Chapter 4

Seaside sedge
USFWS photo

Environmental Consequences

- Introduction
- Effects on Water Quality and Soils
- Effects on Air Quality
- Effects on the Local and Regional Economy
- Effects on Public Access, Educational and Recreational Opportunities
- Effects on Cultural Resources
- Effects on Vegetation and Habitats
- Effects on Threatened and Endangered Species
- Effects on Seabirds, Wading Birds, and Waterfowl
- Effects on Other Native Wildlife of Concern
- Effects of Wilderness Recommendations
- Environmental Justice
- Cumulative Impacts
- Relationship Between Short-term Uses and Long-term Productivity
- Unavoidable Adverse Effects
- Potential Irreversible and Irretrievable Commitment of Resources

Introduction

This chapter describes the environmental consequences we predict from implementing the management alternatives presented in Chapter 2. Where detailed information is available, we present a scientific and analytic comparison between alternatives and their anticipated consequences, which we describe as "impacts" or "effects". In the absence of detailed information, we make comparisons based on our professional judgment and experience. We specifically predict the effects of implementing the management actions and strategies for each of the four alternatives: Alternative A (Current Management), which serves as the baseline for comparing Alternatives B (Service's Preferred Alternative), Alternatives C, and D.

We discuss in more detail the impacts to those resources associated with the goals and significant issues identified in Chapter 1 - Purpose and Need for Action. Direct, indirect, short-term, beneficial and adverse effects likely to occur over the 15 year life span of the plan are discussed. Beyond the 15-year planning horizon, we give a more speculative description of the direct, indirect, and cumulative effects. Table 4-3 summarizes the effects predicted for each alternative and allows for a side-by-side comparison. Finally, this chapter identifies any irreversible and irretrievable commitments of resources and the relationship of short-term uses and long-term productivity.

As you read our descriptions of impacts, we ask that you also keep in mind the relative size of the Refuge in geographic proportion to the entire Gulf of Maine ecosystem. The Refuge comprises 7,961 acres, a relatively small land base compared to the 26 million acre ecosystem. We generally describe the direct and indirect environmental effects on a finer, or more local, geographic scale since these are easier to determine with any certainty. We would also like to point out that Refuge lands are not isolated units, and our prediction on the extent and duration of impacts may be less accurate when considering the influence on the surrounding landscape. In other words, we may have overstated some effects within their larger geographic context.

Herring gull
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Although the Refuge lands comprise only .03% of the ecosystem, all alternatives were developed to contribute towards conservation goals in a larger geographic context. The proposed species and habitat actions are consistent with the State, Regional, Ecosystem Team, and watershed conservation plans identified in Chapter 1. At varying levels, they would each make positive contributions to these larger landscape-scale conservation endeavors.

Where we do not have reliable, quantitative information, we use the terms "positive", "negative", and "neutral" as qualitative measures of how an action could impact resources of concern. A positive impact implies an action we predict would enhance or benefit the resources under consideration and help accomplish goals and objectives over the short- (<15 years) or long-term (>15 years). A negative impact implies an action we predict would be detrimental to a resource over the short- or long-term, possibly affecting our ability to achieve goals and objectives. A neutral impact means either (a) there would be no discernible effect, positive or negative, on the resources under consideration; or, (b) predicted positive and negative effects would cancel each other out.

There are certain types of actions identified in Chapter 2 that do not require additional NEPA analysis because they do not individually, or cumulatively, have a significant effect on the human environment. These actions are "categorically excluded" from further analysis or review and, as such, their consequences are not further described in this chapter. These categorically excluded actions include, but are not limited to, the following:

- environmental education and interpretation programs (unless major construction is involved)
- research, resource inventories, and other resource information collection activities
- operations and maintenance of existing infrastructure and facilities (unless major renovation is involved)
- routine, recurring management activities and improvements
- small construction projects (e.g. fences, berms, small water control structures, interpretative kiosks, development of access for routine management purposes)
- vegetation plantings
- reintroduction of native plants and animals
- minor changes in amounts or types of public use
- issuance of new or revised management plans when only minor changes are planned
- law enforcement activities

We have organized this chapter by major resource heading. Under each heading, we offer an introduction and explanation of potential threats. This is followed by our analysis, organized by alternative, and sub-divided by the four refuge programs expected to result in the biggest resource impacts: 1) land acquisition and protection; 2) public use and access management; 3) vegetation and habitat management; and 4) wildlife populations management. Exceptions to this organization are our discussions on impacts to the local economy, cultural resources, and wilderness.

Effects on Water Quality and Soils

Maine's coastal area is the State's main attraction and has become the single most important resource for tourism and the recreation industry in the state (Colgan and Plumstead 1995). Commercial and private development pressures along Maine's coast continue to increase with additional waterfront real estate being developed for summer homes, piers, and docks. This development, combined with associated human activities, can alter water quality, as well as displace and/or eliminate vegetation, resulting in increased soil disturbance, erosion and storm water runoff and change water circulation patterns. In particular, deteriorating water quality, decreased soil productivity, and erosion in coastal Maine has become a priority issue for State agencies and local communities. Direct impacts can include filling, dredging, dragging, riprapping, damming, covering, impounding, scraping, or other physical activities (Ward 1999). Although building projects may appear small and losses minimal, their cumulative effect can be significant. Direct or nonpoint discharges of pollution can cause increased water temperatures, degrade water quality, create turbid conditions, change currents, or alter water salinity. Any of these can diminish habitat quality or make the area unsuitable for native species.

Failing septic systems have been implicated as one of the major contributors to water quality problems in coastal Maine. When septic systems fail, untreated nitrogen and bacteria may flow directly into groundwater, streams or coastal waters. Even in fully functioning systems, it is estimated that only half the nitrogen dissipates during treatment (Horsley and Witten Inc. 1995). Increasing restrictions on intertidal harvesting due to bacterial contamination is an indication of how degraded water quality can directly effect an important tradition and economic resource for coastal Maine. These same areas also are extremely important to wildlife species, who rely on many of the same resources for food and habitat.

Public use of Maine's islands is increasing and damage to soils and water quality is evident in heavily used areas. Soils can be impacted by reduction in soil macro porosity, decreased air and water permeability, accelerated erosion, loss of ground cover, and increased soil compaction. Water quality can also be affected by public use of islands through improper disposal of human waste, garbage, and litter which can degrade water quality, cause death to marine life, and impair scenic values. Where camping is allowed, soil compaction and vegetation damage can occur at tent site locations.

Saltmarsh on Gouldsboro Bay Division
USFWS photo

A cooperative, interagency, watershed-level approach to protecting these resources offers the greatest opportunity to improve conditions over the long term. On a local level, Refuge management can help improve conditions in

four ways: 1) acquire wetlands, associated uplands, and coastal islands threatened with development; 2) facilitate protection by others of important coastal habitats; 3) exchange technical information with landowners on best management practices; and, 4) restore degraded areas. There are, however, some management practices we employ, (such as herbicides and prescribed fire), that have the potential to negatively impact water quality and soils.

Under each alternative, we present the beneficial and potential adverse consequences of our proposed management.

Alternative A (Current Management)

Impacts from Proposed Land Acquisition and Protection

Under Alternative A, we do not anticipate any negative impacts to water quality or soils from our land acquisition and protection program. On the contrary, Alternative A would result in the Service acquiring the 467.1 acres currently within Petit Manan Refuge's approved acquisition boundary, and 30 additional coastal islands (881 acres), providing all with permanent protection from development. Together, these mainland and islands would result in 1,274 acres protected from further human-induced degradation. Service acquisition of these lands would eliminate the direct and indirect threats, and short- and long-term impacts associated with development and public over-use and would maintain or enhance the water quality and soils over the long- term.

Under Alternative A, we would continue to work with the Gulf of Maine Program and MDIFW to identify significant habitat areas in need of protection. We would continue to assist other conservation partners in facilitating protection of these areas, providing the benefit noted above.

Impacts from Proposed Public Use and Access Management

Under Alternative A, we would continue our current management to minimize resource impacts from public use by allowing only four refuge islands open to public use year round (Bois Bubert, Halifax, Cross, and Scotch Islands). These four islands would be able to support continued year round use without significant impact to water quality and soils because of: their larger size and the fact that public use is dispersed (Cross and Bois Bubert Islands); they are forested and their soils are less susceptible to erosion (Bois Bubert, Cross, and Scotch islands); or, because any sensitive areas are precluded from access (Halifax Island). The remaining islands within the Refuge would continue to be closed seasonally during the seabird nesting period (April 1 - August 31). This seasonal restriction coincides with the highest tourism visitation period, thus reducing the potential for human-induced degradation.

On Bois Bubert and Halifax islands, where overnight camping occurs, capacity limits would remain at 10 campers/island/day. Outreach to visitors by MITA and our staff on "Leave No Trace" outdoor ethics would

continue, as limited sources allow, to promote appropriate uses. All campers would continue to receive "Leave No Trace" guides either as a member of MITA or from our staff when reserving a campsite. We believe these actions would continue to be effective in reducing visitor impacts since little disturbance, and none that appears irreversible, has been observed at camping areas to date.

We do not predict any impacts from continuing our current hunting program. Hunting density is relatively low and access is by foot or boat. We have not observed any impacts on water quality or soils from hunting since the program was established in 2001.

Impacts from Proposed Vegetation and Habitat Management

We would continue limited use (120m^2) of the herbicide Roundup on the 10 acre Petit Manan Island in an effort to control raspberry. The primary active ingredient of Roundup is glyphosate, which has undergone extensive environmental review and has not been found to be toxic to wildlife, or bioaccumulate in the foodchain (Monsanto 1993). Roundup is a broad-spectrum herbicide with no soil residual activity. The compound is degraded by microbes within the soil and the average half life of glyphosate is less than 45 days (Monsanto 1993). On Petit Manan Island, the compound would be applied directly to the raspberry plants using a hand sprayer. The Regional Contaminants Specialist, who is responsible for upholding Federal standards for water quality and soil protection, has reviewed our proposals and approves chemical herbicide use.

Under Alternative A we would continue maintaining approximately 30 acres/year of open field habitat on Petit Manan Point through mowing, brush hogging, hydroaxing, prescribed burning, and limited chemical treatments. The soil types in these uplands sites are not susceptible to compaction, except under saturated conditions. Operations typically occur in early spring or late fall when these conditions are unlikely. No compaction from past mechanical treatments has been noted to date.

Sheep grazing would also continue to be used as a vegetation management tool on Metinic Island to maintain short grasses for nesting terns. This island has been grazed for generations. Approximately 120 sheep graze on the island year round. We would continue to utilize fencing to restrict grazing near the tern colony during the nesting season, but allow this area to be grazed August through April. Without seasonal fencing, sheep grazing can result in disturbance to seabirds, decreased nesting cover, and trampling of nests. Some localized shoreline soil erosion has occurred as a result of reduced ground cover caused by grazing, combined with natural wave and wind action. While some erosion probably has occurred historically under natural conditions, we are not sure of the range of natural variation. It is likely that continued grazing would further result in soil compaction and potential erosion on island banks.

In 2002, we completed an EA for our Fire Program which includes stipulations under which we would operate. We describe these stipulations in greater detail under the "Air Quality" discussion that follows. We would continue to use prescribed fire to manage open fields and grasslands on the Petit Manan Point and continue its use on a limited basis on coastal islands, such as Petit Manan Island. We use fire to maintain those cover types important to migrating and nesting birds, other resident wildlife, and to reduce invasive plants. Up to 55 acres would be burned annually across the Refuge. Our mowing equipment is not always available to do this work, nor accessible to coastal islands, so use of fire is our most viable tool under most conditions. GOMSWG seabird experts are particularly interested in evaluating best management techniques, including fire, for treating island nesting habitat for seabirds over the long-term. Coordinated monitoring of fire effects on the habitat used by nesting seabirds would continue. We would also consider using prescribed fire to manage habitat for seabirds on several additional islands based on our success to date.

While we would strive to maintain all fires within prescription to minimize resource degradation, impacts could occur in small areas. Prescribed fire elevates surface temperatures; mineralizes detritus, litter and standing dead material; volatilizes some nutrients and organic matter; alters soil water-holding capacity; and alters populations of soil micro- and macrofauna (Barbour et al. 1999).

The effects to organic matter depend on the intensity and duration of fire. Intense, long duration fires consume more organic matter than brief, low intensity fires. Nitrogen compounds volatilize and are lost at temperatures of 100-200 °C; in contrast, calcium, sodium, and magnesium are usually deposited on the soil surface and recycled. At temperatures of 200-300 °C, large amounts of organic substances are lost, which can reduce the cation exchange and moisture holding capacity of soils.

Fire usually elevates soil pH, as a result of cation release; the effect is particularly evident in acidic soils. In coastal plain regions, there is often an increase in soil potassium and phosphorous levels following fires. Soil microbial nitrogen fixation may be enhanced following fire, due to mineralization of nutrients and elevated pH levels in soils (Barbour et al. 1999).

Petit Manan Point Division, field after prescribe burn, 2002
USFWS photo

Removal of litter and duff may initially facilitate water infiltration; nevertheless, evaporation is also mediated by loss of litter and blackened soils. This results in an overall reduction in the water-holding capacity of soils. There is little change in water repellency with cool fires (below 176 °C); moderately hot fires increase water repellence (176-204 °C). Extremely hot fires (above 204 °C) volatilize hydrophobic substances

and destroy soil water repellence (Debano et al. 1998). After moderately intense fires, runoff may be increased due to lowered infiltration, and erosion may result.

Fires usually reduce fungi, but increase soil bacteria. It may remove soil and litter pathogens. Nitrifying bacteria are often destroyed by fire. Legumes and other nitrogen-fixing plants often must recover nitrogen losses due to volatilization, as the recovery of nitrifying bacteria is slow (Barbour et al. 1999).

Our prescribed fires are carried out on a small scale in confined areas, lasting for short durations, and are of low to moderate intensity. They also consume only part of the duff/litter layer and rarely transfer significant amounts of heat into the soils. Prescribed fires would be used to remove litter and light fuels, and avoid the significant adverse effects of severe, hot wildfires on soil resources.

Considering all potential treatment methods, we expect negligible direct or indirect impacts on upland soils, as effects are limited due to short duration, and low to moderate intensity, and confined to the project area. We expect none of the proposed actions to adversely impact soils or water quality over the long term.

Impacts from Proposed Wildlife Populations Management

Under Alternative A, no impacts are predicted. No ground-disturbing activities are proposed in support of this program, and there would be no use of avicides.

Alternative B (Service's Preferred Alternative)

Impacts from Proposed Land Acquisition and Protection

Similar to Alternative A, the greatest potential in Alternative B to improve water quality and soils conditions is primarily through land acquisition, protection, and sharing of best management practices to other landowners. Under Alternative B, the Service would acquire the same 467.1 acres within the Petit Manan Refuge approved boundary as Alternative A, but would increase island acquisition to 87 nationally significant nesting islands and acquire 153.3 acres of important wetlands on the mainland. In total, this would add 2,859 acres to the Refuge and afford these acres permanent protection and eliminate the development threats identified in the introduction. This represents an increase of 1,585 permanently protected acres over Alternative A. We would also continue working with our conservation partners to determine the best methods for protecting the remaining 64 unprotected nationally significant islands from development. Alternative B would primarily represent an increase in our ability to maintain or improve water quality and soils conditions on coastal islands.

Impacts from Proposed Public Use and Access Management

Similar to Alternative A, all 87 islands acquired would be seasonally closed during the peak of the tourist season to protect resources, namely

nesting seabirds. This limited access protects the soils from impact as well. Camping would continue to occur on Halifax and Bois Bubert islands, but limits of acceptable change would be established to ensure that water quality, soils, and other natural resources found on the islands are not being adversely effected by camping activities. In cooperation with MITA, we would monitor the camp sites on a regular basis. Although some soil compaction and loss of vegetation is expected at these sites, efforts would be initiated to confine these effects to established sites, within acceptable limits. We would not establish any new tenting sites, and capacity limits would be enforced. We would lower intensity or discontinue camping on the islands if the limits of acceptable change are exceeded. Thus, no long-term, adverse or irreversible impacts would be expected to island soils. Effects to water quality would be the same as described in Alternative A.

Some soil compaction would likely result from the construction of new trails and parking areas on the Gouldsboro Bay, Sawyers Marsh and Corea Heath divisions. We would maintain up to approximately 106,000 square feet (2.5 miles long by eight feet wide) of vegetation for each trail and 800 square feet (room for 10 cars) at each parking area. We would utilize as much of existing, old dirt logging roads as possible. Within two years of trail construction, two trail-side interpretive overlooks impacting 200 square feet each may be added to each trail. Boardwalks would be constructed over saturated sections to protect sensitive vegetation. The trails and parking areas would increase access to the Refuge's mainland divisions for visitors such as photographers, bird watchers, and hunters. Development of the trails would adversely effect the vegetation and compact the soils within the footprint of the trails; however, it would minimize continued soil compaction resulting from the creation of "unauthorized" trails.

On Petit Manan Point, we would build at least one overlook, impacting 200 square feet, on the Birch Point Trail, at Carrying Place Cove. Currently, Refuge visitors routinely venture off the established trail to view this area. While development of the overlook and access trail would adversely effect the vegetation and soils within the footprint of the project, steps would be taken to utilize an existing "unauthorized" trail for the designated access to minimize additional disturbance. Establishment of a viewing platform and access trail should limit human activity to one defined area and minimize adverse effects to vegetation and soils along the various access trails currently used by the public.

As described for Alternative A, we do not predict any impacts from our current hunting program. Further, we do not anticipate impacts from expanding the hunting program to include a limited deer hunt on the Petit Manan Point Division. The new hunt area will occur in upland habitat types where soils are not susceptible to compaction. Access to the hunt area is on foot, and we predict a relatively low hunting density. In addition, the hunt season occurs when soils are likely to be frozen.

Impacts from Proposed Vegetation and Habitat Management

With the exception of an additional 55 acres/year managed for open field, grasslands, and early successional habitat, the effects noted for soils and water quality on the mainland would be similar to those described in Alternative A. Also, treatment methods would be the same as proposed under Alternative A. We would expand the seabird restoration program to include an additional 6 island projects (12 total). We would evaluate the use of sheep grazing, fire and herbicides on additional coastal seabird nesting islands. We predict the same local, low intensity, short duration impacts as described for Alternative A on the new seabird sites. In addition, we would establish a monitoring and evaluation protocol to ascertain the long-term implications of grazing on island soils and avoid irreversible impacts. This alternative would also establish thresholds of acceptable change on each island to ensure long-term protection and productivity of soil and water resources.

Impacts from Proposed Wildlife Populations Management

There would be no impact to water quality or soils from managing wildlife populations under Alternative B. No ground disturbing activities are proposed in support of this program. The use of the avicide DRC-1339 for lethal gull control may be employed to establish the six proposed new seabird restoration islands, but is only likely if other measures prove ineffective. The toxicant is very host specific and decomposes rapidly within 48 hours resulting in no adverse long-term environmental effects to water quality or soils.

Alternative C

Impacts from Proposed Land Acquisition and Protection

Of all the proposed alternatives, Alternative C would result in the most lands acquired by the Service, leading to the most acres in permanent protection to the benefit of water quality and soils. Under Alternative C, the Service would acquire the same 467.1 acres on Petit Manan Refuge as the other alternatives, but also would acquire all 151 nationally significant nesting islands; or portions of the larger islands, and 153.3 acres of mainland described in Alternative B. On larger islands, most of which are nationally significant for bald eagle nesting, we estimate we would pursue approximately 125 acres of land surrounding the nest sites. In total, approximately 6,003 additional acres would be permanently protected. This alternative would provide the greatest protection from the direct and indirect threats to water quality and soils attributed to development and would maintain or improve the integrity of these coastal island habitats.

