent to the historic structures; there are no wildland fuels adjacent to the structures. The buildings are also surrounded by grounds that hide historic foundations, dumpsites, and roadbeds. The family cemetery is also located close to but outside the historic core to the east. The William Floyd Estate was listed on the National Register of Historic Places in October of 1980.

The first Fire Island Lighthouse was established in 1825 (the lighthouse present today was built in 1858). The Light Station area contains the remains of the first lighthouse- at Fire Island Inlet. Additionally, sites and features associated with the second lighthouse (1858), the United States Coast Guard (USCG), United States Life Saving Service (USLSS), and Voice of America are present in the area (McCormick 1977). The Fire Island Lighthouse was listed on the National Register of Historic Places in September of 1981.

Ethnographic Resources: The earliest inhabitants of Fire Island were likely the Secatogues who used the island for hunting (Klopfer et al. 2002). Cultural resource surveys have documented several sites related to historic American Indian use. Traditional cul-

tural uses have not been identified. An Ethnographic Overview Assessment is underway as part of the preparation for a new General Management Plan.

Cultural Landscapes: Cultural Landscape Studies are underway at the William Floyd Estate and Fire Island Lighthouse as part of the preparation for a new General Management Plan. The expectation is that these two areas will be recommended for designation as cultural landscapes.

The effects of wildland fire on archeological resources are influenced by fuel loading, soil texture and moisture, types (e.g., head fire v. backing fire) and rates of fire spread, and residence time (Ryan 2002). Fire effects, accordingly, may vary from negligible to moderate and adverse to beneficial.

Severe fires – those that burn in heavy fuel loads and exhibit long-residence time and a substantial downward heat pulse – may damage buried organic and inorganic materials. In heavy continuous fuels, temperatures at the soil surface may be sufficient to damage stone or ceramic resources by scorching, fracturing, charring, and spalling. Organic matter may be distilled or destroyed at temperatures of 200-300° Centigrade. Temperatures of 500-600° C will begin to affect stone materials. Temperatures diminish rapidly with soil depth; when surface temperatures are 500° C, the temperatures at a depth of 5 cm would be only about 200°C. With fires of light to moderate severity, residence time is usually short and the downward heat pulse is low. Ryan (2002) notes that soil heating is commonly shallow even when surface fires are intense. Surface fuel loading and duff accumulations in vegetation communities at Fire Island NS are generally light; wildland fires would tend to have light to moderate severity. Ryan (2002) noted that fires of moderate severity may consume surface fuel layers and cause charring of the top centimeter of the mineral soil.

Some effects of fires on archeological sites may be beneficial. When vegetation is removed, sites may become evident and accurate inventory and mapping can be completed.

For those historic sites and cultural landscapes which would be vulnerable to impacts from wildland or prescribed fire, such as historic structures, a wide range of options are available to eliminate or mitigate potential impacts. These include complete avoidance of prescribed fire in the vicinity of structures, blacklining around structures or features near wildland fires or proposed prescribed fires, treatment with fire retardant foam prior to or concurrent with fires, wrapping with heat reflective materials, and establishing sprinkler systems on and around structures prior to prescribed fires or concurrent with wildland fire suppression activities. Other standard cultural resource mitigation measures include the following: prior to doing treatment work, conduct an inventory of previously unsurveyed areas using an archeologist who meets the Secretary of the Interior's standards; monitor fire management activities and halt work if previously unknown resources are located; protect and record newly discovered resources; brief work crews about protecting cultural resources; dispose of slash in areas lacking cultural sites; avoid ground disturbance in areas containing known cultural sites; prior to implementation of work, protect character-defining elements of the site's cultural landscapes. For prescribed fires, mitigations would be included in the prescribed fire burn plan. In all cases, protection of structures and features will

be more important than minimizing acres burned. The New York SHPO would be consulted during preparation of the prescribed fire burn plans.

Methodology. Information on the number of acres annually treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence. Other information was gathered from Fire Island NS documents and staff knowledge. Intensity of effects is defined above in Table 5.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Historic properties and archeological sites are identified and inventoried and their significance and integrity are evaluated under National Register criteria. The qualities that contribute to the eligibility for listing or listing of historic properties or archeological sites on the NRHP are protected in accordance with the Secretary of the Interior's Standards.

Source – National Historic Preservation Act; Executive Order 11593; Archeological and Historic Preservation Act; Archeological Resources Protection Act; the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation; Programmatic Memorandum of Agreement Among the NPS, Advisory Council on Historic Preservation, and the National Council of State Historic Preservation Officers (1995); NPS Organic Act; NPS Management Policies.

Impacts of Alternative 1: No-Action

Impact Analysis: Under this alternative, wildland fires would be suppressed at the smallest reasonable acreage. Given recent fire incidence and typical fire return intervals, an estimated 5-10 fires would burn about 65-130 acres during a typical 5-year period. Average fire size over recent years has been about 13 acres and maximum fire size, with one exception, has been around 40 acres. Fire suppression activities in fine fuels include construction of "scratch" lines, blacklining, use of swatters, and direct attack with water. Fire suppression in heavier fuels would include construction of a handline to mineral soil and direct attack with water. Management constraints (see Description of Alternatives) note that retardant may be used; that off-road use of equipment such as engines is warranted only if the potential disturbance they would cause is less than resource damage from fire; and that heavy equipment such as bulldozers would be used only in the event of threats to human life or fire-susceptible historic properties. A wide range of mitigation measures (see Affected Environment above) is also available for use concurrent with fire occurrence.

Mechanical removal of hazard trees and mowing of herbaceous vegetation would be conducted on about 60-80 acres annually near park facilities, park boundaries, visitor use areas, and historic structures. This occurs mainly in old fields on the William Floyd Estate where the same areas and acres would be treated two to five years within a typical 5-year period. Woody material would be left on site to decay or hand-piled for later removal.

Archeological Resources

Wildland fires have probably burned over the archeological resources of Fire Island National Seashore many times since their original deposition. Since most of the vegetation communities within the park are relatively young (an obvious exception being the Sunken Forest), the fire behavior and fire intensity associated with future fires will probably be within the normal range of variation.

Heat from typical surface fires would be insufficient to damage artifacts and other archeological materials in subsurface settings even if they are buried only a few centimeters below the ground surface. The direct adverse impacts of fire on archeological resources at Fire Island NS would generally be negligible. Fire may also expose archeological resources as vegetation is removed. This may allow the discovery, more accurate mapping, and/or more complete assessment of archeological resources. This indirect effect would be short-term to long-term, minor, and beneficial.

The direct adverse impacts of fire suppression on archeological resources under the no-action alternative would be to displace surface materials, expose buried archeological materials during handline construction, or disturb materials immediately below the surface with vehicle use. The indirect effects include exposure of artifacts to erosion and theft. Given (a) very infrequent fire occurrence, (b) small fire size, and (c) implementation of identified mitigations and management constraints, the direct and indirect adverse effects of the no-action alternative on archeological resources would be localized and minor.

The direct adverse impact of mechanical hazard tree removal and mowing of herbaceous vegetation would be exposure of materials due to ground disturbance by vehicles associated with the activities. Indirect adverse impacts would include exposure of artifacts to erosion and theft. With avoidance of known archeological resources and implementation of mitigation actions, the direct and indirect adverse impacts of hazard tree removal would be localized, short-term, and minor.

Historic Structures

Historical structures and sites with flammable wooden elements are especially vulnerable to wildfires and suppression activities. Historic buildings and other historic, wooden structures include the Fire Island Lighthouse and the William Floyd Estate complex of buildings; both are listed on the National Register. In developed areas, presuppression and routine maintenance activities would help to maintain structural clearance from the surrounding vegetation. During the suppression of wildland fires, mitigation would include some or all of the strategies discussed above.

The direct adverse impact of wildland fire on historic structures could be destruction or damage to the structures if fire contacts the structures directly. The indirect impacts would include smoke impacts. The direct adverse impact of fire suppression on historic structures would be limited to the potential to damage such structures by contact with firefighting equipment. Indirect adverse impacts include the possibility of damaging the historic integrity

of sites. The direct and indirect adverse effects of fire suppression on historic structures under the no-action alternative would be localized and negligible to minor. Given the infrequent fire occurrence and small fire size, the likelihood of such adverse effects is further diminished.

The direct adverse impact of mechanical hazard tree removal and mowing of herbaceous vegetation would be damage to structures if hazard trees contact the structures during falling operations or damage to structures by vehicles associated with the activities. Indirect adverse impacts would include potential loss of historic fabric by removal of trees associated with the historic scene. With implementation of mitigation actions, the direct and indirect adverse impacts of hazard tree removal would be localized, short-term, and minor.