Impacts from Proposed Public Use and Access Management

Under Alternative C, all 151 new islands, or portions of larger islands, acquired would be closed seasonally to public use and access to protect nesting birds and sensitive habitat areas. The effects would be similar to those outlined in Alternatives A and B. During the open seasons, we would initiate a permit system for day-use activities for groups larger than six people in an effort to better manage the potentially adverse effects (trampling, soil compaction and erosion) of public use on the coastal island resources.

We would develop the same public use infrastructure on the mainland divisions as Alternative B, resulting in the same levels of impact. Development of the trails would adversely effect the vegetation and compact the soils within the footprint of the trails; however, it would minimize continued adverse effects resulting from the creation of "unauthorized" trails. Boardwalks would be constructed over saturated areas to protect sensitive vegetation.

We would also construct two photo blinds on the mainland divisions to enhance opportunities for wildlife photography. At this point in time, locations for the blinds have not been determined, but we anticipate effects to the soils would be limited to the footprint of the structures, approximately 200 square feet, and short access trails.

We would erect gates on either end of the Old County Road in Gouldsboro in cooperation with town officials in an effort to eliminate illegal off-road vehicle use of the Gouldsboro Bay Division. This action would minimize any further vegetation destruction, soil compaction, and erosion caused by this activity. We have noted these impacts when visiting the division, but have not quantified them.

Ruts resulting from illegal off-road vehicle use, Gouldsboro Bay Division, April 2000
USFWS photo

The impacts we described under Alternative B for our hunting program would be the same under this alternative.

Generally, the proposed actions seek to minimize any direct and long-term impacts to soils and water quality. Where impacts are unavoidable, our actions are designed to contain the impacts to the smallest specific areas.

Impacts from Proposed Vegetation and Habitat Management

The type of impacts are the same as described for Alternative B, only expanded in scope to include 151 new nesting islands, or portions of larger islands, instead of Alternative B's 87 islands. In addition, we would pursue 12 new seabird restoration sites (18 total) commensurate with the in-

creased island ownership proposed. We would follow the same vegetation management and techniques proposed in Alternatives A and B. As we describe in Alternative B, we would evaluate the use of sheep grazing, fire and herbicides on additional coastal seabird nesting islands. We predict the same local, low intensity, short duration impacts as described for Alternative A on the new seabird sites. Similar to Alternative B, we would establish a monitoring and evaluation protocol to ascertain the long-term implications of grazing on island soils and avoid irreversible impacts. This alternative would also establish thresholds of acceptable change on each island to ensure long-term protection and productivity of soil and water resources.

Impacts from Proposed Wildlife Populations Management

Same as Alternative B, except 12 new seabird restoration sites are proposed (18 total), and the use of avicide may be expanded as necessary, when other measures prove ineffective. However, no impacts are predicted to soils or water quality based on our knowledge of the chemical properties of DCR-1339.

Alternative D

Impacts from Proposed Land Acquisition and Protection

Under Alternative D, we would propose service acquisition of only the 467.1 acres currently within the approved Petit Manan Refuge acquisition boundary. Service acquisition of these lands would eliminate the direct and indirect threats to soils and water quality associated with development. Our ability to have a significant impact on water quality and soils protection on coastal islands is much less under this alternative compared to the others due to the more conservative land protection proposed.

Impacts from Proposed Public Use and Access Management

All Refuge islands would be closed to public use and access year round, thereby eliminating all human-induced impacts to soils and water. Natural erosion from wind and wave action would continue at natural levels. While Alternative D offers greater protection for water quality and soils on existing Refuge lands, its limited proposal for new acquisitions would afford much less protection of coastal habitats compared to the other alternatives.

Impacts from Proposed Vegetation and Habitat Management

Under Alternative D, we predict negligible impacts to water quality and soils as no major ground disturbing activities would occur. We would, however, burn up to three acres/year to remove debris piles or remove brush along boundaries. These smaller, debris-pile fires would occur only under the stipulations in the Fire EA. We would discontinue use of mowing and other mechanical treatments and herbicides, thereby minimizing

threats of soil compaction. Unfortunately, precluding the use of Federal-approved herbicides, prescribed fires, and mechanical treatments would severely hamper our ability to control invasive plants. In particular, herbicides and prescribed fire have been used on other refuges to reduce invasive plants and to establish and maintain successful habitat areas in a cost-effective or timely way. Over the long-term, some areas may end up dominated by invasive plants.

This alternative would also eliminate sheep grazing from all Refuge lands, avoiding any further contributions to soil compaction and erosion of shoreline banks from this source. In the absence of burning, grazing, mowing, and herbicide use, island habitats would succeed to denser and higher vegetation favoring some seabird species, but reducing suitable nesting habitat for most seabird species of concern over the long-term. Soils and water quality would be protected, but on fewer acres under this alternative.

Impacts from Proposed Wildlife Populations Management

No wildlife populations management would occur, thus, no impacts are predicted to water quality and soils.

Water Quality and Soils - Summary

None of the actions proposed in any alternative violate the Federal or State Clean Water acts. Over the long-term, considering direct and indirect impacts, Alternative C would provide the most benefits to improved water quality and soils protection. This is due to the greater land protection it affords, while its habitat and public use management designs would maintain or restore water quality and soils. Alternative B would be ranked next highest, followed by Alternative A, then Alternative D.

Effects on Air Quality

Chapter 3 - Affected Environment presents the status of air quality along the Maine coast. Poor air quality has adverse impacts on the Refuge and other natural areas, including the Class I airshed over Moosehorn Refuge's Wilderness Area. These impacts are also noted in Chapter 3.

Our activities are most likely to directly impact air quality through use of prescribed fire for habitat management, and by attracting visitors in vehicles. Prescribed fires and vehicle emissions directly impact air quality in three principal ways: 1) decreased visibility; 2) increased particulates; and, 3) increased pollutants. Air pollutants contributed by vehicle emissions are a major concern in Maine. The State is dealing with this problem through programs to reduce automobile emissions. While our visitors' vehicles directly contribute air pollutants, they are not a principle cause of poor conditions. Most Refuge visitors are either local residents or summer vacationers who are in the area already. The Refuge is a secondary destination. Most visitors travel less than 100 miles to the Refuge from their

permanent or vacation residences. Their contribution to poor air quality is negligible compared to that of urban and industrial centers within a 200-mile radius.

The Refuge positively impacts air quality primarily through protection of natural lands. Natural vegetation and wetlands help offset pollution levels by acting as filters to the environment. Unfortunately, this benefit has never been quantified for existing Refuge lands.

Alternative A (Current Management)

Impacts from Proposed Land Acquisition and Protection

Alternative A would result in the Service acquiring and permanently protecting 1,274 acres of natural lands. While difficult to quantify, Service acquisition of these lands would eliminate the direct and indirect threats to air quality associated with increased development, and permanently maintain the pollution filtering effects of natural vegetation and wetlands.

Impacts from Proposed Public Use and Access Management

We predict annual visitation to the Refuge after 15 years would increase by 10 percent, or an additional 5,000 visitors, based on some planned improvements to our visitor service's program and the State's predicted increase in tourism to the area. We expect much of the additional visitation would occur during the summer and fall months, when families seek an alternative to the congestion at Acadia National Park.

Impacts from Proposed Vegetation and Habitat Management

Under Alternative A, we would contribute to poor air quality primarily through our prescribed fire program.

In April 2002, we completed an environmental assessment (EA) and Fire Management Plan for our wildfire suppression and prescribed fire program. All alternatives in this draft CCP/EA incorporate the decision of that Fire EA. Alternative A proposes to utilize prescribed fire to maintain grasslands, enhance habitats for threatened and endangered species, reduce hazardous fuels and debris, or control invasive plant species. Under the current Fire Management Plan, with existing Refuge lands, we proposed between 12 and 30 acres would be burned annually. Since 1988, we have conducted 26 prescribed burns on 120.8 acres with the majority of the burns occurring on mainland blueberry and grassland units. It is estimated that the size of the burn program would increase slightly (20 to 55 acres annually) as additional lands are acquired and a Habitat Management Plan is developed. Alternative A would implement the following planned projects using prescribed fire over the next 15 years. Consider these figures annual maximums.

- 30 acres/year for enhancing or maintenance of wildlife and plant species populations;
- 15 acres/year to preserve threatened and endangered species and promote biological diversity;
- 7 acres/year to control invasive plants and reduce hazardous fuels, and;
- 3 acres/year for boundary maintenance or debris removal around boundaries, structures and facilities.

Visibility and clean air are important natural resource values on the Refuge and the protection of these resources would be given full consideration in fire management planning and operations. We would comply with all applicable Federal, state, and local air pollution requirements, as specified within Section 118 of the Clean Air Act, as amended (42 USO 7418). In addition, further guidance can be found in the Fire Management Handbook (USFWS 2001) . The plan stipulates required conditions under which prescribed fires would occur, to control its size, to minimize or eliminate impacts on visibility, and to reduce the potential for adding particulates and pollutants into the air created by the burning. All the required conditions are geared to minimize smoke emissions and follow Best Available Control Technology. The following measures would minimize the impacts to air quality from prescribed fires:

- Burning would only be permitted provided that the existing wind speed, wind direction, and atmospheric conditions do not create nuisance smoke conditions.
- Smoke sensitive areas would be identified and addressed within the Annual Prescribed Fire Plan. The direction of wind vector selected would be such that smoke and other particulate emissions are transported away from sensitive areas.
- Burning would be conducted only when the visibility exceeds 2 miles and the fire weather forecast indicates the presence of an unstable airmass, mixing heights are greater than 1,500 feet, and ventilation rates (mixing height x transport wind speed) is 7,500 or greater. A minimum transport wind speed of 5 mph is recommended. A daily spot forecast is required and is obtained from the National Weather Service.
- No burning would occur if any government agency has issued an air pollution health advisory, alert, warning, or emergency for the area surrounding the Refuge.
- Backing and flanking fires would be used when possible to minimize particulate emissions.
- Media sources would be kept informed of fire and smoke dispersal conditions throughout any fire event.

Contrary to the short-term adverse effects on air quality resulting from our prescribed fire program, the pollution-filtering benefits derived from maintaining these areas in natural vegetation conditions would last in perpetuity.

Since we predict our actions would only contribute negligibly to air pollution levels, including impacts to the Class I airshed over Moosehorn Refuge's Wilderness Area, and assuming the prescribed fire stipulations are implemented as stated above, the negative direct and indirect impacts from implementing Alternative A should be of relatively short duration and light intensity.

Impacts from Proposed Wildlife Populations Management

No impacts to air quality are predicted that are not already described in the vegetation management discussion above.

Alternative B (Service's Preferred Alternative)

Impacts from Proposed Land Acquisition and Protection

Compared to Alternative A, greater benefits to air quality would be derived from implementing Alternative B since 2,859 acres of native vegetation and wetlands would be permanently protected from development and would continue to filter pollutants in perpetuity.

Impacts from Proposed Public Use and Access

We predict annual visitation would increase approximately 25 percent over current levels after 15 years (11,750 additional visitors), due to the significant expansion in priority public use services and programs across the Refuge and projected increases in tourism to Maine. More than half of this increase would be attributed to increased commercial boat tours. The contribution to automobile emissions from Refuge related activities would increase proportionately over that projected for Alternative A. However, some of the increased use would be spread throughout the year as we develop environmental education and interpretation programs for children during the school year. Many of these latter programs would consist of larger groups traveling together in public transportation. The contribution to poor air quality through vehicle emissions would increase slightly over current levels, but would remain relatively insignificant in light of the industrial centers nearby. As described with Alternative A, the additional emissions directly resulting from our activities would cause impacts that are negligible and of short duration. The Refuge would continue to be a secondary destination for out-of-town tourists or visited by local residents.

Impacts from Proposed Vegetation and Habitat Management

The impacts and concerns to air quality from managing vegetation stated for Alternative A are the same for Alternative B. However, this alternative

has a slightly increased potential to adversely affect air quality because we would use prescribed fire on more acres. The following planned projects, with their potential use of prescribed fire, would occur under Alternative B. Consider these figures annual maximums.

- 70 acres/year total for enhancement or maintenance of wildlife and plant species populations (includes the existing seabird island restoration projects and the future island restoration projects along the coast of Maine(12 total));
- 25 total acres/year to preserve threatened and endangered species and promote biological diversity;
- 10 acres/year to control invasive plant and reduce hazardous fuels; and
- 5 acres/year for boundary maintenance or debris removal around structures and facilities.

Similar to Alternative A, the natural vegetation and wetlands maintained on the Refuge would help offset pollution levels by acting as filters to the environment. Unfortunately, this benefit has never been quantified for refuge lands. Contrary to the short-term adverse effects on air quality resulting from our prescribed fire, the pollution-filtering benefits derived from maintaining these areas under natural vegetation conditions would last in perpetuity.

Impacts from Proposed Wildlife Populations Management

No impacts predicted to air quality from the implementation of either lethal or nonlethal predator management, or other population management measures except as noted in the vegetation management discussion above.

Alternative C

Impacts from Proposed Land Acquisition and Protection

Compared to Alternative A, substantially greater benefits to air quality would be derived from permanently protecting approximately 6,003 acres of native vegetation and wetlands. Protected from development, these lands would continue to filter pollutants in the atmosphere to the long-term benefit of air quality in the region.

Impacts from Proposed Public Use and Access

We predict annual visitation to the Refuge would increase approximately 50% over current levels after 15 years (23,500 additional visitors) due to a dramatic expansion of priority public use opportunities. The distribution of this increase and its impacts would be similar to Alternative B, with the largest increase in visitors on commercial tour boats. Despite this increase, we believe impacts to air quality are negligible over the long-term.

Impacts from Proposed Vegetation and Habitat Management

The types of impacts and concerns stated for Alternative A and B are similar for Alternative C. However, this alternative has the highest potential to adversely affect these resources since we would be expanding the use of prescribed fire, mechanical, and chemical means on more acres proposed for habitat restoration and invasive species control. The following planned projects would occur under Alternative C. Consider these figures annual maximums.

- 140 acres/year total for enhancement or maintenance of wildlife and plant species populations (includes the existing seabird island restoration projects and the future island restoration projects along the coast of Maine(18 islands total));
- 50 total acres/year to preserve threatened and endangered species and promote biological diversity;
- 50 acres/year to control invasive plant and reduce hazardous fuels; and
- 10 acres/year for boundary maintenance or debris removal around structures and facilities.

Impacts from Proposed Wildlife Populations Management

Same as Alternative B.

Alternative D

Impacts from Proposed Land Acquisition and Protection

Under Alternative D, the Service would acquire only the 467 acres within the Petit Manan Refuge's approved boundary. We would continue working with our conservation partners to determine the most appropriate means of providing permanent protection for the remaining 151 unprotected, nationally significant nesting islands. However, there is no assurance that these islands would be protected. As such, the unprotected islands would be subject to development and there would be a loss of the pollution filtering effect afforded by natural vegetation and wetlands.

Impacts from Proposed Public Use and Access

We would expect visitation to be the same as Alternative A on our mainland divisions, but annual island visitation would decline by approximately 34% (16,000 fewer visitors). This decline would be attributed to a year-round closure on all Refuge islands and decreased habitat quality for nesting seabirds resulting in fewer commercial tours. As such, the Refuge's contribution to poor air quality from vehicle emissions would be similar to Alternative A, which is negligible, given the impacts of nearby industrial centers and tourist destinations.

Impacts from Proposed Vegetation and Habitat Management

Alternative D would not implement prescribed fire for any restoration or habitat project. However, we would burn up to 3 acres/year to remove debris piles or remove brush along boundaries. These smaller, debris-pile fires would occur only under the conditions stipulated in the Fire EA. These stipulations limit the scope, duration, and intensity of the fires, and ensure that the impacts to air quality from the burn program would be negligible.

Impacts from Proposed Wildlife Populations Management

No impacts are predicted as no population management is proposed.

Air Quality - Summary

No actions proposed in any of the alternatives violates State or Federal EPA standards for the Clean Air Act. Alternative D would not contribute any additional vehicular emissions, impair visibility, or use prescribed fire. As such, Alternative D results in the least direct and indirect negative impact to air quality compared to the other alternatives. Alternative A would follow with the next lowest visitation numbers expected and next least acres proposed for prescribed burning. This is followed by Alternative B, then C. Of note, however, is that while Alternative C proposes the most acres of prescribed fire and would result in the highest number of visitors traveling by automobile, these impacts are offset, though difficult to quantify, by the alternative's substantially greater land protection benefits compared to the other alternatives. In summary, Alternative D would have the least adverse impact on air quality, followed by Alternative A, then B, then C.

Effects on the Local and Regional Economy

It is said that Maine's seacoast is the backbone of the State's economy. This is not surprising as coastal Maine's southern and mid-coast regions are growing at a faster rate (1.7 percent during 1990-1996) than the state as a whole (0.9 percent during 1990-1996) with 44 percent of the State's 1.2 million people living here (State Planning Office, 2000).

The coastal counties of Maine comprised 56% of employment in 2001, up from 53% in 1990. Over 1990-2001, the coastal counties saw employment grow by more than 18%, compared with only 6.4% in the inland counties. The coastal counties from York to Washington accounted for nearly 80% of all the job growth in Maine over 1990-2001. Waldo County (46%) and Knox County (33%) were the fastest growing in employment. Sagadahoc County saw a small decline in employment (-5.2%) (Colgan 2001).

Tourism, with the highest percentage along the coast, has also increased substantially in recent years and is now significant to the Maine economy. In 2000, nonresident visitors to Maine directly and indirectly generated $8.8 billion in sales of goods and services, over 116,000 jobs; and $2.5 billion in total payroll (ME Office of Tourism, www.visitmaine.com).

Most certainly, it is the natural beauty, rich natural resources, and diverse recreational opportunities that draw people to the coast. Likewise, the need to conserve this rich, natural biodiversity has attracted the Service's efforts in wildlife conservation in this area.

Coastal visitors engaged in recreational pursuits generate huge revenues to the economies of local towns as they purchase equipment, lodging, food, and guide services in support of their activities. Commercial wildlife-viewing and hunting are two nature-based recreational activities that are directly affected by Refuge management.

In this section, our discussion focuses on the economic impacts to: 1) local property taxes and associated revenues from additional Service land acquisition; 2) tax revenues generated from commercial wildlife viewing; 3) tax revenues generated from hunting; 4) sheep farming; and, 5) commercial harvest of marine resources. These are the economic entities we believe would be most directly affected by Refuge management.

Property Taxes and Associated Revenues

The Service, in partnership with many other conservation organizations, is an important player in land protection in coastal Maine. Lands acquired by the Service become part of the National Wildlife Refuge System. Besides this Refuge, there are two other refuges along the coast of Maine: Rachel Carson Refuge, based in Wells, ME, and Moosehorn Refuge, based in Baring, ME. In this document, we will only be evaluating the impacts from the proposed land acquisition for Maine Coastal Islands Refuge. Lands would be acquired by the Service through either fee acquisition or conservation easements, and only from willing sellers.

Service acquisition would withdraw potentially developable, revenue-generating acreage in respective towns. Since the Federal government does not pay property taxes, there is a direct net loss to towns in property tax revenues. We predict the greatest loss in towns where the property acquired by the Service is zoned residential. On the other hand, it is important to recognize that the potential to develop a home or business on offshore islands is tempered by existing state and local environmental laws that regulate coastline development (Kelley, et al., 1989, Maine Dept. of Inland Fisheries and Wildlife, 2000). Unfortunately, it is difficult for us to predict at this time what limits might be placed on proposed island development. However, we can predict with some accuracy the loss of property tax revenue to respective towns.