Ethnographic Resources

American Indian Tribes are often reticent about identifying locations of sensitive sites, so some ethnographic sites may remain undocumented. If ethnographic resources are lost or damaged by wildland fires, fire suppression activities, and hazard tree removal, long-term minor to moderate adverse impacts would occur.

Cultural Landscapes

Within the park, two potential cultural landscapes are being evaluated. Fires or damage from suppression activities or hazard tree removal also can result in direct adverse impacts by removing important landscape elements, structures, or historic sites and leaving behind unsightly burned and scorched vegetation, stumps, and unvegetated firelines.

Since both potential cultural landscapes are associated with historic structures, the potential adverse impacts would be the same as those described for historic structures. The direct and indirect adverse effects of fire and fire suppression activities on cultural landscapes under the no-action alternative would be localized and negligible to minor.

The direct adverse impacts of the no-action alternative on cultural resources would, therefore, be localized, short-term, and negligible to minor. The indirect impacts of the no-action alternative on cultural resources would be localized, short-term, minor, and adverse to beneficial.

Cumulative Effects: Both within and outside the park, natural erosion and aging contribute to cumulative effects on archeological resources, historic structures, and cultural landscapes. Vandalism or theft may also diminish their values. The number and variety of archeological and historic resources in the region continue to be diminished through the development of residences, highways, utility lines, waterworks and businesses, erosion, and collection of artifacts for profit or personal interest. The direct adverse impacts of the no-action alternative would be localized and negligible to minor. The indirect adverse impacts would be localized and negligible to minor. No projects or activities are proposed in the park in the foreseeable future that would contribute to cumulative effects. The cumulative effects of the no-action alternative are regarded as adverse, localized, and minor to moderate.

Conclusion: The no-action alternative would have localized and negligible to minor adverse direct impacts on cultural resources. The indirect adverse impacts would be localized, short-term, and negligible to minor. The no-action alternative would not produce any major adverse impacts or impairment of cultural resources whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management

Impact Analysis: As noted above under the no-action alternative, the effects of fire on surface and subsurface artifacts vary with fuel loading and fire behavior. More intense fire on surface artifacts may cause scorching, fracturing, charring, and spalling. If artifacts are buried under as little as 1 cm of soil, the effects are far less. Head fires generate a smaller downward heat pulse than do backing fires. With prescribed burning, use of head fires can reduce any potential impact on unknown surface archeological resources. Fire suppression and prescribed fire activities include construction of "scratch" lines, handlines, blacklining, use of swatters and other hand tools, and direct attack with water.

The amount of fire on the landscape would be increased under the preferred alternative. With use of appropriate management responses to wildland fires, acreage may increase slightly as natural and man-made barriers are used in lieu of constructed firelines. Under this alternative, 2-5 prescribed fires may treat about 100-200 acres of oak forest, pitch pine, and old fields with broadcast prescribed fire in a typical 5-year period. Most prescribed fires would be less than 50 acres. Fire prescriptions would be designed to minimize soil heating and thus avoid impacts to buried archeological resources. Prescribed fires would generally be designed to avoid historic resources. If prescribed burning was proposed near the historic resources, the prescribed burn plan would specify actions to avoid or mitigate potential adverse impacts to known structures or features.

Hazard tree removal and mowing herbaceous vegetation in old fields near park facilities, park boundaries, visitor use areas, and historic sites would continue on about 60-80 acres annually, though some mowing in old fields may be replaced with prescribed burning.

Mechanical reduction treatment of hazardous wildland fuels would be conducted on 10-15 acres annually near park facilities, park boundaries, visitor use areas, and historic structures. Woody material would be hand-piled for later removal or burning. Pile burning would be conducted during periods when the potential for fire escape is very low.

Archeological Resources

Heat from typical surface fires would be insufficient to damage artifacts and other archeological materials in subsurface settings even if they are buried only a few centimeters below the ground surface. The direct adverse impacts of fire on archeological resources at Fire Island NS would generally be negligible. Fire may also expose archeological resources as vegetation is removed. This may allow the discovery, more accurate mapping, and/or more

complete assessment of archeological resources. This indirect effect would be short-term to long-term, minor, and beneficial.