Still, a reduction in developable acreage does not necessarily equate to a net economic loss to local towns. Several studies question the common assumption that development always provides greater economic benefits than conservation (Cheney, 1993, Freedgood, 1993, Infante, 1994, Maine Coast Heritage Trust, 1991). They suggest that lands reserved in open space for conservation may actually have higher net revenues because of their low- to no-demand on infrastructure services. Conservation owner-

ship has been found to result in reduced needs for services such as police, fire, roads, utilities, and school facilities, all of which could offset property tax losses.

While the Service does not pay property taxes, under Federal law, a town which hosts a national wildlife refuge is entitled to annual Refuge Revenue Sharing (RRS) payments. These payments are the greater of 75 cents per acre or $.075 of market value. The exact amount of the annual payment depends on Congressional appropriations, which in recent years, has tended to be less than the full amount. In 2001, the actual payment was 51.89% of authorized levels. That year, the Service paid $51,134 to Maine communities for lands under administration of the Refuge. Interestingly, in rural areas of low growth, the RRS payments can be equal to, or even exceed, the amount that would have been collected from taxes if in private ownership. In many areas, such as the Maine coast where development pressures are high, RRS payments on developable land are typically less than revenues that would have accrued from taxation.

In order to analyze property tax losses to affected towns with our refuge expansion proposals, and the offset gained from RRS payments, we enlisted Dr. Charles Colgan, Professor of Public Policy, University of Southern Maine, to help us. His full report is included as Appendix G. What follows is a summary of his assessment of the net reduction in revenues to towns associated with the proposed refuge expansion of additional islands. This analysis was done by alternative. There was no analysis done for Alternative D, since we are not proposing an expansion from what is currently approved.

The analysis of property tax impacts does not include those islands over 200 acres where the Service proposes to protect bald eagle nesting sites. In these cases, the Service would likely purchase a conservation easement on up to 125 acres surrounding the nest site. Because precise sites and properties for potential acquisition have not been identified, it was not possible to calculate the property tax impacts in the same manner as was done with the islands purchased in fee in their entirety. Purchase of these bald eagle sites would increase the property tax impacts in the towns of Vinalhaven, Isleboro, Isle Au Haut, Bar Harbor, Mt Desert, and Jonesboro. Furthermore, we acknowledge that given the escalating property values in coastal Maine, and the fact that the analysis is based on 2002 and 2003 values, our figures may have underestimated actual impacts. However, we continue to believe the analysis is a reasonable approximation.

Alternative A (Current Management)

Service acquisition of 30 islands would result in property tax impacts that are predicted to be quite small. We were able to get assessed values on all but one of them. If all islands proposed in Alternative A for which assessed value is available are acquired, property taxes rise in the affected towns by

a total of $31,000; an overall average of 0.04% per town assuming RRS payments occur at FY02 levels. This figure is the net of RRS payments at 52% of authorized levels. The town with the largest impact would be Matinicus Isle Plantation in Knox County which would see a 3.5% increase in its mil rate; however, the actual loss is only slightly more than $3,450.

Alternative B (Service's Preferred Alternative)

Service acquisition of 87 islands would result in property tax impacts that are predicted to be small. We were able to obtain assessed values on 84 of these islands. If all islands proposed in Alternative B for which assessed value is available are acquired, property taxes would potentially rise in the affected towns by approximately $130,000; an overall average of 0.05% per town assuming RRS payments occur at FY02 levels. This figure is the net of RRS payments at 52% of authorized levels. The Town of Kittery in York County would see the largest absolute reduction in taxes at $30,738, while the Town of Frenchboro in Hancock County would be most affected in proportional terms. Data on two of the three islands proposed for acquisition in Frenchboro was available, and should these islands be acquired, there would be an estimated increase of 9% in Frenchboro's mil rate, although the total taxes lost amount to approximately $6,300 after RRS payments. The increase in mil rate for Frenchboro would be even higher if all three islands proposed are acquired by the Service. Appendix G identifies the 3 islands that were not included in this analysis, and the towns that would be additionally impacted.

Alternative C

Under Alternative C, the Service would acquire up to 130 islands in fee or conservation easement and, on up to 21 larger islands (>200 acres) significant for bald eagle nesting, the Service would only acquire approximately 125 acres surrounding the nest sites. We were able to obtain assessed values on 132 of the islands proposed for acquisition in fee or easement. If all islands proposed in Alternative C for which assessed value is available are acquired, property taxes rise in the affected towns by approximately $225,000; an overall average of 0.08% assuming RRS payments occur at FY02 levels. Similar to Alternative B, the Town of Kittery in York County would see the largest absolute reduction in taxes at $30,738, while the Town of Frenchboro in Hancock County would be most affected in proportional terms. The impact in the Town of Frenchboro is the same as Alternative B. Appendix G identifies the 19 islands that were not included in this analysis, and the towns that would be additionally impacted.

Alternative D

No impacts are predicted as no expansion is proposed.

Wildlife Viewing

In Chapter 3-Affected Environment, we describe the status and significance of the commercial and recreational seabird viewing industry in Maine, since it benefits directly from Refuge seabird management. Two islands within the Refuge are currently the focus of tour boat trips to view coastal nesting seabirds: Petit Manan and Cross islands. Machias Seal Island, which we manage under an MOU with MDIFW, is a third island popular for commercial seabird viewing tours.

We enlisted Dr. Charles Colgan to analyze the revenues generated from this activity and the impacts refuge management might have on this activity. His analysis, further described in Chapter 3, determined that $5-10 million in commercial seabird viewing related spending occurred in 2001 in Maine. When we asked Dr. Colgan whether or not the commercial seabird-viewing industry could continue to grow, he responded that it is probably at its maximum potential given the present distribution of active seabird colonies with sufficient numbers of birds to make a commercial trip worthwhile. In other words, unless seabirds establish new colonies, accessible for viewing by commercial tour boats, there are no new expansion opportunities for a commercial venture, except perhaps more boats to islands currently on tour.

Dr. Colgan's 1996 survey, described in Chapter 3, presents the scope of recreational seabird viewing and its importance in regional economic terms. However, because seabird viewing takes place throughout the coastal region, and because birds range over the same area, it is not possible to assign a specific economic value to a specific nesting island or even group of islands. This makes it impossible to differentiate the effects of alternative nesting habitat protection strategies from an economic value perspective. It is clear that protection of habitat will support the maintenance and possible expansion of this recreational activity, with its attendant benefits to individuals and firms, into the future. It is also the case that loss of habitat will, over time, degrade the resource upon which these benefits depend. The pace and extent of this degradation cannot be forecast.

Lost Economic Benefits

While the total economic value, and the level of economic activity, associated with seabird viewing is substantial, assessing the impacts of specific protection strategies creates some difficulties. Economic costs will also be associated with protection efforts, since an important element of habitat protection will be to restrict access to islands with significant sea bird nesting habitat during the summer, which is also the prime time for recreation. This will limit the recreational activities of some, decreasing to some degree their recreational values. This is particularly likely to be the case for members of the Maine Island Trail Association, who visit the islands for general recreation purposes. Thus, there will be some loss of recreational economic benefits to those who visit islands directly. The exact losses cannot be estimated, but will depend upon:

- which islands are chosen for protection;
- the extent of restrictions on activity; and,
- the extent to which alternative islands which would provide the same or slightly lower benefits are available.

Alternative A (Current Management)

No new seabird colonies would be established under Alternative A; therefore, no new seabird viewing opportunities would result. Existing restoration sites would continue to be managed, maintaining the current industry. As such, there would be no impacts to the current economic outputs contributed by the seabird viewing industry directly resulting from Refuge management.

Alternative B (Service's Preferred Alternative)

Alternative B would include 6 new seabird restoration sites. In our estimation, at least one of these sites could meet the criteria for size, distribution, access, and location needed for a viable commercial venture. However, it is important to note that we estimate it would be at least 8-10 years before a new colony with sufficient numbers of birds would be established to make a commercial venture worthwhile. This is due to the time needed to acquire the island, complete the restoration work necessary to make the island attractive to seabirds, and build the seabird population in that colony. As such, benefits to the commercial seabird industry would not occur to a significant degree in the short-term.

Alternative C

Alternative C would include 12 new restoration sites, creating the most potential opportunities for additional seabird viewing businesses over the long-term. We estimate that at least two sites could meet the criteria for a viable commercial venture. However, as with Alternative B, it would take at least 8-10 years to get a colony established.

Alternative D

No new seabird colonies would be established under Alternative D. In fact, management of the existing colony at Petit Manan Island would be scaled back, with less intervention and habitat manipulation. Over the long term, this would likely lead to a decrease in nesting habitat quality for those seabirds requiring short vegetation. Gull nesting and predation would likely increase as a result, and with no predator control, most seabirds would abandon the site within the 15 year planning horizon. While it is possible the birds would move to a new location, in all likelihood, seabird viewing opportunities would be lost over the long-term at Petit Manan Island.

Hunting

Hunting is another nature-based recreational activity generating substantial revenues in Maine, and is supported on the Refuge. Currently, migratory game bird and waterfowl, small game, and big game hunting is offered on refuge lands as described in Chapter 3. Also of note is the fact that the Colonial Ordinance of 1641-1647, as clarified by Title 12 M.R.S.A. 571 et seq. (Colonial Ordinance), reserves a broadly construed right for public use of privately-owned intertidal zones for hunting, fishing, and fowling. As a result, waterfowl hunting occurs within the intertidal areas of most of the Refuge islands under the jurisdiction of the state, and is administered by the MDIFW.

Nationally, hunting participation is decreasing. This is also true for the State of Maine, as evidenced by the sales of hunting licenses. According to Boyle and Teisl (1998), sales of Maine hunting licenses declined by 1.7% between 1986 and 1996. It is primarily small game hunting that is declining in Maine; big game and migratory bird hunting has stayed relatively flat in terms of the number of hunters and number of hunting days (USFWS 2002). According to Service statistics, the average hunter in Maine is spending $327/trip for a big game hunt, $167/trip for a small game hunt, and $222/trip for a migratory bird hunt (USFWS 2002). The expenditures are related to lodging, food, gas, and equipment. The types of hunters are distributed as follows: 39% waterfowl, 7% other migrating birds, 25% upland game, and 29% big game.

Unfortunately, we have no census of hunter numbers for the Refuge; however, we estimate approximately 280 hunter days occur during the mainland hunting seasons based on our field observations. Using the expenditures listed above, this would translate to $66,710 in revenue to the local economy. However, we believe that the amount is overstated, because most of the Refuge hunters are local. Out-of-state hunters are likely to seek more productive and accessible hunting areas off Refuge lands which offer a greater likelihood of success. In our opinion, hunting on the Refuge is not contributing significantly to the local economy.

With regards to off-shore waterfowl hunting, it would be inaccurate to claim all the benefits of waterfowl hunting around Refuge islands, as most hunters are operating from boats in the inter-tidal area and are floating on and off Service-owned lands. Furthermore, it is virtually impossible to estimate waterfowl hunter numbers tied directly to Refuge lands. As such, we did not analyze this contribution further.

Alternative A (Current Management)

Under Alternative A there would be no change in hunting opportunities from what is currently offered. The program includes migratory game, waterfowl, and small and big game on Sawyers Marsh and Gouldsboro Bay divisions; white-tailed deer hunting on Bois Bubert Island; and, migratory waterfowl hunting on 22 islands. As we describe above, we believe our program would not contribute significantly to the local economy.

Alternative B (Service's Preferred Alternative)

Under Alternative B, we would open the Petit Manan Point Division to white-tailed deer hunting in addition to the hunting offered in Alternative A. During the regular firearms season, we would open the Division to disabled hunters only; during the muzzle-loading season, hunters of all abilities would be allowed.

We predict this would provide approximately 70 new hunter days. This is based on our estimate that 10 new hunters would partake in the disabled firearms season at 3 days each, and 10 hunters would participate in the muzzle-loader season at 4 days each. Using the expenditures/trip noted above, this new opportunity would generate approximately $6,540 in hunter revenues (20 hunters x $327/trip) above what was predicted in Alternative A. However, as described in Alternative A, this is likely overstated since most hunters would continue to be local, so there would be no lodging, and little food and gas expenditures. This is a relatively insignificant contribution to the local economy. Generally, the benefits from this new opportunity are more social, providing local hunters with a new hunting area. In the short term, Petit Manan Point would offer a high quality hunt, with hunter numbers low and success rate high, since it has been closed to hunting for years and deer are congregating here. However, over the long term we would expect the success rate to decline as deer disperse, resulting in the low densities common to the coastal area.

In addition, we would evaluate the potential for waterfowl hunting opportunities on all 87 islands proposed for Service acquisition. In general, we plan to open the islands to waterfowl hunting unless we determine there are overriding resource concerns unforseen at this time. We do not know at this time whether or not the current landowners allow public hunting, but because of the Colonial Ordinance allowing hunting in all intertidal areas, we suspect that it is occurring on most islands. As such, we would not effectively be offering new hunting opportunities with Service acquisition of coastal islands.

Alternative C

Same as Alternative B, except we would evaluate waterfowl hunting on all 151 islands proposed for Service acquisition.

Alternative D

Under Alternative D we would not allow hunting on Refuge lands. While the economic losses to the local economy would be negligible, there would be social costs to local hunters who would lose the small game and big game hunting opportunities on the Gouldsboro Bay and Sawyers Marsh divisions, and big game hunting on Bois Bubert Island. Waterfowl hunting would not likely be affected because of the intertidal Colonial Ordinance that reserves the public right to hunting in these areas.

Sheep Farming

Sheep farming has occurred on certain Maine islands for generations. It is considered an historic and traditional cultural use by many residents of Maine. As we describe in Chapter 3 in the island descriptions, there are two Refuge islands, Metinic and Little Nash islands, where sheep grazing is occurring. On Metinic Island, half the island is owned by the Service and most of the remaining portion is owned by a private landowner who leases his land to a shepherd. On Nash Island, sheep walk from the adjacent Big Nash Island at low tide. In most years, there are approximately 120 sheep on Metinic and 30 sheep on Nash islands, respectively. Since the private landowners do not fence, it is incumbent on us to install fencing to manage the sheep on the islands. We have incorporated sheep grazing into our vegetation management program for nesting seabirds on Metinic Island. Our monitoring has indicated that the current situation appears to be providing suitable nesting habitat for the terns.

Although locally important as a traditional and historic cultural use, these two sheep operations represent a negligible contribution to the State's sheep industry, and to the local economy, when compared to other coastal industries.

Alternative A

Under Alternative A, sheep grazing on Metinic Island would continue to be used for vegetation management. On Nash Island, we would continue to monitor the grazing, but not otherwise implement a change. As such, there would be no economic impacts to the current operators or the local economy as no change would occur.

Alternative B

Under Alternative B, sheep grazing on Metinic and Nash islands would be used for vegetation management, but only under special use permit stipulating numbers, timing, and intensity. In addition, we would consider sheep grazing on future island acquisitions where we determine it can be used to effectively manage vegetation in support of our habitat goals. Under this alternative, the individual sheep operators may incur additional expenses to adhere to permit requirements, but we would not expect costs to be prohibitive or cause an operator to fail. While we expect new opportunities for sheep grazing would occur with future island acquisitions, we cannot predict where or when with any certainty. With implementation of Alternative B, there would be little to no adverse impact to the current sheep operators, and no effect on the local economy.

Sheep grazing on Metinic Island
USFWS photo

Alternative C

Same as Alternative B.

Alternative D

Alternative D we would eliminate sheep grazing from the Service-owned portions of Metinic and Nash islands. With a loss in access to these lands, we predict that shepherds would be forced to modify their operations, possibly by reducing herd size or establishing more human presence on the islands. In either case, some economic burden would be incurred by the sheep owners and/or operators. However, because these operations are so few and small, their loss would not result in any impact to the local economy.

Commercial Harvest of Marine Resources

The harvesting of plants and animals for commercial purposes in the intertidal and near-shore zones in coastal Maine is not only significant to the State's economy, but is also a traditional and historic way of life in many coastal communities. Harvesting marine resources on and adjacent to refuge lands occurred well before the Refuge was established. Intertidal resources that are harvested include: clams, mussels, oysters, and marine worms. In addition, lobstering and salmon aquaculture are probably the best known commercial marine industries, occurring in offshore State-waters. Seaweed harvesting is also becoming a more viable industry as harvesting equipment improves and seaweed processing centers become established. Rockweed is the common name given to the fucoid seaweeds and usually refers to the knotted wrack (Ascophyllum nodosum).

Intertidal zones provide abundant habitat for many invertebrate species that are important food sources for migratory birds. These areas serve as foraging sites for tens of thousands of migratory shorebirds and waterfowl. Currently, we have no documentation on the level of harvest or the numbers of harvesters using the Refuge intertidal areas. Monitoring the level of use and harvest is needed to determine how Federal trust resources are affected.

With regard to the increasing commercial interest in rockweed harvest, there is a concern by many people, including scientists, about the short-term and long-term effects of unregulated harvesting of a plant so vital to many birds and marine wildlife. The invertebrates that cling to rockweed are an incredible source of nutrients to many migrating shorebirds and waterfowl. Rockweed filters nutrients and contaminants, produces oxygen, and recycles nutrients. In Maine, the Department of Marine Resources has adopted regulations to allow for a sustainable harvest; however, in our opinion, monitoring and enforcement to prevent over- harvesting is not commensurate with the use. Rockweed and other seaweed harvesting is not allowed in Refuge intertidal zones because no commercial collection

of vegetation is allowed on national wildlife refuges, the activity is not considered appropriate in light of the Refuge's purposes and is not supported by a compatibility determination.

As described under waterfowl hunting, the Colonial Ordinance reserves a broadly construed right for the public to use privately owned intertidal zones for fishing, fowling, and navigation. We recognize this ordinance and allow harvest of shellfish and worms in Refuge intertidal areas. Although our ability to monitor these activities is limited, we do have the authority to eliminate these activities on Refuge lands if we determine Federal trust resources are adversely impacted, such as at seabird or bald eagle nesting sites.

In Chapter 3, we describe the status of the finfish and shellfish aquaculture industries and their contribution to the State and local economy. In 2000, the salmon aquaculture industry generated $78.9 million; and in 2001, the lobstering industry produced a market value of $151.9 million.

Maine's salmon aquaculture industry has faced several challenges in recent years. Outbreaks of the highly infectious salmon anemia, foreign competition, Federal listing of the endangered Atlantic salmon, and a lengthy leasing process are each examples of events that have impacted the industry. All of these factors are outside of the influence of the Refuge. However, none of these events were caused, directly or indirectly, by Refuge management activities.

In Chapter 1, we describe why some people view Service ownership as a potential threat to aquaculture, and commercial fishing and lobstering operations. In general, industry supporters believe that Service acquisition would result in restrictions or limits on operations in State- adjacent waters. In fact, the Service has no direct authority over these operations and can not unilaterally impose restrictions. On the other hand, if a Federal trust species, such as an endangered or threatened species, could be impacted, then the Service will initiate Section 7 consultations under the Endangered Species Act. Commercial finfishing and shellfishing is regulated by the State. Aquaculture leases are issued by the U.S. ACOE and State of Maine.

Alternative A

Under Alternative A, there would be no change in opportunity for commercial harvest of shellfish and worms. Harvesting rockweed would be eliminated on the intertidal areas surrounding the 1,274 acres proposed for Service acquisition. We do not know the extent of the opportunity lost, or its economic impact, because we have not surveyed for rockweed in these areas, nor monitored levels of harvesting. In addition, we are not aware of any reliable source for this information.

We do not anticipate any measurable impacts on the salmon aquaculture or lobstering industries from either Service acquisition of new islands or Refuge management in general. No existing aquaculture facilities would be impacted near existing Refuge lands. Indirect benefits to these industries may be realized through the permanent protection of natural areas, but we have no way to quantify this benefit. There are no active aquaculture leases on record in the vicinity of lands proposed for acquisition.

Alternative B

Under Alternative B, the impacts would be the same as Alternative A, except there are 2,859 acres proposed for acquisition, including 87 nationally significant nesting islands that would be added to the Refuge boundary. Rockweed harvesting would be eliminated on these islands, but we do not know the extent of this economic loss. Impacts to salmon and lobstering industries are the same as predicted in Alternative A.

Alternative C

Under Alternative C, the impacts would be the same as Alternative B, except there are approximately 6,310 acres proposed for acquisition, including all or portions of 151 nationally significant nesting islands that would be added to the Refuge boundary. As with Alternative B, all islands would be closed to rockweed harvesting, although we cannot predict the impact to this industry because we have no baseline information. There are four finfish leases and two shellfish leases on record near to islands proposed for acquisition. At this writing, our information indicates that three of the finfish leased operations (Little Black, Great Waas, and Little River islands) are more than 1/4 mile from nesting areas, and the two shellfish operations (French House and Treasure islands) are low intensity with no anticipated impacts. Only one of the finfish operations may be a concern to us (Treat Island), but only if a new or expanded facility is proposed within 1/4 mile of the bald eagle nesting site. Given that Service acquisition of Treat Island is speculative at the current time, and no direct impacts are predicted to this or the other 5 leased operations, and because of the external influences we described in Chapter 1 (Re: Issues Outside the Scope of this CCP/EIS, Issue #1) and Chapter 3, we do not expect any impacts to current operations over the short-term. Also, given these current external influences on the industry, and the uncertainty of how they would affect the industry as a whole, and/or individual operations, we did not further evaluate long-term impacts from our respective, proposed actions.

Alternative D

Same as Alternative A, except there are only 467.1 acres within the currently approved boundary that would be acquired; no expansion is proposed.

Local and Regional Economy - Summary

Overall property tax losses to towns is greatest in Alternative C because it proposes the largest Refuge expansion, followed by Alternative B, then A. There is no property tax loss in Alternative D since no expansion is proposed.

Alternative C would possibly result in two new commercial seabird viewing opportunities, while Alternative B would possibly result in one new opportunity. We would maintain current opportunities with implementation of Alternative A, and there would be a loss of opportunity on Petit Manan island with implementation of Alternative D.

Alternatives B and C would effectively provide the greatest increases in hunting opportunity and associated revenues. An approximate increase of 70 hunter days is predicted with either alternative, generating an additional $6,540 to the local economy. There would be no change in hunter opportunity or revenues generated with Alternative A. Alternative D proposes to eliminate hunting, so it would result in a total loss of hunter opportunity and revenues generated.

None of the alternatives would appreciably impact Maine's sheep industry; however, the two local sheep operators would be most impacted by Alternative D as it would cause them to modify their operations and incur some expenses in doing so.

It is difficult to predict with any certainty the potential impacts on the lobstering or aquaculture industries since our recommendations for a 1/4 mile no-activity buffer are not always incorporated into ACOE permits. However, Alternative C, which proposes the largest Refuge expansion, has the greatest potential to impact the industry. At present, we know of six aquaculture leases which have been issued off islands proposed for acquisition in this alternative. Alternative B has the next highest potential to impact the industry because of the expansion proposed, although no aquaculture leases have been issued next to proposed islands. Alternative A follows next, although no leases are known. No impact would result from Alternative D.

Aquaculture pens at Cross Island
USFWS photo

Effects to Public Access, Educational and Recreational Opportunities

As described previously, coastal Maine is a major attraction for outdoor enthusiasts. While the Refuge is not typically the principal destination in and of itself, it does enhance the coastal experience by offering public access to a premiere setting with outstanding opportunities for wildlife-dependent recreational activities. Since Refuge lands are held in the public trust by the Service, access is ensured for these activities unless Federal trust resources would be impacted. In addition, Colonial Ordinance grants easement to the public over intertidal lands for the purpose of fishing, fowling, or navigation. Refuge lands are open to the following priority, wildlife-dependent public uses: hunting, wildlife observation and photography, and environmental education and interpretation. We have never officially opened the Refuge to fishing as freshwater fishing opportunities are so few or low quality, and there has been no public interest. The surf fishing generally occurs in the intertidal area, where the State ordinance is recognized.

Total visitation on the Refuge in 2004 was estimated to be approximately 47,000 visitors; 19,000 visitors on the mainland divisions units, and 28,000 to the islands or surrounding waters.

The mainland divisions are open year round from sunrise to sunset. We currently maintain two interpretive hiking trails, the Hollingsworth Memorial Trail (1.5 miles) and the Birch Point Trail (four miles round-trip), both on the Petit Manan Point Division. The Hollingsworth Trail has parking for approximately eight cars; the Birch Point Trial has parking for approximately 10 cars. The only universally accessible facility on the Refuge is an informational kiosk on the Petit Manan Point Division. The Gouldsboro Bay and Sawyer's Marsh divisions contain old logging roads that are passable by foot but have no designated trails or parking lots.

Nash Island Lighthouse
USFWS photo

Of the 28,000 visitors to the Refuge islands during 2004, 24,000 of these visitors only experienced them aboard commercial tour boats. With the exception of Machias Seal Island, these tour boat visits do not involve landing on the islands. We estimated that the remaining 4,000 visitors land on Refuge islands, typically by kayak or canoe.

In order to minimize disturbance to nesting birds, the Refuge's seabird nesting islands are closed to public use from April 1 - August 31 each year. In addition, four active bald eagle nesting islands are closed to public access from February 15 - August 31. Four historic bald eagle nesting islands are also closed to public access from February 15 - August 31, but may be open after May 1 if no nesting occurs.

While island closures limit the public's access during the popular spring and summer tourist seasons, all islands (except Seal Island) are open in the early fall, when weather still allows visitation.

Cross, Scotch, and Bois Bubert islands, along with a portion of Halifax Island, are open year round because they do not support nesting seabirds. Most of Halifax Island is closed year round to protect botanical resources. Seal Island is also closed to all public uses year round due to unexploded ordnance.

Some popular activities are not compatible and are prohibited by Refuge regulations. Activities prohibited include seaweed harvesting, collecting balsam fir branches for making Christmas wreaths, use of off-road vehicles, and open fires. While leashed dogs are permitted on the Refuge mainland, dogs are prohibited on Refuge islands. Local residents expressed concern when these restrictions were first implemented, but complaints have diminished in recent years. Public trapping has never been allowed on Refuge lands.

Two Refuge islands are part of the MITA trail: Bois Bubert and Halifax islands. Campers must obtain a permit from either MITA, who administers this program as a service to their members, or the Refuge headquarters. All campers receive information on practicing "Leave No Trace" principles. In addition, MITA has a very effective campaign within their membership to reinforce and promote these stewardship principles through literature, other media, and through personal contacts while monitoring the sites. Our experience monitoring these two refuge island campsites validates that "Leave No Trace" principles are usually followed.

Alternative A (Current Management)

Impacts from Proposed Land Acquisition and Protection

Implementation of Alternative A includes Service acquisition of 467.1 acres within Petit Manan Refuge's approved boundary and another 30 nationally significant coastal nesting islands. At this time, we do not know whether these private island owners currently allow public access. Our observations indicate that some island owners tolerate a low level of day use activities, but do not approve of extensive use of their islands, nor would they allow camping. Most absentee owners probably do not know the extent of activities on their island. It is also possible that some of the islands proposed for acquisition under this alternative are effectively closed to all public access.

All islands proposed for acquisition under this alternative support nesting seabirds or eagles, and would therefore be closed to public access during the peak visitation season. Without knowing for certain what current owners allow in terms of public use, we are unable to quantify this impact on visitors. In addition, it is important to recognize that not all 30 proposed islands are within reach of many recreational boaters and have accessible

landing sites. Therefore, it is an overstatement to suggest Service acquisition would represent a lost opportunity on all 30 islands. We would expect that the biggest adverse impact to visitors would be the restricted access to undeveloped islands with landing sites and within 5 miles of shore. Islands beyond 5 miles from shoreline are generally too far for kayakers and canoeists. On the other hand, Service acquisition would allow legal, approved access to these same islands during the fall months.

Impacts from Proposed Public Use and Access Management

With implementation of Alternative A, we project a 10% increase in annual visitation over the next 15 years based on regional tourism trends, increased Service land acquisition, and planned visitor services activities. This would result in an additional 4,700 visitors/year; approximately 2,400 of whom would be taking part in commercial tours, 400 of whom would visit refuge islands on their own, and 1,900 of whom would visit the mainland. We do not anticipate that this increase would adversely affect resources or use or enjoyment by current visitors because most of the increased use is on boat tours and because of our proposed increase in the land base. The increases projected for other refuge islands and the mainland would be well-distributed and primarily associated with organized Refuge programs.

There is an increasing local demand for outreach and environmental education programs as evidenced by the numerous requests we receive, increased regional tourism, and the growth of coastal populations. Alternative A would continue to provide limited environmental education and outreach. These include taking part in local fairs, talks to local organizations, newspaper articles, and providing refuge brochures to chambers of commerce and highway information centers.

Public education may reduce illegal ATV use
USFWS photo

Under Alternative A, we would also maintain our environmental education partnerships with the Chewonki Foundation, Damariscotta River Association, National Audubon Society, and Hurricane Island Outward Bound School. Humboldt Research Station would continue to use refuge lands as an outdoor classroom and laboratory. The Friends of Maine Seabird Islands, a newly formed Refuge Friends Group, would continue to assist us with outreach activities. While these important activities would continue, our current staff would not be able to meet even the current demand for outreach and educational programs.

Alternative A would continue to provide mainland infrastructure for wildlife observation and photography on the Petit Manan Point Division, with access provided by the refuge road and two trails. This alternative would not expand parking or trails, and summer weekend visitors would often continue to find parking lots filled and the quality of their visit reduced because mainland visitors are concentrated on this unit's two interpretive trails. The islands (except Seal) would continue to be accessible for wildlife observation and photography outside of closure periods. Commercial photographers would continue to be allowed access to closed areas by special use permit only.

We would continue to provide the current level of interpretative programs. Similar to our other programs, the demands for interpretive programs would exceed our ability to meet them. The existing informational kiosks would be maintained at the Petit Manan Point Division and new kiosks would be built at refuge offices in Rockport and Milbridge as planned. Two to three staff- and volunteer-led interpretive programs would occur on Refuge and partner lands each year. A summer interpretive intern would be hired for Petit Manan Point Division. Interpretive signs would also be developed for Halifax Island focusing on the rare plant communities. While these actions would improve our current programs, we would not be able to meet all requests for programs.

Alternative A would maintain current hunting opportunities on Sawyers Marsh and Gouldsboro Bay divisions and the 22 islands. Local hunters and MDIFW have expressed an interest is seeing us expand our hunting opportunities to the Petit Manan Point Division. Since Petit Manan Point would remain closed to hunting under Alternative A, we would not be fulfilling this request.

Alternative A would continue to allow blueberry picking for personal use only. Hand raking of blueberries would not be permitted to ensure some berries are left for wildlife. This restriction has been accepted by the public, and has generally been adhered to. Further, there are many other local places open to the public where more intensive harvesting could occur.

The MDIFW has previously requested we open the Refuge mainland divisions to furbearer trapping. The islands were not suggested because they do not have viable furbearer populations. Under Alternative A, public trapping would not be allowed on existing or proposed Refuge lands. Trapping would only occur for management purposes and would be conducted only by professional contracted trappers or our staff. With our existing knowledge of the mainland tracts proposed for acquisition, we do not believe that any of the current owners allows public trapping. As such, there would be no net loss of trapping opportunities with proposed Service land acquisition; however, there would continue to be an unmet request of MDIFW's by not allowing it on existing Refuge lands.

Impacts from Proposed Vegetation and Habitat Management

Under Alternative A, we would continue to maintain the blueberry and grass fields along the entrance road at the Petit Manan Point Division, enhancing wildlife viewing opportunities and providing the public easy access to blueberries for personal use. The vegetation and habitat activities conducted on Refuge islands is specifically designed to enhance nesting habitat for seabirds. This has a direct and positive benefit to the quality of wildlife viewing opportunities, especially to the commercial seabird viewing tours.

Impacts from Proposed Wildlife Populations Management

Managing the six seabird colonies that are visible to commercial tour boats or recreational boaters provides a unique wildlife observation and photography experience. The seabird viewing opportunity on Machias Seal Island, which we cooperatively manage, is unrivaled in the lower 48 States. No adverse impacts are predicted to public use and access from this program.

Alternative B (Service's Preferred Alternative)

Impacts from Proposed Land Acquisition and Protection

Alternative B would result in Service acquisition of 467.1 acres within the Petit Manan Refuge's approved boundary and the addition of 87 nationally significant nesting islands and 153.3 acres of mainland. Similar to Alternative A, we do not know whether the current landowners allow public access. All of these islands proposed for acquisition would have a seasonal closure, as described under Alternative A. The island closures would be implemented during the peak visitor season, as all the islands support either nesting seabirds or bald eagles. However, under Alternative B, there would be one modification to the seasonal closure dates. On islands where only gulls and eiders are nesting, we would allow day use access to begin on July 31 rather than August 31. This change would be consistent with MDIFW island closure periods and would provide the public with an additional month for day use activities on 9 Refuge islands and 6 islands proposed for acquisition. This change would directly benefit kayak and canoe enthusiasts.

As described in Alternative A, not all 87 islands proposed for acquisition are accessible to boaters, especially to kayakers and canoeists, because of their distance from shoreline and the lack of suitable landing sites. As such, it is an overstatement to suggest that public access opportunities would be lost with seasonal closures on all 87 islands. Further, we suggest that Service acquisition may actually afford legal access, in the fall months, to many islands where it may not have been allowed previously by a private landowner.

Impacts from Proposed Public Use and Access Management

Under Alternative B, we project a 25% increase in annual visitation over the next 15 years, representing an additional 11,750 people/year over current visitation. In total, we estimate that 58,750 people would visit the Refuge annually; approximately 13,750 would visit the mainland; 30,000 would engage in commercial seabird tours; and 5,000 would visit islands on their own. On the mainland, we predict that most of this increase would result from developing new interpretive and environmental education programs for schools and other groups. On the islands, the increase would be due to the fact that more islands are included in the Refuge. Our visitor capacity is greatly expanded with these additional 87 islands, and we do not anticipate that this increase would adversely affect resources or the use and enjoyment by current visitors. We would implement monitoring strategies to ensure resource damage does not occur, and to evaluate visitor satisfaction.

Under Alternative B, we would increase our environmental education and outreach programs and partnerships substantially. We would continue to explore a partnership with the National Park Service, Acadia National Park, at their Schoodic Point property which they have converted to a Learning Facility for research and environmental education. This would also help us foster a stronger relationship with Acadia National Park. In addition, we would continue to pursue a new Refuge Administration and Coastal Education Center in the mid-coast area to further enhance environmental education opportunities. With full implementation of this alternative, we believe we would be able to meet most demands for environmental education and outreach.

Opportunities for commercial photographers might be reduced since we would ensure there is a direct benefit to the Service before issuing a special use permit. However, amateur nature photographers would directly benefit from construction of photo blinds and observation platforms on the mainland divisions. This new construction would be accessible to persons with disabilities, an opportunity new on the Refuge.

Alternative B would substantially increase environmental programs such as this walking tour
USFWS photo

We would be creating access to the Gouldsboro Bay Division with a designated trail and expanded parking area with a capacity for 10 cars. This would provide a more inviting area for a greater number of visitors interested in wildlife-dependent activities. It would also alleviate some of the pressure Petit Manan Point Division receives. We would be able to distribute mainland visitors better.

Under Alternative B, we would create a new opportunity for hunting by opening up the Petit Manan Point Division to white-tailed deer hunting. The hunt would allow only disabled hunters during the regular firearms season, and hunters of all abilities during the muzzle-loader season. The hunting area would be north of the access road, in the Birch Point Trail area.

This would satisfy a request from MDIFW and local hunters. For the first few years, we predict this area would provide a high quality, successful hunting opportunity. After approximately three years, we expect this would diminish when the deer no longer feel as secure and disperse to the lower densities more common along the Maine coast. As a result of opening the area to hunting, public access to the Birch Point Trail on Petit Manan Point may need to be closed during the firearm and muzzle loader season depending on the number of hunters. We predict that approximately 200 non-hunting visitors would be impacted from Monday through Saturday during late October to early December if we determine the trail must be closed for public safety. On Sundays there is no hunting allowed in the State.

The new trail and parking area on the Gouldsboro Bay Division would also facilitate access and parking to this popular waterfowl hunting area. All islands and mainland property acquired under this alternative would be opened to waterfowl hunting unless restricted by deed. As we described previously, the Colonial Ordinance allows "fowling" in intertidal areas, so our actions would not appreciably increase the amount of area open to waterfowl hunting.

Under Alternative B, we would continue existing camping opportunities on Bois Bubert and Halifax islands by permit-reservation with cooperation from MITA, Maine Bureau of Parks and Lands, and other partners. We would utilize this partnership to develop and implement a monitoring program that would identify threshold limits of island usage. Five islands we propose to acquire under this alternative are currently part of the Maine Island Trail. Three of the islands are currently day use only, while two also allow camping. If acquired by the Service, all would be subject to a seasonal closure to protect wildlife and habitat. Access for day use would only be allowed outside the nesting season. In addition, we would close these islands to camping year round. These restrictions would likely necessitate that MITA administrators seek alternative sites to ensure the trail has no gaps. Implementation of Alternative B would negatively affect MITA trail users until alternative sites can be located. We expect members of MITA would be inconvenienced by this action.

Under Alternative B, we would not allow public trapping. The impacts would be similar to those described under Alternative A.

Impacts from Proposed Vegetation and Habitat Management

Under Alternative B we would continue to maintain the blueberry and grass fields as described in Alternative A. The increased habitat manage-

ment proposed in Alternative B would afford new opportunities for environmental education and interpretation, two programs where demand is ever increasing. Wildlife viewing and photography would also be enhanced by managing for habitat and wildlife diversity.

Impacts from Proposed Wildlife Populations Management

We would establish six new seabird restoration projects, which may provide increased opportunities for both recreational and commercial tour boat operators to view wildlife in new sections of the coast. Distance from shore, proximity to population centers, and seabird colony size and species present would most likely dictate how well these new sites provide an opportunity. A new opportunity would not likely be realized for at least 8 years, the length of time we think it would take for a seabird colony to get established to a size that might interest a commercial seabird viewing operator.

Alternative C

Impacts from Proposed Land Acquisition and Protection

Alternative C would result in Service acquisition of all, or portions of, 151 unprotected nationally significant nesting islands, 153.3 acres of mainland, and 467.1 acres currently within Petit Manan Refuge's approved acquisition boundary. Similar to Alternatives A and B, without knowing the policies of current island landowners, we are not able to fully evaluate the effects of this action on public access. We anticipate that Service acquisition could result in greater access to some islands, outside the nesting season. More likely, however, Service acquisition would limit access at islands now open for year-round visitation.

Under Alternative C, each Refuge island would be evaluated separately to determine the most effective public access closure period for the species nesting on the island. For example, closure periods may extend outside of the currently used February 15 to August 31 dates, if appropriate, to cover the entire breeding season of all species present. Leach's storm-petrels are known to nest into November; so, on islands with these birds the closure period may not end until November 15. Other changes may be warranted with new and better information, or as necessary to protect sensitive areas such as rare or declining plants or habitats. It is possible that the closure dates could change on an annual basis as we respond to new information. We predict that frequent changes in closure periods on a given island, and different closure periods between the islands, would cause much confusion and inconvenience for visitors. It would also require us to conduct extensive outreach campaigns each year to alert people to the changes. We would not expect this strategy to be favored by our current visitors.