With the preferred alternative, wildland fires may burn a slightly larger acreage as appropriate management responses are implemented. This, however, would result in fewer firelines and avoidance of known archeological sites. The direct adverse impacts of fire suppression on archeological resources under the preferred alternative would be to displace surface materials, expose buried archeological materials during hand-line construction, or disturb materials immediately below the surface with vehicle use. Initial attack, however, would focus on using natural barriers and other tactics with minimal ground disturbance. The indirect adverse effects include exposure of artifacts to erosion and theft. With implementation of identified mitigations and management constraints, the direct and indirect adverse effects of fire suppression on archeological resources under the preferred alternative would be localized and minor. The relative infrequency and small size of wildland fires would further diminish the probability of adverse impacts.

The direct and indirect effects of hazard tree removal and mowing of herbaceous vegetation would be the same as those described for the no-action alternative. With avoidance of known archeological resources and implementation of mitigation actions, the direct and indirect adverse impacts of hazard tree removal and mowing herbaceous vegetation would be localized, short-term, and minor.

In implementing prescribed burns, known archeological sites could be avoided during preparation of control lines. The direct adverse impacts of prescribed burning would be to damage stone or ceramic resources by scorching, fracturing, charring, and spalling if fire severity is quite high. However, fire severity in surface fires would usually elevate temperatures at the ground surface only slightly. Prescribed fires would be designed to avoid known archeological sites with surface organic material. Indirect adverse impacts include exposure of surface artifacts to erosion or theft. Most burned areas would "green up" within the same season or, at the latest, the next spring. Regrowth would then diminish the possibility of artifacts being eroded or stolen. Thus the direct and indirect adverse impacts of prescribed burning would be localized, short-term, and minor.

Most mechanical treatments of hazardous fuels would occur near park facilities, park boundaries, historic structures, and visitor use areas. The direct adverse impact of mechanical hazard fuel reductions would be exposure of materials or damage to artifacts due to ground disturbance by vehicles associated with the activities. Indirect adverse impacts would include exposure of artifacts to erosion and theft. With avoidance of known archeological resources and implementation of mitigation actions, the direct and indirect adverse impacts of hazard fuel reductions would be localized, short-term, and minor.

Historic Structures

Again, slightly more acres may be burned when wildland fires are managed under an appropriate management response. The direct adverse impact of wildland fire on historic structures could be destruction or damage to the structures if fire contacts the structures directly.

The indirect impacts would include smoke impacts. The direct adverse impact of fire suppression on historic structures would be limited to the potential to damage such structures by contact with firefighting equipment. Indirect adverse impacts include the possibility of damaging the historic integrity of sites. Given the proposed hazard fuel reduction projects near historic structures, the direct and indirect adverse effects of fire suppression on historic structures under the preferred alternative would be localized and negligible to minor. The relative infrequency and small size of wildland fires would further diminish the probability of adverse impacts on historic structures.

The direct and indirect effects of hazard tree removal and mowing of herbaceous vegetation would be the same as those described for the no-action alternative. With avoidance of historic resources and implementation of mitigation actions, the direct and indirect adverse impacts of hazard tree removal and mowing herbaceous vegetation would be localized, short-term, and minor.

Most prescribed burning would not be conducted near historic structures. When prescribed burning is proposed near such resources, one or more of the mitigations mentioned under the Alternatives section above would be included in the prescribed fire plan and implemented prior to ignition. With mitigations in place, there should be no direct adverse impacts to historic structures. Indirect adverse impacts would include smoke drifting into structures. Prescriptions using wind directions that move smoke away from structures would reduce or eliminate this effect. Given the location of prescribed fires and typically small burn block size, the direct and indirect adverse impacts of prescribed burning on historic structures would be localized, short-term, and negligible to minor.

Mechanical hazardous fuels reduction would occur near historic resources. There would be no direct adverse impacts of hazardous fuels reduction actions to such resources. Indirect beneficial impacts would include reducing the threat of wildland fire near the historic resources, reducing the potential damage of vegetation encroachment on the resources, and preserving more historic scenes at the sites. The indirect impacts would be localized, short-term to long-term, negligible to minor, and beneficial.

The direct and indirect adverse impacts of the preferred alternative on historic structures would be localized, short-term, and negligible to minor. Long-term indirect impacts would be beneficial.