Under Alternative C, acquisition of new islands and the impacts on the current MITA trail users would be similar to those described for Alternative B.

Impacts from Proposed Public Use and Access Management

Under Alternative C, we predict a 50% increase in annual visitation over the next 15 years, representing an additional 23,500 visitors/year over current levels. In total, we estimate 70,500 people would visit; 28,500 would visit the mainlands; 36,000 would visit on seabird boat tours; and 6,000 would visit the islands on their own. Similar to Alternative B, most of the increase would be attributed to the expanded land base and increased visitor programs. As with Alternative B, the expanded land base would disperse use so that we do not anticipate the increase in visitation to adversely affect resources or the use and enjoyment of individual visitors. We would also implement monitoring strategies to ensure resource damage does not occur and to evaluate visitor satisfaction.

We would implement new public use infrastructure on the mainland divisions as proposed in Alternative B. The new trails proposed would also alleviate some of the pressure that Petit Manan Point Division receives. As with Alternative B, we would be able to distribute mainland visitors better.

In addition to the new programs described in Alternative B, under Alternative C we would also develop a web-based environmental program whereby students around the world could view seabirds on refuge islands. Research data from the restoration islands would be posted on the website and students would be led through lessons using the data. This would effectively expand our outreach to a world-wide audience.

By implementing Alternative C, we would evaluate the compatibility of opening Petit Manan Island and other select islands to photo blind tours. If this use is found to be compatible with the purpose of the Refuge, it would be allowed, offering a rare opportunity for the public to view seabirds up close. In Maine, this opportunity only exists at Machias Seal Island and is in incredibly high demand. Bird watchers and photographers would especially benefit from this new opportunity.

Alternative C would result in impacts to waterfowl hunting similar to Alternative B. We anticipate opening all island property acquired under this alternative to waterfowl hunting unless restricted by deed. Without knowing the policies of current island owners, it is difficult to assess the effects of this action on hunting opportunities.

Bois Bubert and Halifax islands would remain open for camping, as part of the MITA trail. However, under Alternative C, special use camping permits would be administered only by our staff. This would allow us to better monitor the number of users, group size, length of stay, and their effects on resources. It could potentially result in a reduction in the number of days the area is available for camping. Other impacts to camping are similar to Alternative B.

Under Alternative C, we would allow public trapping on Petit Manan Point, Sawyers Marsh and Gouldsboro Bay divisions, and Cross and Bois

Bubert islands according to State and Refuge regulations. No trapping would be allowed on the three mainland divisions during waterfowl migration season (September through November) to reduce disturbance to waterfowl who are congregating on the refuge building reserves for their southern flight. Trapping for management purposes would continue as described in Alternative A. This new opportunity satisfies a request from MDIFW, which is seeking hunting and trapping opportunities on all public lands where safety and resource concerns are not an issue. We are not certain as to the number of trappers this would benefit; however, we would predict less than five trappers would participate.

Impacts from Proposed Vegetation and Habitat Management

Same as Alternative B

Impacts from Proposed Wildlife Populations Management

We would initiate 12 new seabird restoration projects, which may provide increased opportunities for both recreational and commercial boat operators to view wildlife in new sections of the coast. Similar to Alternative B, distance from shore, proximity to population centers, colony size and species present would most likely dictate how many of these new sites provide a new opportunity. As with Alternative B, new opportunities would not likely be realized for at least 8 years. Under Alternative C, we predict that 2 new viewing sites may become established and result in new destinations for commercial operators.

Alternative D

Impacts from Proposed Land Acquisition and Protection

Under Alternative D, the Service would not acquire any more islands beyond those already in Petit Manan Refuge's approved boundary. In addition, this alternative would close all acquired islands to public use year round. As such, public access would be negatively impacted and many visitors would be upset by this change. We predict this action would significantly reduce public support for the Refuge and our programs.

Impacts from Proposed Public Use Programs

Implementation of Alternative D would result in all Refuge islands being closed to public access year round. The only public access to islands would be through staff-led programs or organized under special use permits. This would severely limit the public's access to the islands, depriving at least 4,400 people annually of this experience. Many visitors and local residents would be upset, as would local community officials. This would adversely impact the relationship of the Service with the local community over the long term. Mainland based opportunities would remain the same or decrease slightly as under Alternative A.

Under Alternative D, we would expect a 34% decline in total visitation over the next 15 years due to the elimination of public access to islands, as well as a 50% reduction in seabird viewing opportunities. This loss in seabird viewing is attributed to the fact that the Petit Manan Island colony would no longer be actively managed, it would be overtaken by gulls who could adapt to the changes in vegetation, and it would likely be abandoned by most other seabirds within the 15 year planning horizon and taken over by gulls. Most of our commercial tour boat visitation occurs at this island, so it would result in a total loss of viewing opportunities within 15 years.

Under Alternative D, the interpretive trails, overlooks, and other infrastructure described in Alternative B would not be built. The substantial demand for environmental education and interpretation programs would be even less satisfied than under Alternative A. We would disappoint many visitors and local educators with our limited resources.

Alternative D would close all Refuge lands to hunting, including those proposed for acquisition which may currently allow hunting. This would eliminate current Refuge hunting opportunities on 22 refuge islands, and mainland parcels at Sawyers Marsh and Gouldsboro Bay Divisions. Over 280 annual hunter visits would be eliminated. Local hunters would be the most impacted, and we believe that most would remove their support for the Refuge. We cannot predict the impact to hunting opportunities on those islands to be acquired under this alternative since we do not know what current owners allow.

Camping would be eliminated on the two Refuge islands included in the Maine Island Trail (Halifax and Bois Bubert). This action would reduce the number of islands in the Downeast section of the Maine Island Trail that are open to public camping, which is a very unique experience. Further, a gap would be created in the trail which would affect trail users' ability to island-hop. This would mostly affect members of MITA. In the long-term, MITA may be able to get permission for camping from private island owners, but this is not definite. MITA members would be very upset with this proposal. We would jeopardize our working relationship with them if this action were implemented.

Impacts from Proposed Vegetation and Habitat Management

Under Alternative D, vegetation would grow unimpeded. Over the long-term, wildlife viewing opportunities would decrease as vegetation would screen wildlife from view. The habitat would no longer provide foraging opportunities for white-tailed deer. Blueberry picking would also be eliminated as blueberry fields require active management to stay productive and to eliminate encroachment by woody species.

Impacts from Proposed Wildlife Populations Management

No impacts predicted.

Public Access, Educational and Recreational Opportunities - Summary

Compared to Alternatives A and D, Alternatives B and C would appreciably expand Service ownership (87 islands and 151 islands, or portions thereof, respectively) where priority public uses would be allowed outside of seabird and bald eagle nesting seasons. Since virtually all of these islands are privately-owned, this would represent a substantial increase in public access to Maine coastal islands. Alternative A includes a 30 island expansion and Alternative D would not allow any public access year round.

Over the next 15 years, we project increased visitation in Alternatives A, B, and C commensurate with the proposed expansions and increased visitor services programs. Alternative C would realize the greatest potential increase in annual visitation with an additional 23,500 visitors; followed by Alternative B with 11,750; and, Alternative C with 4,700. Under Alternative D, we predict annual visitation would actually decline over current levels over the next 15 years, since the seabird colonies in the most popular viewing areas would no longer be actively managed and their numbers would decline.

Many visitors use their own boats to access Refuge islands outside the seabird nesting season
USFWS photo

We would expect to meet or exceed the demand for priority public use programs under Alternatives B and C. We would increase our environmental education, interpretation, wildlife observation and photography programs on the mainland, offer a new deer hunting opportunity on Petit Manan Point Division, and continue to provide waterfowl hunting on the majority of islands. Camping would continue to be allowed on two Refuge islands, in partnership with MITA. Alternative C is the only alternative that would allow trapping in certain areas, a new opportunity on the Refuge. Alternative A would continue current programs, where unmet requests for programs is a common occurrence. Alternative D would emphasize environmental education on the mainland and with partners, but would scale back on programs that draw more people to the area.

Effects on Cultural Resources

In protecting our cultural and historic resources, we are guided by specific executive orders, policies, laws, regulations, standards, and guidelines. We would comply with all appropriate legal mandates in our efforts to protect and manage the cultural resources on the Refuge. Our actions likely to affect archaeological and historic sites are routinely reviewed and assessed under provisions of Sec. 106 of the National Historic Preservation Act. To date, projects requiring such review on the Refuge include the rehabilitation and stabilization of historical lighthouse structures.

It is probable that unrecorded coastal archaeological sites exist on current Refuge lands and on islands proposed for Service acquisition. Many of these are likely to include seasonal shore fishing stations and trading locations dating from approximately 2000 years ago up to the earliest periods of European contact and settlement. Few of these locations have been successfully located within New England, and even fewer studied through archaeological excavation. Such sites could be among the most significant of the nation's historic archaeological sites, and the threat of loss by erosion makes their discovery, study, and protection increasingly urgent.

Alternative A (Current Management)

Under Alternative A, the proposed Service acquisition of 467.1 acres within the approved Petit Manan Refuge boundary and 30 additional islands would have a direct, positive effect on cultural resource protection. Service acquisition affords permanent protection from losses or disturbances due to development. While we are not aware of any recorded sites on these lands, it is probable there are sites worthy of further study. Unfortunately, under this alternative, we would not be equipped for further cultural resource inventories or studies, or able to reverse losses to sites impacted by natural or human-induced erosion.

Lacking trained staff, a formal cultural resources survey, cultural resources plan, and partnerships to cooperatively protect resources, we would not be proactive in evaluating and protecting sites. Also, the limited law enforcement staff under this alternative would not allow us to adequately prevent or address Archeological Resources Protection Act (ARPA) violations. With regards to our historic structures, we would continue to be unable to adequately maintain them due to funding and staffing shortfalls; we would simply not be able to address all of their existing and future maintenance and stabilization requirements.

Alternative B (Service's Preferred Alternative)

Under Alternative B, the proposed Service acquisition of 467.1 acres within the approved Petit Manan Refuge boundary and 87 additional islands would have a direct, positive effect on cultural resource protection, almost tripling island protection compared to Alternative A.

This alternative would allow us to make an important, positive contribution to meeting our cultural resource public trust responsibilities. We would have adequate resources to survey, map, catalog, monitor, and protect archaeological and historic resources. Under Alternative B, we

would increase staffing and training, conduct surveys and inventories, develop formal agreements with the Coast Guard and respective lighthouse Friends Groups, and establish a partnership with the Passamaquoddy Tribal Nation. Also, this alternative would result in the development and dissemination of educational and outreach information emphasizing the need to respect and protect cultural resources. We would be able to advance public awareness, understanding, and cooperation in protecting these resource. This alternative would result in a significant increase in our ability to meet and carry out national mandates to protect cultural resources on Refuge lands. Appendix K shows a letter from the Maine Historic Preservation Commission which concurs with our findings.

Alternative C

Under Alternative C, impacts would be similar in context to Alternative B, except the increased Service land acquisition of 151 islands would make an even greater contribution to the protection of cultural resources in coastal Maine. Implementation of Alternative C would incorporate all the cultural resource protection actions included in Alternative B, plus add additional public use and law enforcement personnel. We would increase by magnitudes our effectiveness in cultural and historic resource protection over the long-term.

Alternative D

Under Alternative D, we would also contribute positively to cultural resource protection through Service acquisition of the 467.1 acres in the approved Petit Manan Refuge boundary. However, the overall benefits are much less than those proposed in Alternatives A, B, and C, since no new islands are proposed for acquisition.

We would obtain more staff able identify and address ARPA violations than we currently have. In addition, all islands would be closed to public access under this alternative, thereby reducing the potential for direct human-induced impacts on cultural resources. We would seek alternative and supplemental funding sources to assist us in protecting the historic lighthouse structures. Our goal would be to meet or exceed minimum standards for their protection. This would positively impact historic resource protection over the long term, more so than Alternative A.

No formal education or outreach program would be planned under this alternative, thus reducing the effectiveness of our own protection efforts and the ability to gain recognition and assistance from others.

Cultural Resources - Summary

All alternatives comply with legal mandates to protect and maintain archeological and historic sites. All alternatives also propose to improve relations with the Passamaquoddy and other Wabanaki Tribes through a partnership agreement. Alternatives B and C would improve our baseline information on existing and potential sites through surveys. Partnerships would be developed to protect and restore historic sites. Under Alternatives A and D, very little change would occur; we would continue to meet only the minimum standards for protection of historic sites.

Effects on Vegetation and Habitats

The Refuge includes an incredible diversity of habitats, some of which are unique to the Refuge System. Our limited habitat management on the Refuge mainland is focused on maintaining grasslands, open fields and blueberry barrens, and water impoundments for migrating birds. We very successfully manage six Refuge islands to benefit nesting seabirds. The effects of our management actions on Refuge habitats, including forested uplands, shrub and early successional habitat, saltmarsh and freshwater wetlands are described below for each of the four alternatives. Effects on native, exotic, invasive plants, and rare plant communities are also described.

Alternative A (Current Management)

Impacts from Proposed Land Acquisition and Protection

Our land acquisition proposal under Alternative A would protect 467.1 acres currently within Petit Manan Refuge's approved boundary, and 30 additional nationally significant islands, from one of the principle threats facing coastal habitats: habitat degradation resulting from development. We do not anticipate the need for any active habitat management on the 30 coastal islands acquired under this alternative. Therefore, in the short term, natural processes would dictate any changes to the existing vegetation communities. Vegetative succession is slow on these islands and we do not anticipate any significant changes over the next 15 years. As a result, the habitats found on these islands and coastal properties would continue to support diverse vegetation communities, and provide valuable nesting, foraging, and stopover habitat for a variety of species. On the mainland, acquisition of the 95-acre Sawyers Marsh property would allow us to initiate measures to protect important saltmarsh habitat, which is currently being impacted by illegal off-road vehicle use.

Impacts from Proposed Public Use and Access Management

Under Alternative A, we would continue to provide public use opportunities on the two interpretive hiking trails, the Hollingsworth Memorial Trail and the Birch Point Trail, both on the Petit Manan Point Division. Soil compaction and vegetation trampling would likely continue to occur on both trails, although under current public use levels, neither is considered a major threat to Refuge resources. Generally, the disturbance would continue to be confined to the trail.

No public use facilities or parking areas have been developed on the Gouldsboro Bay or Sawyer Marsh divisions, nor would any be developed under Alternative A. Visitors would continue to utilize existing unauthorized "trails"created during past forestry harvesting operations. Hunters and shellfish harvesters would also continue to violate Refuge and State regulations on the Gouldsboro Bay Division by driving off-road vehicles into the saltmarsh, thus trampling vegetation. Similarly, illegal off-road vehicle use would continue at the Sawyers Marsh Division where no

infrastructure is in place. This practice would continue to result in soil compaction, erosion, and destruction of vegetation. Without law enforcement staff to enforce regulations, both upland and saltmarsh vegetation on Sawyers Marsh and Gouldsboro Bay Divisions would continue to be adversely affected, resulting in long-term habitat degradation.

All seabird nesting islands would remain closed to public visitation from April 1 - August 31, to protect nesting seabirds from human disturbance. The seasonal closures on the 30 proposed new islands would limit traditional uses, such as camping, which has a high probability of impacting vegetation through trampling if not managed properly. The seasonal restrictions would also serve to limit potential damage during the peak growing season of most fragile botanical communities located on coastal islands.

Camping would continue to be allowed in designated sites on Bois Bubert and Halifax islands. While some soil compaction has occurred, we do not believe that continued camping would cause irreversible degradation in the short term. We would continue to work with MITA to monitor sites to detect and reverse the potential for long-term negative impacts

A significant portion of Halifax Island would remain closed to public access year round to protect rare plant communities. We anticipate that some of the 30 proposed new islands would also host rare plant communities. Acquisition by the Service would protect these sites from the threats associated with development (vegetation clearing, construction, and off-road vehicle use) and uncontrolled public access during the peak growing season.

Impacts from Proposed Vegetation and Habitat Management

Under Alternative A, once land is acquired by the Service, natural disturbances would be the dominant force altering the forest composition of these lands over the long-term. As a result, the combined effects of wind, fire, ice, insects, and pathogens would create a variety of landscape patterns that vary in stand sizes, shapes, ages, and structural diversity (Elliot 1999). Small natural disturbances can create gaps in the forest canopy that promote the growth of younger trees and increase the overall diversity of the stand (Elliot 1999). We do not anticipate any significant short-term effects to the composition of Refuge forests through our acquisition process or management actions. However, over the long-term, these forests would be sustained as mature and old growth conifer dominated stands subjected to natural processes. The resulting stands would be more diverse in structure and composition than they appear today.

We recently completed cover-type maps for the mainland divisions using the National Vegetation Classification System. Accurate cover-type maps allow us, with input from a variety of conservation agencies, to evaluate the current cover type patterns as well as the best cover type distribution to meet our goals and objectives on Refuge lands. Under Alternative A we would continue this evaluation in support of our goals and objectives.

We would continue to operate without a detailed Habitat Management Plan for the Refuge. Instead, we would continue to manage a few project areas without long-term goals, objectives, and evaluation strategies. We would continue to utilize a variety of vegetation management techniques to maintain or enhance open field habitat for species of conservation concern. These include use of prescribed burning, herbicides, fencing, mowing, rototilling, and sheep grazing. We would continue to monitor vegetation treatment areas pre- and post-treatment to evaluate the effectiveness of manipulating vegetation and determining wildlife response. Overall, the effects of our habitat manipulation efforts would rarely last beyond one to two growing seasons, and there are no significant changes to species composition. Plants would continue to primarily regenerate from seeds within the soil or roots left unharmed by the treatment method. A more detailed description of our treatment methods is presented below.

Prescribed Burning: We would continue to use prescribed fire to facilitate old field and blueberry barren management and restoration on approximately 70 acres, to manage threatened and endangered species habitats, to reduce hazardous fuels and debris, or to control invasive or exotic species. The following figures would be our annual maximums for prescribed burning under Alternative A:

- 30 acres/year for enhancing or maintaining wildlife or botanical populations;
- 15 acres/year to preserve threatened or endangered species and promote biological diversity;
- 7 acres/year to control exotic or invasive species and reduce hazardous fuels, and;
- 3 acres/year for boundary maintenance or debris removal around structures.

We have utilized prescribed burning and mowing to maintain grassland habitat on Petit Manan Island and we would continue its use there and potentially on other islands. Our efforts have focused on reducing the abundance and density of blue joint (*Calamagrostis canadensis*) and raspberry (*Rubus* sp.). Both species grow to densities and heights which exclude nesting by terns and may promote nesting competition by laughing gulls. In recent years, we have conducted these prescribed burns on portions of Petit Manan Island during the month of April. This practice results in an oxidation of standing dead biomass and surface litter, with little damage to regenerating herbaceous perennials (N. Richards pers. comm.). Although spring burns reduce small woody and semi-woody stems down to near ground level, the plants retain their ability to re-sprout below the burned stems. With the exception of species that re-sprout readily after a burn and benefit from the temporary reduction in dead plant cover, spring burning would not likely have a significant effect on the existing community composition.

Prescribed burning efforts on Petit Manan Point Division
USFWS photo

Unfortunately, raspberry may actually benefit from the release of nitrogen, the warming of blackened soil, and the liming and fertilizer effect resulting from the burned vegetation (N. Richards pers. comm.). Although the long-term effects of repeated burning of blue joint and raspberry on Petit Manan Island are not currently known, fire does remove standing raspberry canes. At a minimum, this sets back plant height for the following growing season. For dense thatch forming species such as blue joint, burning reduces the thatch component and exposes more bare ground. Based on our experiences, the prescribed fire activities conducted on Petit Manan Island would rarely affect habitat conditions beyond the next growing season.

On the Petit Manan Point Division, we would continue to use prescribed fire to enhance blueberry production and control encroachment of invasive woody species such as sweet fern in the 70 acres of open field. Commercial blueberry growers have determined that crop yield can be improved with periodic pruning, including pruning by fire or mowing. In addition to removing the stems, fire offers several other benefits to the crop, including a reduction in insects, disease, and weeds (University of Maine, Coop. Ext. fact sheet #229). This practice maintains nesting habitat for a variety of grassland breeding birds, and also produces significant berry crops utilized by a variety of bird and mammal species, including migratory whimbrels. In addition to reducing plant height and density, burning removes accumulated layers of organic material from the surface of the ground. During the past five years, we have burned up to 33 acres per year on Petit Manan Point. We would continue to adhere to the Fire Plan to ensure burning effects are short-lived and do not degrade or cause long-term damage to soils or vegetation. We would typically burn these acres on 3 to 5 year intervals.

Sheep Grazing: We would continue to use sheep grazing to manage vegetation for common and Arctic terns nesting on Metinic Island. The flock of 120 sheep belongs to the family who owns the southern 150 acres of the island. With the exception of a few small vegetation study plots that we have fenced, the sheep are generally allowed to graze the entire island. In an effort to monitor the vegetation's response to grazing, we would continue to maintain two permanently fenced plots and two reference "unfenced"plots. Several times each season, we would continue to record the species composition and plant height in these four plots. Prior to the tern nesting season, we would also encircle the 3-acre tern restoration area with electric fencing. Protection from grazing allows the vegetation to

increase in height, and provide nesting cover for the terns. Although terns will nest within a variety of habitat conditions, they generally prefer some overhead cover and a mix of vegetation and open space (Cramp 1985, USFWS 2000). The density and height of the plants seem to be more significant in determining use by nesting terns rather than specific plant species composition. (NAS 1994, NAS 1995). Information we have gathered to date on Metinic Island indicates that sheep are altering the species composition, density, and height of the vegetation. However, it appears that the seasonal fencing of the restoration area is providing terns with appropriate nesting cover. At the end of the nesting season, the fence is removed and the sheep may graze the entire island. Seasonal grazing of the restoration area controls the growth of rank vegetation, which, in the absence of vegetation management, would eventually exclude nesting terns. We would continue seasonal grazing of the restoration area as it appears to be providing terns with suitable nesting habitat and is the most viable vegetation management tool we have available on this remote island.

On Nash Island, approximately 30 sheep graze the adjacent privately owned Big Nash Island and cross at low tide to access Service-owned Nash Island. The effects of sheep grazing on the vegetation and seabirds of Nash Island have not been studied. Our observations indicate that grazing pressure and vegetation conditions are similar to that observed on Metinic Island. We would continue to allow grazing on these two islands since it would remain the most viable means of vegetation management for nesting terns on a remote island. As with many coastal islands, sheep have grazed here for generations, so it is difficult to determine with certainty what the natural vegetation community would look like in the absence of grazing.

Mowing: On the Petit Manan Point Division, we would continue to mow to control the encroachment of invasive woody species such as sweet fern. Our primary objective would continue to be enhancement of habitat for migratory birds and grassland breeding birds. During the past five years we have mowed up to 18 acres per year. Typically, mowing has been utilized when weather or logistical constraints prohibit burning of targeted fields. Mowing reduces plant height without altering species composition or reducing accumulated thatch. Fields would require repeated mowing or burning within 3-5 years to maintain desired habitat conditions.

On several occasions, we have utilized mowing in an effort to enhance nesting habitat for terns on Petit Manan and Ship islands. We would continue this practice under Alternative A, mowing in the fall. Limited spring mowing efforts have proven unsuccessful, and the vegetation generally has recovered to full height within a matter of weeks. In 2002, we initiated a fall mowing schedule on Petit Manan Island. If favorable moisture conditions exist, mowing in August and September will set back plants that are actively growing at that time, and foster cool-season grasses and other species that have a second vegetative growth period in the fall

(N. Richards pers. com). We anticipate that repeated fall mowing efforts would reduce areas of raspberry, while promoting the growth of various grass species which would provide better nesting habitat for terns. This practice may also reduce the vigorous spread of the invasive species dodder (*Cuscuta gronovii*) on Petit Manan Island. We do not anticipate mowing on any other seabird islands due to the logistical difficulties of getting the equipment onto the islands.

Herbicides: We would continue very limited use of the herbicide Roundup[1] on Petit Manan Island in an effort to control raspberry. The primary active ingredient of Roundup is glyphosate, which has undergone extensive environmental review and has not been found to be toxic to wildlife, or bioaccumulate in the foodchain (Monsanto 1993). Roundup is a broad-spectrum herbicide with no soil residual activity. The compound is degraded by microbes within the soil and the average half life of glyphosate is less than 45 days (Monsanto 1993).

On Petit Manan Island, we applied the compound directly to the raspberry plants using a hand sprayer. The single application of Roundup was applied in August 1999 and resulted in the elimination of raspberry from the treated areas during the 2000 seabird season. In some treated areas, the raspberry started to recover in 2001, and now once again represents a significant component of the vegetative cover. It is possible that removal of the vegetative cover may have resulted in increased nutrient release from the soil resulting in increased seed germination (N. Richards pers. comm.). This could result in aggressive invasive species gaining a foothold in the treated area. We minimized effects to non-target species by hand spraying and applying the compound while non-target species were dormant. We do not anticipate significant future use of herbicides on Refuge property. Roundup application would continue to be appropriate for the control of exotic or invasive species, or to treat areas that are unsuitable for other methods of vegetation management (i.e. adjacent to structures, rocky terrain). Due to the availability of plant seeds within the soil, herbicide application would not have the ability to alter species composition on Petit Manan Island, nor would it be expected to have any effect beyond 1-3 years.

Rare plants: We would continue to conduct botanical evaluations on at least two Refuge islands per year to identify plant communities of concern and to serve as a baseline for future habitat management decisions. With island specific information, we would be better able to determine potential threats and the conservation measures necessary to ensure continued viability of rare plants. Unfortunately, our current staffing levels do not allow us to aggressively eradicate exotic and invasive species which have been documented as threats to rare plants on coastal islands.

[1] The use of trade, firm, or corporation names in this publication is for the information and convenience of the reader. Such use does not constitute an official endorsement of any product or service by the U.S. Department of Interior.

Impacts from Proposed Wildlife Populations Management

No impacts are predicted.

Alternative B (Service's Preferred Alternative)

Impacts from Proposed Land Acquisition and Protection

In addition to the 467.1 acres currently within the approved Petit Manan Refuge boundary, the Service would acquire 87 nationally significant seabird, wading bird, bald eagle, and waterfowl nesting islands and 153.3 acres of important wetlands and migratory bird habitat. This effort would protect these parcels from one of the principle threats facing coastal habitats: habitat loss and degradation resulting from development. The islands span the entire Maine coast and represent the full diversity of island habitats. Service acquisition would result in permanent protection of representative coastal habitats, providing valuable nesting, foraging, and stopover areas for a wide variety of species.

On all but 12 of the islands, only natural processes would dictate changes to the vegetation communities, as we would not be actively managing the habitat. On the 12 islands selected for seabird restoration efforts, intensive habitat management would occur as described below.

Impacts from Proposed Public Use and Access Management

In addition to actions proposed in Alternative A, under Alternative B we would build a new trails and parking areas on the Gouldsboro Bay, Sawyers Marsh, and Corea Heath divisions. These would each require clearing approximately 106,000 square feet (2.5 miles long by eight feet wide) of vegetation for the trail and 800 square feet (room for 10 cars) for the parking area. We would utilize as much of old dirt logging roadbeds as possible. Up to two trail-side interpretive overlooks would also be added to each trail. The trail and parking area would increase access to the Refuge's mainland divisions for hikers, bird watchers, and hunters. Development of the trail would permanently remove vegetation within the footprint of the trail; however, it would minimize continued vegetation destruction resulting from creation and use of "unauthorized" trails. All visitors would be required to stay on designated trails. Boardwalks would be constructed over saturated areas to protect sensitive vegetation from adverse impacts.

Under Alternative B, on Petit Manan Point we would build a designated access trail to at least one overlook on the Birch Point Trail at Carrying Place Cove. Currently, visitors routinely venture off the present trail to view this cove. While development of the overlook and designated spur trail would result in a permanent loss of vegetation within the footprint of the trail, we would utilize existing "unauthorized" trails to the extent possible to minimize additional disturbance to vegetation. Establishment of a viewing platform and access trail should limit human activity to one

defined area and minimize adverse effects to vegetation along the various trails currently used by the public. Areas not part of the designated trail would revegetate naturally from adjacent seed and root sources.

The seasonal seabird and bald eagle nesting island closures would potentially limit traditional uses, such as camping, on some islands, but would also reduce vegetation damage associated with human visitation. These closures afford protection to the fragile botanical communities located on many of the islands during their peak growing season.

Gates would be erected at several vehicle access points on the Sawyers Marsh Division. This would eliminate or significantly reduce visitors' ability to drive onto refuge lands and adjacent saltmarsh for hunting or other purposes. While some visitors may be inconvenienced, this access by highway and off-road vehicles has never been authorized, and we have been concerned about resource damage. Soil compaction, erosion, and destruction of vegetation would all be reduced by this management action. Law enforcement staff hired under this alternative would allow us to enforce against these unauthorized activities.

The expanded deer hunt program on the Petit Manan Point Division may result in localized (less than 10 square feet), short-term disturbance to vegetation where temporary blinds may be constructed for the disabled hunt. However, the hunt occurs outside of the active growing season, so impacts on vegetation are predicted to be negligible

Impacts from Habitat and Vegetation Management

Under Alternative B, we would complete a Habitat Management Plan (HMP) for the Refuge within one year, providing more detailed and site specific objectives and strategies for each cover type. We would work closely with our conservation partners during the development of this plan to ensure that we continue to contribute to the ecological diversity of the Maine coast. We would use vegetative treatments, similar to Alternative A, such as mechanical, biological, chemical, grazing, and prescribed fire, where appropriate, to manage for desirable vegetation and to control invasive and exotic plants. Our management activities would be designed to enhance habitat conditions for certain species of management concern, which may include negative trade-offs with other native species. Our HMP would further refine the direction for managing cover types provided below for Alternative B.

Mature Conifer: We would maintain mature conifer forest habitat where it exists on the Refuge; including, 905 acres on Petit Manan Point, 734 acres on Bois Bubert Island and 1,248 acres on Cross Island. Although conifers dominate a large percentage of Maine's forests, the forest industry has favored shorter harvest rotations which has created younger, even-aged forested stands that provide less structural and age-class diversity than

older stands. These younger, even-aged forests typically have a lower supply of downed and standing dead wood, more uniform vertical structure and canopy gaps, and a highly altered plant and animal composition (Elliott 1999). Under Service ownership, natural disturbances would be the dominate force altering forest composition, and the trees would grow and age as nature dictates. We would not anticipate any short-term changes to these forests resulting from our management. However, over the long-term, we anticipate that these forests would acquire more old-growth conditions, resulting in greater standing and down, live and dead biomass, more structural diversity and an increased variety of age classes.

Northern Hardwood-mixed Forest: We would maintain at least 1,250 acres of northern hardwood-mixed forest habitat where it exists on the Refuge. Although small amounts of this habitat type can be found on many of the islands, the largest parcels would remain on three mainland divisions (453 acres on Petit Manan Point Division, 123 acres on Gouldsboro Bay Division, and 455 acres on Sawyers Marsh Division). Our management actions would focus on maintaining a range of forest age structures. The majority of acres would be mid-successional and late-successional forest, providing structural diversity (shrubs and treefall) within the forest. We would not anticipate any short-term changes to the forest through our management. However, over the long-term we would predict that more shade tolerant species would dominate the stand, resulting in a gradual conversion to conifer forest. After 50 years, hardwood species would remain a viable component of the forest, but would likely develop a more patchy distribution as they would only germinate in canopy gaps created through natural disturbances.

Timber cove, Gouldsboro Bay Division
USFWS photo

Early Successional Forest/Scrub-Shrub Community: We would manage approximately 226 acres in early successional forest/scrub-shrub community, primarily on the Petit Manan Point Division, which is dominated by speckled alder, mountain ash, and sweet gale. In the Northeast, this habitat is typically created from natural disturbances such as fire, flooding, beaver activity, or severe storms or occurs as a relatively short-lived vegetation stage after agricultural abandonment or logging (Rosenberg and Hodgman 2000). Throughout coastal Maine, current land management practices strive to avoid these disturbances and, as a result, this habitat type and many landbirds associated with it are in decline. We would utilize some of the habitat management techniques described in Alternative A to maintain these serial stages of vegetation. Without active management, or natural disturbances, this habitat would eventually be replaced by northern hardwood, then conifer forest.

Open Field/Blueberry Barrens: We would manage up to 100 acres of open field and blueberry barren habitat on the Refuge mainland, mainly on Petit Manan Point Division. Without some level of intervention, it is likely that these fields would eventually evolve into shrubs and young forest. We would continue to use prescribed fire and mowing to facilitate open field and blueberry barren management and restoration across the Refuge, to manage threatened and endangered species, to reduce hazardous fuels and debris, or to control invasive or exotic species. The following figures should be considered annual maximums for prescribed burning:

- 70 acres / year for enhancing or maintaining wildlife or botanical populations;
- 25 acres / year to preserve threatened or endangered species and promote biological diversity;
- 10 acres / year to control exotic or invasive species and reduce hazardous fuels, and;
- 5 acres / year for boundary maintenance or debris removal around structures. The impact from prescribed fire and herbicides has already been described.

On the coastal islands there are extensive areas of mixed grasses and various herbaceous species, which provide high quality nesting and migration habitat for many bird species of conservation concern. Our management of these island cover types would continue to be at seabird restoration sites. Under Alternative B, we would establish six new seabird restoration projects on islands in addition to the six we currently manage. Several of these projects could require intensive habitat management in order to create suitable nesting habitat for the terns. We have not identified which islands would support these projects, therefore, we cannot evaluate the site specific consequences of our management actions at this time. However, we would utilize the vegetation management techniques outlined in Alternative A. Grazing may be permitted on some of the seabird islands, however, we would require special use permits be issued to the operators to better manage grazing intensity, distribution, and duration on Refuge lands. We would re-evaluate the effectiveness of grazing after 5 years of CCP approval as stipulated in the compability determination (Appendix C).

Maritime Saltmarsh and Estuary: We would maintain the existing 69 acres of maritime saltmarsh and estuary located on Cross Island, Sawyers Marsh, Gouldsboro Bay and Petit Manan Point Divisions, to ensure the quality and natural function of the marshes are sustained. Service acquisition of the marshes and the adjacent upland habitat would protect these sites from the adverse effects (i.e. non-point source pollution, erosion, invasive species) associated with development of surrounding uplands. We would manage to minimize the human-induced adverse impacts on this habitat type. We do not anticipate that the vegetation communities found in these marshes would be modified as the result of this manage-

ment action. Over the long-term, greater protection would be afforded these areas.

Jack Pine: We would maintain the existing 40 acres of jack pine woodlands (28 acres on Bois Bubert Island and 11 acres on the Petit Manan Point Division) to ensure this community continues to provide a unique and important contribution to the biological diversity of the Refuge. Jack pine is a "pioneer"species which establishes in areas that have been disturbed by fire or other disturbance processes that set back vegetation. The seeds do not usually survive in areas with a thick organic layer and studies indicate that seeds experience a higher germination rate when a fire consumes the organic material and exposes a more suitable seed bed of mineral soil (Maine NAP 1983). Exposure to periodic fires increases the ability of jack pine to maintain its dominance over potentially invasive or fire-sensitive tree species. Without further disturbances, these jack pine woodlands would be replaced by spruce-fir forests over time (Maine NAP 1983). The two jack pine stands found on the Refuge represent two of only eight known stands in Maine. Loss of these areas would represent a significant reduction in the biodiversity of this region. We would coordinate with our Regional Fire Management Officer to determine appropriate site-specific prescriptions for burning.

Rare Plants and Invasive Plants: We would manage rare plant communities on the Refuge to maintain or enhance their populations, ensuring that they remain viable and contribute to the natural botanical diversity of the area. We would conduct six botanical inventories per year on Refuge islands in an effort to document rare plant occurrences and to develop management actions. This information would serve as a baseline for future management decisions and allow us to address threats from exotic and invasive species. Similar to Alternative A, we may restrict public access in order to protect rare or fragile plant communities. Minimizing human disturbance would help to protect these plant communities from trampling, soil compaction, and illegal collection.

We would actively treat exotic and invasive plant species. Treatment methods used would include herbicides, prescribed fire, mowing, and biological control measures. We would work with our conservation partners to determine the most appropriate and effective means of control. With information available to us, we do not think we have a significant invasive plant problem at this time. However, as additional islands are added to the Refuge and botanical inventories are conducted, we anticipate that more active control measures would be needed. Invasive species control measures would protect the long-term native biodiversity of these coastal islands. Over the long-term, acquisition of islands supporting rare plants or communities would continue to be the best initial step to protect them from human induced habitat alteration. Over the long-term, our goal would be to ensure that rare plant communities are sustained and contributing to the rich ecological diversity of the Maine coast.

Freshwater Wetlands: We would manage the existing 467 acres of freshwater wetlands on the four mainland divisions. The wetlands represent a diversity of habitats ranging from forested wetland to coastal raised bogs. On Petit Manan Point, three large wetland complexes (Meadow Brook, Mague Flowage, and Cranberry impoundment) comprising 112 acres, provide areas of open and shallow water marshes, ericaceous shrubs, and wild rice. Although all three impoundments have water control structures, we do not actively manage the water levels. Annual precipitation levels and beaver dams would continue to dictate water levels. When conditions allow, we would introduce additional wild rice into Mague flowage in an effort to enhance foraging habitat for migratory waterfowl. We would not anticipate any significant long-term changes to the wetland vegetation as a result of our management actions. Also on the mainland divisions, we would continue surveys to locate vernal pools and document use by amphibians and reptiles. This baseline information would allow us to make more informed decisions on managing these habitats to benefit wetlands-dependent species over the long-term.

Impacts from Wildlife Populations Management

No impacts predicted.

Alternative C

Impacts from Proposed Land Acquisition and Protection

In addition to the 467.1 acres currently within the approved Petit Manan Refuge boundary, the Service would acquire all, or portions of the larger (>200 acres), 151 nationally significant seabird, wading bird, bald eagle, and waterfowl nesting islands. These islands would be permanently protected from one of the principle threats facing coastal habitats: habitat degradation resulting from development. These 151 islands represent all of the seabird, wading bird, bald eagle, and waterfowl nesting islands not currently protected in conservation ownership. Similar to Alternative B, these islands include the full diversity of island habitats along the Maine coast. Their protection would ensure that valuable nesting, foraging, and stopover habitat would be available long-term to Federal trust species.

Similar to Alternative B, on most of the islands, natural processes would dictate any changes to the vegetation communities because they would not be actively managed. The only exception would be the proposed seabird restoration islands, which will increase from 6 to 12 new islands. Alternative B described these impacts in more detail.

Impacts from Proposed Public Use and Access Management

We would construct the same public use infrastructure as identified in Alternative B and the impacts would be similar. We predict that establishing the trails would minimize continued vegetation destruction resulting

from creation and use of "unauthorized" trails. Boardwalks would be constructed over saturated areas to protect sensitive vegetation. All visitors would be required to stay on designated trails. The impacts from the hunting program would be similar to those described for Alternative B.