Ethnographic Resources

American Indian Tribes are often reticent about identifying locations of sensitive sites, so some ethnographic sites may remain undocumented. All aspects of the proposed action, as with the no-action alternative, have some potential to adversely affect ethnographic resources. Direct adverse impacts may include the loss of or damage to traditional cultural properties. Indirect adverse effects would include diminishing the integrity of traditional cultural properties if loss occurred; beneficial impacts would include the restoration of plant communities to a more natural condition. If ethnographic resources are identified, the proposed actions under the preferred alternative would avoid such resources. The direct and in-

direct effects of the preferred alternative on ethnographic resources would be localized, adverse or beneficial, short-term or long-term, and negligible to minor.

Cultural Landscapes

Within the park, two potential cultural landscapes are being evaluated. Wildland and prescribed fires, suppression activities, hazard tree removal, and hazard fuels reductions have the potential to result in direct adverse impacts by removing important landscape elements, structures, or historic sites and leaving behind unsightly burned and scorched vegetation, stumps, and unvegetated firelines. On the other hand, a long-term indirect effect of prescribed fires and hazard fuels reduction projects, by reducing accumulated fuels, may be restoring the integrity of cultural landscapes. This would be considered a long-term benefit. The direct and indirect effects on cultural landscapes under the preferred alternative would be localized, short-term to long-term, adverse or beneficial, and negligible to minor.

Therefore, the direct adverse impacts of the preferred alternative on the cultural resources would be localized, short-term, and negligible to minor. The indirect impacts would be localized, short-term to long-term, negligible to minor, and adverse or beneficial.

Section 106 Summary: Historic properties occurring in Fire Island NS were determined by reviewing past survey work and previously recorded sites. The Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR Part 800.5, Assessment of Adverse Effects) were applied to those predicted resource types. The National Park Service concludes that with proposed mitigation, implementation of the preferred alternative would have no adverse effect on cultural resources at Fire Island NS.

Cumulative Effects: Both within and outside the park, natural erosion and aging contribute to cumulative effects on archeological resources, historic structures, and cultural landscapes. Vandalism or theft may also diminish their values. The number and variety of archeological and historic resources in the region continue to be diminished through the development of residences, highways, utility lines, waterworks and businesses, erosion, and collection of artifacts for profit or personal interest. The direct adverse impacts of the preferred alternative would be localized and negligible to minor. The indirect adverse impacts would be localized, adverse or beneficial, short-term to long-term, and negligible to minor. No projects or activities are proposed in the park in the foreseeable future that would contribute to cumulative effects. The cumulative effects of the preferred alternative are regarded as adverse, localized, and minor to moderate.

Conclusion: The preferred alternative would have localized and negligible to minor adverse direct impacts on cultural resources. The indirect impacts would be localized, adverse or beneficial, short-term to long-term, and negligible to minor. The preferred alternative would not produce any major adverse impacts or impairment of cultural resources whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Impacts of Alternative 3: Appropriate Management Response and Non-fire Fuels Management

Impact Analysis: The direct and indirect effects of Alternative 3 on cultural resources would be the same as those which would occur under the preferred alternative, except that both the adverse and beneficial impacts of prescribed burning would not occur. Thus the direct adverse impacts of Alternative 3 would be localized, short-term, and negligible to minor. The indirect impacts of Alternative 3 on cultural resources would be localized, short-term to long-term, negligible to minor, and adverse or beneficial.

Cumulative Effects: Both within and outside the park, natural erosion and aging contribute to cumulative effects on archeological resources, historic structures, and cultural landscapes. Vandalism or theft may also diminish their values. The number and variety of archeological and historic resources in the region continue to be diminished through the development of residences, highways, utility lines, waterworks and businesses, erosion, and collection of artifacts for profit or personal interest. The direct adverse impacts of Alternative 3 would be localized and negligible to minor. The indirect adverse impacts would be localized, adverse or beneficial, short-term to long-term, and negligible to minor. No projects or activities are proposed in the park in the foreseeable future that would contribute to cumulative effects. The cumulative effects of Alternative 3 are regarded as adverse, localized, and minor to moderate.

Conclusion: Alternative 3 would have localized and negligible to minor adverse direct impacts on cultural resources. The indirect impacts would be localized, adverse or beneficial, short-term to long-term, and negligible to minor. Alternative 3 would not produce any major adverse impacts or impairment of cultural resources whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

Chapter 4 – CONSULTATION/COORDINATION

Agencies/Organizations/Persons Contacted

Federal Agencies
U.S. Fish and Wildlife Service

Tribes

State and Local Governments and Agencies
New York State Forest Rangers
New York State Department of Environmental Conservation
New York State Historic Preservation Officer
Mastic Beach Fire Department
Patchogue Fire Department
Cherry Grove Fire Department
Davis Park Fire Department
Dunewood Fire Department
Fair Harbor Fire Department
Fire Island Pines Fire Department
Kismet Fire Department
Ocean Bay Park Fire Department
Ocean Beach Fire Department
Point-O-Woods Fire Department
Saltaire Fire Department
Suffolk County Fire Marshal's Office
Suffolk County Fire, Rescue, and Emergency Services

Other Organizations and Individuals
Fire Island Wilderness Committee

Preparers

Stephen Petersburg, Wildland Fire Associates
George Leone, Collateral Duty Fire Management Officer, Fire Island National Seashore
Michael Bilecki, Chief of Resources Management, Fire Island National Seashore
Odin Smith, Environmental Protection Specialist, Fire Island National Seashore
Richard Stavdal, Supervisory Park Ranger, Fire Island National Seashore

List of EA Recipients

Federal Agencies
U.S. Fish and Wildlife Service
U.S. Coast Guard
Environmental Protection Agency

Tribes

State and Local Governments and Agencies

New York State Forest Rangers
New York State Department of Environmental Conservation
New York State Historic Preservation Officer
Mastic Beach Fire Department
Patchogue Fire Department
Cherry Grove Fire Department
Davis Park Fire Department
Dunewood Fire Department
Fair Harbor Fire Department
Fire Island Pines Fire Department
Kismet Fire Department
Ocean Bay Park Fire Department
Ocean Beach Fire Department
Point-O-Woods Fire Department
Saltaire Fire Department
Suffolk County Fire Marshal's Office
Suffolk County Fire, Rescue, and Emergency Services
Town of Brookhaven
Town of Islip
Village of Saltaire
Village of Ocean Beach
Smith Point County Park
Robert Moses State Park

Other Organizations and Individuals

Fire Island Wilderness Committee
All Community associations on Fire Island, in Shirley and Mastic Beach
The Nature Conservancy
Audubon Society
Wilderness Society

REFERENCES

Anderson, H.E. 1982. Aids to determining fuel models for estimating fire behavior. USDA For. Serv. Gen. Tech. Rep. INT-22. Intermt. For. And Range Exp. Stn., Ogden, Utah 84401. 22p.

Backman, A.E. and W.A. Patterson III. 1984. Fire and long-term development of the Sunken Forest at Fire Island, New York.

Baker, J.C. and W. C. Hunter. 2002. Effects of Forest Management On Terrestrial Ecosystems. *In* Wear, D.N. and J.G. Greis, eds. 2002. Southern Forest Resource Assessment. Gen.

Tech. Rep. SRS-53. USDA, Forest Service, Southern Research Station. Asheville, NC. 635 p.

Caldecutt, W.J. 1997. Freshwater wetlands delineation and inventory of wetland herpetological species on Fire Island National Seashore. State University of New York, Stony Brook, NY. Report to the National Park Service. 5 pp.

Chi, C.T., D.A. Horn, and R.B. Reznik. 1979. Source assessment: prescribed burning, state of the art. EPA–600/2–79–019h. Research Triangle Park, NC: U.S. Environmental Protection Agency, Industrial Environment Research Laboratory. 107 pp.

Chamberlin, T.W., R.D. Harr and F.H. Everest. 1991. Timber harvesting, silviculture, and watershed processes. American Fisheries Society Special Publication. 19:139-179.

Conner R.C. and A.J. Hartsell. 2002. Forest Area and Conditions. *In* Wear, D.N. and J.G. Greis, eds. 2002. Southern Forest Resource Assessment. Gen. Tech. Rep. SRS-53. USDA, Forest Service, Southern Research Station. Asheville, NC. 635 p.

Cross, Diana Harding. 1983. Wildlife habitat improvement by control of Phragmites communis with fire and herbicide. Fort Collins, CO: Colorado State University. 81 p. M.S. Thesis.

Fabre, L.L., S.M. Stevens-Nerone, and E. Taylor. Undated (ca. 2003). Northeast Coastal Barrier Network: vertebrate species of Fire Island National Seashore. Report of the NPS Inventory and Monitoring Program. 83 pp.

Horton, L.J., W.A. Patterson, A.E. Backman, and J.L. Rudnicky. 1986. Fire Regimes on Fire Island National Seashore.