We would also construct two photo blinds on the mainland divisions to enhance opportunities for wildlife photography. At this point in time, locations for the blinds have not been determined but we anticipate impacts on vegetation would be limited to the footprint of the structures and short access trails. Approximately 1 acre would be disturbed for each project.

With concurrence of the Town of Gouldsboro, we would erect gates on either end of the Old County Road. This would eliminate illegal off-road vehicle use of the Gouldsboro Bay Division. This action would minimize continued vegetation destruction, soil compaction, and erosion, all of which we have observed resulting from unauthorized ATV use. Law enforcement staff hired under this alternative would also provide us with the resources to enforce against unauthorized access and continued resource degradation.

Impacts from Proposed Vegetation and Habitat Management

In addition to the HMP outlined under Alternative B, we would develop "island-specific" plans for each of the islands within the Refuge. This action would require extensive financial and staff support to document botanical communities and exotic and invasive species concerns on all current and proposed Refuge only islands.

Under Alternative C, we would manage the uplands and wetlands cover types, and rare plant communities on the mainland the same as Alternative B. We predict impacts would be similar to those described for Alternative B. On islands, the management strategies and impacts would also be the same, except they would be increased in scope over Alternative B by virtue of the proposed increased island acquisition.

We would continue to use prescribed fire and mowing to facilitate old field and blueberry barren management and restoration, to manage threatened and endangered species, to reduce hazardous fuels and debris, or to control invasive or exotic species. The following figures should be considered annual maximums:

- 140 acres / year for enhancing or maintaining wildlife or botanical populations;
- 50 acres / year to preserve threatened or endangered species and promote biological diversity;
- 50 acres / year to control exotic or invasive species and reduce hazardous fuels, and;
- 10 acres / year for boundary maintenance or debris removal around structures.

Under Alternative C, we would establish 12 new seabird restoration projects, in addition to the 6 we currently manage (e.g. 18 sites total). This represents a significant expansion of our restoration activities, and would require dramatic increases in funding and staffing support. We have not selected the new restoration islands, so it is not possible to thoroughly evaluate the consequences to vegetation. However, we would likely reduce the abundance of rank species such as raspberry, in an effort to promote vegetation favored by nesting terns (i.e. mixed grasses). We would utilize the variety of techniques outlined in Alternative A to maintain habitat on the restoration islands.

Impacts from Proposed Wildlife Populations Management

No impacts predicted.

Alternative D

Impacts from Proposed Land Acquisition and Protection

Under Alternative D, the Service would acquire the 467.1 acres currently within the approved Petit Manan Refuge acquisition boundary. No additional protection would be afforded to the 151 nationally significant seabird, wading bird, bald eagle, and waterfowl nesting islands currently lacking conservation ownership. Instead, this alternative assumes the islands are best served through ownership by our conservation partners. However, we cannot commit our partners to acquiring these specific islands. Each conservation organization would evaluate its interest based on available resources, its mission, and commitment by constituents. We would expect that islands requiring active management, monitoring, or law enforcement would receive less protection under this alternative.

Impacts from Proposed Public Use and Access Management

Under Alternative D, all Refuge islands would be closed to public access year round. The islands would be managed as ecological reserves, where human intervention and presence are minimized. A few staff- or partner-led tours would be provided or permitted only under special use permits. As a result, soil compaction and vegetation trampling resulting from day visits and camping on the islands would be eliminated or significantly reduced over the long-term, and areas already impacted would be able to recover.

No additional public use facilities would be developed on the mainland, so no losses in vegetation would occur due to new construction. Soil compaction, vegetation trampling, and intrusions in to the saltmarshes would likely continue and ultimately worsen as public use continues to increase. In particular, failure to designate a trail at Gouldsboro Bay Division would result in continued loss of vegetation and degradation of conditions along the “unauthorized” trails currently utilized by visitors.

Under Alternative D, we would close the Refuge to hunting. It is unlikely this would result in significant vegetation change within the next 15 years; however, should deer population levels increase significantly, the inability to conduct a hunt may result in over browsing, damage to rare plant communities, and conflicts with adjacent landowners.

Impacts from Proposed Habitat and Vegetation Management

Under Alternative D, we would allow natural succession to occur in all habitat types. The mature conifer and northern hardwood-mixed forest would continue to mature as proposed in Alternative B. In addition, we would no longer manage for early successional forest/edge habitat dominated by species such as alder (Alnus spp) and cherry (Prunus spp) approximately 2-10' tall. We anticipate that without management a significant percentage of this habitat would mature into conifer or conifer-hardwood mixed forest over the long-term. We would also not actively manage the saltmarsh and wetlands on the Refuge; however, we do not expect any appreciable impacts or changes to vegetation. Other impacts to cover types resulting from Alternative D are presented below.

Northern blue flag
USFWS photo

Open Field/Blueberry Barren: We would eliminate sheep grazing, herbicides, mowing, and burning as habitat management tools. This change in management practices would significantly reduce our ability to maintain or enhance open field/grassland habitats. Within the next 15 years, the grass and blueberry fields on Petit Manan Point would likely be replaced by shrub communities, with conversion to forested habitat over the long-term. On the coastal islands, we would not actively manage vegetation, even on the six seabird restoration sites. This would result in a loss of nesting habitat for terns which generally require lower vegetation than would be expected under "non-managed" conditions. On several of the seabird islands, we have documented the expansion of rank vegetation and the subsequent loss of breeding opportunities for terns. Combined with a reduction in predator control efforts, this alternative would significantly limit our ability to contribute to restoration efforts for the endangered roseate tern and several other state-listed species. In contrast, species such as common eider and laughing

gull would benefit in the short-term from the growth of rank vegetation (blue joint and raspberry), and their nesting population would be expected to expand on these 6 islands. This benefit would not last over the long-term; however, as they would eventually succumb to the increase in predators.

Rare Plants: Service acquisition of the 467.1 acres in the approved Petit Manan Refuge boundary would permanently protect rare plants. However, botanical resources would be at risk on the remaining 151 nationally significant nesting islands unless protected by others, which we cannot guarantee. We would not actively manage the vegetation or permit grazing on Refuge islands which could have both positive and negative consequences on rare plants. Currently, we only manage the vegetation on three of the six seabird restoration islands and we avoid any rare plant communities during these management actions. However, it is possible that our management is suppressing a rare species or plant community that we have not detected to date. This type of species could benefit from a "no vegetation management/no-grazing" approach. Species which require periodic disturbance or removal of more aggressive vegetation growth in order to survive would be adversely affected by the "hands-off" approach proposed under Alternative D.

Under Alternative D, staff and financial resources would not allow us to adequately inventory and evaluate threats to rare plant communities. It is probable that rare species and botanical communities would be lost due to habitat change from succession, invasive or exotic species, or habitat alteration without our knowledge. Alternative D would limit our ability to detect plant population declines, and irreversible changes could occur.

Jack Pine: Due to the "hands-off" approach to management in this alternative, we would not initiate any actions, including prescribed burning, to benefit the maintaining the two jack pine woodlands found on the Refuge. The significance of these communities and their specific habitat requirements are outlined in Alternative B. Without future management actions or natural fire events, it is likely these jack pine woodlands would be replaced by spruce-fir forests (Maine NAP 1983). Although no significant change would be expected within the next 15 years, the long-term consequences of this alternative would be conversion to spruce-fir forest, and the biological diversity of the Refuge and coastal Maine would be negatively affected.

Impacts from Proposed Wildlife Populations Management

No impacts predicted.

Vegetation and Habitats - Summary

Under Alternatives A, B, and C, few changes in vegetation management would occur on existing Refuge lands. The few changes would occur under Alternatives B and C and include up to 100 acres of northern hardwood-mixed forest and scrub shrub managed to diverse age classes, and active management of rare plant sites and Jack pine stands. Under Alternative D, no vegetation management would occur so any changes would be the result of natural processes. On the islands, the primary difference in active vegetation management would be associated with the number of proposed seabird restoration sites. Under Alternative A, it would remain at 6 sites; under Alternative B it would be 12 sites; under Alternative C it would be 18 sites, and under Alternative D it would be minimum maintenance of 6 sites.

Effects on Threatened and Endangered Species

The two Federal-listed species most likely to be impacted from our management actions are the endangered roseate tern and threatened bald eagle. We also discuss implications to the threatened piping plover. Appendix J shows an intra-Service evaluation form from our Ecological Services office in Maine, which concludes that all alternatives comply with the Endangered Species Act, and that no further consultation is required under Section 7 of this Act.

Alternative A (Current Management)

Impacts from Proposed Land Acquisition and Protection

Under Alternative A, Service acquisition of the 467.1 acres currently within the approved Petit Manan Refuge boundary and 30 additional nationally significant nesting islands would permanently protect these important nesting areas. One proposed new island currently supports nesting bald eagles, but several others provide suitable habitat for eagles to nest in the future. Permanent protection of nesting areas and protection from human disturbance are the two most significant factors necessary to insure the continued expansion of the Maine bald eagle population.

Two historic roseate tern nesting islands, currently not under conservation ownership, would also be permanently protected under Alternative A. Land protection remains a critical component in the recovery of roseate tern and other nesting seabirds because sufficient habitat must be available to accommodate expanding populations. Active predator control and/or habitat management may also be necessary if the roseate tern is to sustain nesting on any of these islands.

Protection of additional Refuge islands would also provide migratory stopover and foraging areas for the Federal-listed piping plover. The islands are generally free from mainland mammalian predators, and human disturbance is much reduced during the migration seasons. By protecting critical feeding and resting areas we would be contributing to improved physical conditions of piping plover during their migration, and ultimately contributing to the recovery of the species.

Impacts from Proposed Public Use and Access Management

We would continue to manage public use and access on Refuge lands to minimize any disturbance or adverse impact to threatened and endangered species. Our seasonal public access restrictions on nesting islands would support this goal.

In addition to our current nesting islands, we would implement the seasonal restrictions outlined below on all 30 islands proposed for acquisition.

Bald Eagles: We would maintain seasonal closures on bald eagle nesting islands during the breeding season. Currently we have six active and four historic bald eagle nesting sites on the Refuge. Islands (or portions thereof) which support nesting bald eagles would remain closed to public access from February 15 to August 31. Historical eagle nesting islands would remain closed from February 15 to May 1. By May 1, we would determine whether to keep the islands closed to public visitation until August 31 due to the presence of eagles, or open them for day use. Several of the islands proposed for acquisition under this alternative could, in the future, provide nesting habitat for eagles. We would continue to use public education efforts to inform the public about the adverse effects of disturbing eagles during the nesting season.

Roseate Terns: We would continue to close all seabird nesting islands to public visitation from April 1 to August 31. When a human or other perceived predator enters a tern colony the majority of the colony will rise up from their nests to mob the "predator". Group defense of the nesting area is one of the primary benefits of nesting colonially. Frequently, gulls will take advantage of this disturbance and enter the seabird colony to prey on eggs and chicks. Minimizing human disturbance at nest sites reduces the energy reserves seabirds need to spend defending their nest sites, reduces the susceptibility of nests to predation from other seabirds (i.e. gulls), and reduces the time adult seabirds are kept away from their nests. Closing nesting islands to public access during the breeding season should improve the nesting success of the endangered roseate tern and other seabird colonies.

Impacts from Proposed Habitat and Vegetation Management

We would protect, but not actively manage, the habitat on the six active and four historic bald eagle nesting islands. Forests would be allowed to mature under natural conditions, and natural forces would dictate any significant changes. Mature forest conditions would also continue to develop on 15 existing forested Refuge islands, the mainland divisions, and approximately 25% of the islands proposed for acquisition. These developments would help to ensure continued availability of nesting areas for a growing population of bald eagles.

Habitat management techniques utilized for roseate tern nesting islands would be similar to those described in the "Effects on Vegetation and

Habitat" for Alternative A. We would provide a variety of habitats including open field, bare ground, and certain species of vegetation which would provide overhead cover to the terns. Roseate tern nests in the Northeast are predominantly under cover such as dense vegetation, under rocks or driftwood, or in artificial sites such as nest boxes (Spendelow 1982, Burger and Gochfield 1988a, Gochfield et al. 1998). We would continue to provide artificial nest structures for roseate terns nesting on Petit Manan Island. We would evaluate the need to provide additional boxes on an annual basis. Our actions would support recovery goals for this species, but probably not contribute significantly.

Impacts from Proposed Wildlife Populations Management

After 20 years of active seabird restoration and predator management activities along the Maine coast, the endangered roseate tern population has increased 276%; from 76 pairs in 1984, to 285 pairs in 2002 (MDIFW 2002). Predator management remains a critical component of the restoration process, and population recovery for all three species of terns (roseate, Arctic, and common) would not have been possible without this management tool. In the absence of predator management, we have observed complete colony abandonment, decreased survival rates, or elimination of productivity.

Under Alternative A, we would continue to utilize a variety of gull control techniques including harassment, pyrotechnics, nest destruction, and shooting on our six existing seabird restoration islands. The majority of our predator management efforts have been, and would continue to be, targeted at herring and great black-backed gulls. Predator management efforts undertaken on the seabird restoration projects in Maine have not adversely affected the State or regional population of gulls. Less than 10 gulls per year are lethally removed from the six Refuge Complex restoration islands. Current survey information indicates that 15,800 pairs of great black-backed gulls are nesting on 231 islands in Maine. In addition, 28,290 pairs of herring gulls nest on 183 islands (Allen pers. comm.).

Control of nesting gulls on specific islands has resulted in significant population increases for several species of seabirds. All four islands supporting nesting roseate terns have ongoing predator management programs. Information gathered on the restoration islands demonstrates significantly higher site attendance, population growth, and survival rates for both juvenile and adult seabirds as compared to sites where gulls are not managed.

In addition to gull control, under Alternative A we would manage other predators as warranted on seabird islands. The presence of a single mammalian predator (i.e. mink) or nocturnal avian predator (i.e. black crowned night heron or great horned owl) can have disastrous effects on nesting seabirds. Mink have been observed killing large numbers of terns, and a

single mink is believed responsible for the drastic reduction in the NAS Jenny Island colony that dropped from over 1,000 pairs of terns in 2000, to 59 pairs in 2001 (Hall pers. comm.). Past experience has demonstrated that without prompt and effective predator control measures a small number of predators could significantly reduce the Maine roseate tern population. Predator management measures for mammals and nocturnal avian predators would continue to be targeted at individuals preying on the tern colony. No significant local or regional population declines would be expected.

Although predator management practices have resulted in a significant population gain for roseate terns, the birds remain extremely vulnerable to catastrophic events such as oil spills or disease outbreaks due to their limited distribution and population size. In 2002, 95% of the Maine roseate tern population was nesting on two islands, with the remaining 5% of the birds nesting on two additional islands. While we remain optimistic that roseate tern will initiate nesting on other existing restoration islands, the threat of a single event eliminating the majority of the population remains a significant concern.

Numerous other species of seabirds have benefitted from our predator management efforts. Common and Arctic terns, laughing gulls, Atlantic puffins, and razorbills have all expanded breeding populations on the islands with active predator management. Common eiders have also experienced increased duckling survival rates on the waters surrounding the seabird restoration islands, as compared to regions with no gull control (Mawhinney 1999).

Continued expansion of the bald eagle population could adversely affect other seabird species. Within Maine, eagles nesting along the coast have been found to forage primarily on gulls and cormorants (Welch 1994). Eagles will also prey on common eiders and wading birds if they are available. The presence of bald eagles nesting on islands adjacent to seabird or wading bird nesting islands may result in increased predation rates for those colonies. While we do not anticipate adverse effects on the regional populations of seabirds or wading bird colonies, reductions in individual colony productivity or site abandonment could result from increased bald eagle predation.

Alternative B (Service's Preferred Alternative)

Impacts from Proposed Land Acquisition and Protection

Bald Eagles: The primary goal of the Northern States Bald Eagle Recovery Plan, which includes Maine, is self-sustaining populations of bald eagles in suitable habitats. Protection and enhancement of eagle populations and their habitat continues to be a major focus of recovery plan implementation. Conservation agencies agree that continued habitat loss and degradation could reverse the current upward population trends. Service acquisition of 87 additional islands proposed in Alternative B would represent a significant contribution towards the recovery plan goal.

Currently, 37 of these islands support nesting bald eagles and represent the highest protection priority need based on habitat integrity, length of occupancy by eagles, absence of human disturbance, and strategic geographic importance in conserving the eagle population along the coast of Maine (MDIFW 2003). Additional islands acquired under this alternative would provide for future expansion of eagles into new nesting territories. Service acquisition of these bald eagle nesting islands would also contribute in a major way towards the State goal of securing 150 bald eagle nesting areas in conservation ownership. Once this goal is realized, the species can be removed from the Maine Endangered Species list.

Roseate Terns: The primary objective of the Roseate Tern Recovery Plan is to promote an increase in breeding population size, distribution, and productivity. Service acquisition of active and historic roseate tern nesting islands, public education, and restricted public access during sensitive nesting periods would allow us to make an important contribution to recovery. Under Alternative B, the Service would acquire two new islands with historic roseate tern nest sites. Since the few known active Maine colonies are concentrated on only four islands, protection of historic sites would be very important to future restoration efforts. Many of the other islands proposed for acquisition offer foraging habitat for these birds. Any opportunities to increase the population and improve the geographic distribution of these endangered species would promote recovery.

Impacts from Proposed Public Use and Access Management

Management of public access to minimize impacts to nesting bald eagles and roseate terns on islands would be similar to Alternative A; the only difference is the number of islands affected. Both alternatives include the current Refuge islands; however, under Alternative B, an additional 87 islands would have seasonal public access restrictions. This island protection effort vastly improves nesting opportunities over the long-term, especially for bald eagles. With adequate enforcement, human disturbance would no longer be a threat at nesting sites.

The bald eagle nesting site in the Gouldsboro Bay Division would not be impacted by proposed public use and infrastructure. We would locate the trail to avoid disturbance, and would require people to stay on the trail. As with the islands, we would increase outreach and enforcement to ensure human disturbance would not pose a threat. If necessary, we would implement seasonal closures in the southern end of the division.

Impacts from Proposed Habitat and Vegetation Management

Similar to Alternative A, we would protect, but not actively manage, the mature forest stands that support bald eagle nesting habitat. We do not predict any significant changes in the quality of nesting habitat over the short-term. Impacts would be similar to those described under Alternative A.

Under Alternative B, we would initiate six new seabird restoration projects. Our habitat management objectives would be to provide suitable nesting habitat for roseate, common, and Arctic terns and we anticipate that some vegetation management would be necessary on these islands. We would utilize the variety of vegetation management techniques to enhance conditions for nesting terns that were described under Alternative A. Management efforts would not be applied to the entirety of the islands, so that a diversity of vegetation communities and plant height would be available to the birds. When appropriate, roseate tern nest boxes would be provided on the new restoration islands. Enhancing habitat conditions for nesting roseate terns would likely increase productivity, improve their distribution, and eventually increase population numbers in coastal Maine. Our actions, if successful, would make an important contribution to the recovery of the roseate tern over the long-term.

Impacts from Proposed Wildlife Populations Management

Under Alternative B, we would continue to implement both lethal and non-lethal predator management measures on the seabird restoration projects. Lethal measures would only be used when, based on available information, non-lethal measures would not produce the necessary reduction in an island's gull populations. In addition to the methods described in Alternative A, we would consider using the avicide DRC 1339 to remove breeding populations of herring and great black-backed gulls from seabird restoration islands. The avicide has typically been applied during the first one to two years of restoration efforts on an island. Only gulls with established nesting territories are affected by this technique. It allows us to lethally remove breeding gulls from an island in a few days. While this may alter the local abundance of herring or black-backed gulls, it would not affect regional or State population levels for either species.