Kirby, R.E., S. J. Lewis, and T.N. Sexson. 1988. Fire in North American wetland ecosystems and fire-wildlife relations: an annotated bibliography. U.S. Fish and Wildlife Services, Biological Report 88(1):1-146.

Klopfer, S.D., A. Olivero, L. Sneddon, and J. Lundgren. 2002. Final Report of the NPS Vegetation Mapping Project at Fire Island National Seashore. Conservation Management Institute, Virginia Tech, Blacksburg, VA. 209 pp.

Larson, D.L., W.E.Newton, P. J. Anderson, and S.J. Stein. 1999. Effects of Fire Retardant Chemical and Fire Suppressant Foam on Shrub Steppe Vegetation in Northern Nevada. International Journal of Wildland Fire 9(2): 115–127, 1999.

McCormick, J. 1977. Final Report on a Document Review and An Archeological Reconnaissance of the William Floyd Estate and the Fire Island Lighthouse Tract, Fire Island National Seashore, Suffolk- County, New York. 164pp.

Minshall, G.W. and J.T. Brock. 1991. Observed and anticipated effects of forest fires on Yellowstone stream ecosytems. *In* R. B. Keller and M.S. Boyce, eds. The Greater Yellow-

stone Ecosystem: Redefining America's Wilderness Heritage. Yale University Press. pp. 123-135.

National Park Service. 1983. Wilderness Management Plan, Otis Pike Fire Island Wilderness Area. Fire Island National Seashore, Patchogue, NY.

National Park Service. 1998. Resource Management Plan. Fire Island National Seashore, Patchogue, NY. 32 pp.

National Park Service. 1998. Environmental Assessment for Endangered Species Habitat Management. Fire Island National Seashore, Patchogue, NY. 61 pp.

National Park Service. 2001. Management Policies. U.S. Department of Interior, Washington, D.C.

Ryan, K.C. 2002. Dynamic Interactions between Forest Structure and Fire Behavior in Boreal Ecosystems. Silva Finnica 36(1):13-39.

Stanturf, J.A., D.D. Wade, T. A. Waldrop, D. K. Kennard, and G. L. Achtemeier. 2002. Fire in Southern Forest Landscapes. *In* Wear, D.N. and J.G. Greis, eds. 2002. Southern Forest Resource Assessment. Gen. Tech. Rep. SRS-53. USDA, Forest Service, Southern Research Station. Asheville, NC. 635 p.

Stavdal, R. 2004. Personal Communication: Fire History of the William Floyd Estate. 2pp.

Swanson, D. N. 1991. Natural Processes. *In* Influences of Forest and Rangeland Management on Salmonid Fisheries and Their Habitats. W. R. Meehan, ed. American Fisheries Society Special Publication 19. Bethesda, Maryland. p. 139-179.

Tiedemann, A.R., C.E. Conrad, J.H. Dieterich, J.W. Hornbeck, W.F. Megahan, L.A Viereck, and D.D. Wade. 1979. Effects of Fire on Water. U.S. Forest Service General Tech. Report WO-10.

Trani-Griep, M.K. 2002a. Terrestrial Ecosystems. *In* Wear, D.N. and J.G. Greis, eds. 2002. Southern Forest Resource Assessment. Gen. Tech. Rep. SRS-53. USDA, Forest Service, Southern Research Station. Asheville, NC. 635 p.

Trani-Griep, M.K. 2002b. Maintaining Species in the South. *In* Wear, D.N. and J.G. Greis, eds. 2002. Southern Forest Resource Assessment. Gen. Tech. Rep. SRS-53. USDA, Forest Service, Southern Research Station. Asheville, NC. 635 p.

Underwood, H.B., F.D. Verret, and J.P. Fischer. 1998. Density and herd composition of White-tailed deer populations of Fire Island National Seashore. Report to the NPS.

USDI/USDA. 1995. Federal Wildland Fire Management Policy and Program Review. Final Report. National Interagency Fire Center, Boise, ID. 45 pp.

USDI/USDA. 1998. Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide. National Interagency Fire Center, Boise, ID. 80 pp. + App.

Warner, J.W. Jr., W.E. Hanna, R.J. Landry, J.P. Wulforst, J.A. Neeley, R.L. Holmes, and C.E. Rice. 1975. Soil Survey of Suffolk County, New York. USDA, Soil Conservation Service and Cornell Agricultural Experiment Station. 101 pp. + maps.