Avicide-treated bread cubes are used to remove targeted gulls
USFWS photo

DRC 1339 (3 Chloro-4-methyl benzenamine hydrochloride) has been found to be highly toxic to gulls, but has low toxicity to non-target species, and decomposes rapidly. Laboratory tests showed DRC 1339 is lethal to gulls, starlings, and blackbirds, yet considerably less toxic to most other species of birds and relatively non-toxic to mammals. The product decomposes rapidly to harmless by-products, and, when applied properly, results in virtually no accidental take of non-target species. Secondary poisoning studies conducted on several raptors found no secondary ill effects to the birds, even when they consumed over 100 treated starlings. In fact, we have not observed any non-target species affected during our previous applications.

DCR 1339 is licensed only for use by Service and U.S. Department of Agriculture's Animal Damage Control applicators who are certified pesticide application masters in the State which it is used. The bait is prepared by mixing a small amount of 1339 (6 grams) with 1 lb. of margarine which is then spread on bread and cut into 9 individual cubes. The treated bread cubes are placed within the gull nest, and are frequently consumed within minutes of placement. Treatment occurs in spring when nesting gulls are aggressively defending their territories. This assures that non-target species do not consume the bait. Any unconsumed or regurgitated bait is collected within 12 hours of the application as an added safety measure. Once consumed, the toxicant causes kidney failure resulting in a humane death within 24 - 72 hours. Carcasses are collected from the island and buried or provided to educational institutions for research.

Through the use of DRC 1339, the Service and its partners have successfully restored seabirds to historic nesting sites at Petit Manan, Seal, Ship, and Pond islands. While other methods of gull control exist, the Service continues to support the use of DRC 1339 as the most effective and efficient means of removing a large number of breeding gulls from a restoration island.

The benefits of 20 years of active roseate tern management were described in Alternative A. While the overall population has increased by 276%, total number and distribution remain concerns. The number of pairs has somewhat stabilized over the past five years (255-285 pairs), and 95% of roseate terns breed on only two islands. New restoration projects are necessary for continued population growth and viability. We anticipate the six new restoration projects, continued predator control, and habitat management efforts would result in continued population growth and the establishment of additional roseate tern nesting colonies within Maine. These efforts would continue to reduce the number of individual predators in a local setting, but overall viability of regional or State predator populations would not be negatively impacted over the long term.

Alternative C

Impacts from Proposed Land Acquisition and Protection

Alternative C would include the benefits of Service acquisition related to bald eagle habitat protection and cooperative seabird restoration efforts identified in Alternative B. It would, however, further enhance the positive impacts by permanently protecting all 151 nationally significant nesting islands not currently in conservation ownership. The potential to dramatically improve the nesting populations and geographic distribution of roseate terns and bald eagles is substantial. Long-term protection of nesting sites has been identified as a high priority in the recovery effort for both bald eagles and roseate terns (MDIFW 2001 and USFWS 1998). Acquisition by the Service would remove all threats associated with development of the islands and uncontrolled public access. In addition, with permanent protection, these islands would continue to provide critical

nesting, foraging, and migratory habitat for a variety of other species of conservation concern.

Impacts from Proposed Public Use and Access Management

Management of public access to bald eagle and roseate tern nesting would be similar to that detailed under Alternative B, although Alternative C allows for some modifications to the closure period on an island-specific basis, based on localized nesting conditions and species present. For example, where Leach's storm-petrel nest on an island, we would consider extending the closure period through November 15th, since these birds are known to be in their burrows until then. While much more labor intensive for us, all nesting birds would be protected to the maximum extent possible.

Impacts from Proposed Habitat and Vegetation Management

Our habitat management objectives and techniques outlined under Alternative B would be expanded to 12 new restoration projects under Alternative C. Roseate terns would benefit directly from continued efforts to manage vegetation and predator population levels on the 6 current and 12 new restoration islands. With regards to bald eagles, maintaining mature forested conditions on coastal islands would ensure continued availability of nesting and roosting habitat for a growing population. As a result of implementing Alternative C, we would make a significant contribution towards both State and Federal recovery goals for the roseate tern and bald eagle.

Impacts from Proposed Wildlife Populations Management

Under Alternative C, the predator management techniques and their impacts outlined for Alternative B would be implemented on the 12 new seabird restoration projects. Our goal in establishing additional restoration projects would be to increase the geographic distribution of the roseate tern and other seabird colonies. Similar to Alternative B, we do not predict that regional or Statewide populations of herring or black-backed gulls would be significantly affected by our control measures, while we would dramatically reduce local populations on restoration islands.

Alternative D

Impacts from Proposed Land Acquisition and Protection

Under Alternative D, land acquisition would be limited to the 467.1 acres currently within Petit Manan Refuge's approved boundary. While some of this includes potential bald eagle nesting habitat, no new active nest sites would be acquired. Under Alternative D, we would also not pursue ownership of any of the 151 unprotected nationally significant nesting islands. As such, no additional roseate tern nesting islands would be acquired by the Service and no new seabird restoration projects would be initiated. Instead, we would encourage protection of these islands by our conserva-

tion partners. Most islands requiring active management or enforcement would receive less protection under this alternative because many of our conservation partners do not have the staffing and resources to purchase the land and/or to fully engage in seabird management. Without Service acquisition or significant increases in our partners' ability to purchase and manage nesting islands, the State population of bald eagles and roseate terns could decline over the long-term. Roseate tern, in particular, would be at risk because the colonies are so few and so poorly distributed. A single catastrophic event could eliminate the population. In other words, their decline could be more dramatic without additional protection.

Impacts from Proposed Public Use and Access Management

Under Alternative D, all Refuge islands would be closed to public access year round, thus minimizing all risk from human disturbance on nesting islands. However, since islands are currently closed during the most sensitive nesting period, we would not anticipate that closing the islands year round would result in a dramatic positive response by either bald eagles or roseate terns. In other words, we would not expect a significant increase in population for either species over the long-term.

Impacts from Proposed Habitat and Vegetation Management

Under Alternative D, we would utilize a custodial approach to wildlife and habitat management, and minimize survey efforts and data collection. Monitoring efforts would be limited to a few high priority seabird species such as roseate tern. We would eliminate the use of sheep grazing, herbicides, mowing, and burning as habitat management tools. The resulting development of rank vegetation would exclude nesting terns over the long-term. A reduction in predator control efforts would further negatively impact suitable nesting conditions for roseate terns.

Common tern on nest with chick
Photo by Bill Silliker, Jr.

There would be insufficient staff time and dollars to complete baseline surveys, map vegetation, conduct research programs, and census birds. This lack of information would limit our ability to monitor threats to endangered and threatened wildlife populations. In summary, this alternative would not provide us with the tools necessary to effectively protect the tern colonies, and, at a minimum, we would anticipate a reduction in roseate tern nesting distribution and possibly a reduction in population size.

We would not anticipate any short-term effects to bald eagle nesting habitat since the mature conifer and conifer-mixed stands would be allowed to grow unimpeded, similar to Alternative A. However, the continued, incremental loss of unprotected coastal nesting areas to development expected under this alternative would significantly affect the long-term viability and growth of the State's population.

Impacts from Proposed Wildlife Populations Management

Under Alternative D, we would be limited to non-lethal predator control measures. This change in management practices would significantly reduce our ability to manage and protect endangered roseate tern colonies along the coast of Maine. Past records indicate that when gull control measures have been reduced or eliminated, herring and great black-backed gulls have rapidly repopulated the tern islands. As observed on Petit Manan Island in the late 1970's, terns will completely abandon these islands when gulls reestablish nesting colonies. Over 90% of all terns nesting in Maine are nesting on islands with active gull control. In our experience, we would need the flexibility to employ any gull control techniques mentioned in Alternative B to be effective. Limits on gull control methods, as proposed in Alternative D, would significantly reduce our ability to contribute to the recovery efforts outlined in the Roseate Tern Recovery Plan (USFWS 1998) and would likely result in a decline in roseate tern distribution, productivity, and survival rates.

We do not anticipate that this use of only non-lethal methods would affect recovery efforts for bald eagles because predators are not the limiting factor in increasing bald eagle populations. Should a mammalian predator situation arise at a nest site, we would continue to utilize "flashing material" to prevent the mammal from climbing the nest tree and reaching the eaglets.

Under Alternative D there would be no direct loss to predator populations on a local, regional, or State level as no lethal control measures would be used.

Threatened and Endangered Species - Summary

Alternatives A, B, and C would maintain the seasonal closures to protect nesting roseate terns and bald eagles on existing Refuge lands. Alternative D would close Refuge islands to public use year round. Roseate terns are nesting on two Refuge islands and bald eagles are nesting on four islands and the Gouldsboro Bay Division. Alternatives A, B and C would continue to manage the 6 seabird restoration projects which provide nesting and/or foraging sites for roseate tern. Alternative C, with the largest expansion proposal, would provide the greatest long-term benefits to roseate tern and bald eagles by protecting existing and potential future nesting sites. It would contribute the most to species' recovery goals. Alternative B would provide the second greatest long-term benefits, followed by Alternative A. Alternative D does not propose an expansion, and would provide the least support to recovery goals.

Effects on Seabirds, Wading Birds, and Waterfowl

Alternative A (Current Management)

Impacts from Proposed Land Acquisition and Protection

Service acquisition of the 467.1 acres currently within the approved Petit Manan Refuge boundary and 30 additional nationally significant seabird, wading bird, waterfowl, and bald eagle nesting islands would permanently protect these areas from one of the principle threats facing coastal habitats: habitat degradation resulting from development. We do not anticipate any active habitat management on the coastal islands acquired under this alternative. Existing habitat conditions would continue to provide suitable nesting habitat for seabirds, wading birds and waterfowl over the short-term, including: common eider, herring and great black-backed gulls, great blue heron, and Leach's storm-petrel. Unfortunately, without active predator or habitat management, it is unlikely that significant numbers of terns or alcids would initiate nesting on any of these islands over the long-term.

The proposed acquisition would support the land protection objectives outlined in the USFWS Tern Plan and the MDIFW Species Assessment Plans for: Atlantic puffin, razorbill, common eider, and Leach's storm-petrel. Permanent protection of additional seabird, wading bird, and waterfowl nesting islands would insure these sites continue to provide critical nesting, foraging, and migratory habitat for a variety of species of conservation concern. It would also improve the distribution of protected nesting islands.

Service acquisition of the 95 acre Sawyers Marsh, adjacent to the Refuge's Sawyers Marsh Division, would ensure that this entire area permanently protects valuable nesting, feeding, and migratory habitat to a variety of waterfowl, wading bird, and shorebird species over the long-term.

Impacts from Proposed Public Use and Access Management

Under Alternative A, we would continue to close all seabird, waterfowl, and wading bird nesting islands to public visitation between April 1 - August 31. Minimizing human disturbance on nesting islands would reduce the energy reserves these birds spend defending their nests, and would minimize the susceptibility of nests to predation from other seabirds (i.e. gulls). Closing islands to public visitation during the nesting season would also improve the nesting success of these colonies.

Common eider hen on nest
USFWS photo

We would continue to conduct outreach and educate local rockweed harvesters about the importance of rockweed to wildlife and to explain Service regulations (50 CFR27.51(a)) that protect vegetation harvesting within national wildlife refuges. Rockweed, and the variety of invertebrates that can be found on the plants, provide a vitally important forage to nesting, migratory, and wintering populations

of waterfowl and shorebirds (Bannerman 1960, Mawhinney 1999, Mittelhauser 2000). Its continued availability to these species' diet helps them maintain or enhance their body conditions during critical times of the year, most importantly, during nesting and migration.

Available information indicates that human disturbance associated with hunting may cause waterfowl species to alter their feeding behavior and diet composition, change distribution patterns, and increase their energy expenditure as they flee these disturbances. The combined result may be a reduction in overall body condition of the birds. We would maintain no-hunting areas on Petit Manan Point Division and Bois Bubert Island, two areas frequented by waterfowl on the Refuge. These no-hunting areas would provide the birds with high security, high quality forage areas, and contribute to better overall body condition of waterfowl using this portion of the Refuge.

We would continue to allow waterfowl hunting on 22 Refuge islands. In addition, the inter-tidal areas surrounding all Refuge islands would remain open to hunting under Colonial Ordinance. As new islands are acquired, we would evaluate each island to determine if it should be open to hunting. Although we have not quantified the level of harvest associated with Refuge islands, we do not believe that many of the islands receive significant hunting pressure due to their distance from the mainland and availability of other hunting locations. We would not anticipate a significant number of waterfowl would be harvested from these new additions to the Refuge. Further, State and Federal regulations determine waterfowl harvest limits based on an analysis of the entire Atlantic flyway population. Our hunt program tiers to these regulations.

Impacts from Proposed Habitat and Vegetation Management

Under Alternative A, vegetation on the majority of the Refuge islands would not be actively managed. Natural processes would be the dominant force resulting in any changes to the vegetation communities. Common eider would benefit from the development of rank vegetation and the seasonal closures of the islands. On the six restoration islands, we would continue efforts to enhance nesting habitat for common, Arctic, and roseate terns using the following methods:

Open field/grassland: On portions of our seabird restoration islands, we would continue to reduce rank vegetation in an effort to provide common and Arctic terns with suitable nesting habitat. Vegetation management techniques already described for Alternative A in the section: Effects to Vegetation and Habitat, would continue on all six restoration islands. To date, our management has been intermittent, but we have observed a positive response from seabirds, as nesting success and nest density have increased. We would not anticipate any significant change in the level of management intensity during the next 15 years, but we would anticipate

maintaining or increasing the number of tern nests and individual nest productivity.

We would continue to allow sheep to graze on two islands. Grazing results in a reduction in plant density and height, and potentially causes soil compaction and erosion. It is possible that sheep grazing could limit the availability of suitable nesting habitat for species which prefer rank vegetation (e.g. common eider and laughing gull), or burrow nesters such as Leach's storm-petrels. However, common and Arctic terns would benefit from reduction in rank vegetation, whether we use grazing or mechanical techniques. We would expect increased tern nesting densities in areas where vegetation is managed. We would minimize the adverse effects on species such as common eider and laughing gull by allowing rank vegetation to develop on portions of the restoration islands.

Construction of artificial nest structures or boxes: We would continue to provide artificial nest burrows on Petit Manan Island for nesting alcids. The burrows would provide the birds with increased nesting opportunity, and would hopefully result in continued population growth for both Atlantic puffins and razorbills. We would also provide nest boxes for roseate terns on Petit Manan and Metinic islands, which benefits common tern chicks who frequently use the boxes for shelter. We would anticipate increased chick survival at nest sites provided with nest boxes.

Freshwater impoundments and saltmarshes: We would continue to maintain the three existing freshwater impoundments on the Petit Manan Point Division. These areas would continue to provide foraging and roosting habitat for thousands of migrating waterfowl, shorebirds, and wading birds. In addition, our protection of saltmarshes on Gouldsboro Bay and Sawyers Marsh divisions would also maintain extensive foraging habitat for a variety of species of conservation concern, namely waterfowl, wading birds, and shorebirds.

Impacts from Proposed Wildlife Populations Management

Predator Management: We would continue to use the predator management measures on the six seabird restoration projects previously discussed for Alternative A in the section: Effects on Threatened and Endangered Species. These measures include lethal and non-lethal techniques to control herring and black-backed gulls, mammals, and nocturnal avian predators. We would anticipate that all the seabirds nesting on the restoration islands would continue to benefit from these management actions, and would experience greater productivity and survival rates. Over the long-term various other factors would also contribute to a successful seabird colony (i.e. island protection, habitat management, seasonal closures, social attraction), predator management remains a significant component of the restoration process within Maine. Over 90% of the tern population, and all of the Atlantic puffin and laughing gull populations are nesting on islands where predators are managed.

Atlantic puffin courtship
USFWS photo

Intensive, cooperative management by members of GOMSWG has reversed the tern and alcid population declines that occurred for much of the past century. Atlantic puffins, razorbills, common, Arctic, and roseate terns have all experienced significant population growth during the past 20 years. In the Gulf of Maine, the common tern population has increased 168% (2,543 to 6,806 pairs)and the State-threatened population of Arctic terns has increased 73% (1,720 to 2,975 pairs). In Maine, the roseate tern population has increased 278% (76 to 289 pairs). This level of population growth would not have been possible without active predator management efforts.

Although we cannot predict the population growth that would be achieved during the next 15 years of seabird restoration efforts on Refuge islands, it is reasonable to assume that we would continue major steps towards seabird recovery of historic population levels. Three island projects: Ship, Metinic, and Pond islands, have been established in the past 5-10 years and would be expected to experience considerable population growth in future years. We would not anticipate the establishment of any additional large tern colonies on islands without aggressive predator control measures, and no new restoration projects are proposed under this alternative. As a result, we would expect continued population growth for the three species of terns and several species of alcids on established colonies, but not an expansion in colony number or distribution.

Herring and great black-backed gulls: Despite gull control measures on the six restoration islands, we would continue to acquire and protect islands that support populations of nesting herring and great black-backed gulls. These gulls are important components of the Gulf of Maine ecosystem and contribute to overall seabird diversity. Based on past experience, only a small number of gulls (<10 individuals) would likely be lethally removed each season from the six restoration islands, and no gulls would be allowed to nest within the restoration areas. We do not anticipate any significant regional or State population level declines for either species of gull as a result of our management. Further, removal of individual, predatory gulls from the restoration islands would allow a variety of species of concern including common, Arctic, and roseate terns, Atlantic puffins, razorbills, common eider, and black guillemot to experience increased productivity and survival rates.

Laughing gulls: We would continue to limit the number and distribution of laughing gulls nesting on Petit Manan Island using non-lethal techniques. This management action would result in a reduction of laughing gulls nesting on the island, and an overall reduction in the number of gull chicks produced at the colony. No adult birds would be killed; we would

simply discourage or disrupt their nesting through a variety of harassment techniques. As experienced in 2002, tern nesting density, distribution, and productivity would be expected to increase as a result of this management action.

Alternative B (Service's Preferred Alternative)

Impacts from Proposed Land Acquisition and Protection

In addition to the 467.1 acres currently within the approved Petit Manan Refuge boundary, the Service would acquire 87 nationally significant bald eagle, wading bird, waterfowl, or colonial nesting seabird islands which lack permanent protection from habitat degradation caused by development. Specifically, this alternative would protect the remaining 55 seabird and wading bird islands currently lacking permanent protection in Maine. The remaining 32 islands proposed for acquisition support nesting bald eagles. As a result, Service acquisition of these 87 islands would provide permanent nesting, foraging, and migratory habitat for an incredible diversity of species of conservation concern. Permanent conservation ownership of nesting sites has been identified as a high priority by both the Service and MDIFW in meeting the recovery objectives for the seabirds, wading birds, and waterfowl species nesting on the islands. The Regional Waterbird Plan and the Atlantic Northern Forest Bird Conservation Plan also recommend that actions be taken to increase nesting opportunities for roseate tern, razorbill, and Atlantic puffin. Service acquisition would remove all threats associated with land development and uncontrolled public access. Through acquisition, seabird habitat restoration, and cooperative research, the Service would provide leadership in accomplishing the goals of the various regional conservation plans.

Impacts from Proposed Public Use and Access Management

Similar to Alternative A, all existing and proposed nesting islands would have seasonal public use restrictions to protect nesting birds. In an effort to increase opportunities for public access, we would modify current seasonal closure dates for all eider- and gull-only nesting islands to April 1 - July 31. There are 9 existing Refuge islands and 6 proposed acquisition islands that would have this shorter closure period. This modification recognizes the fact that common eider and most gull species nest earlier and therefore fledge young sooner than seabirds and bald eagles. We would allow earlier public access and not impact nesting birds. All other seabird and wading bird and waterfowl nesting islands would remain closed until August 31. Minimizing human disturbance at nest sites would reduce the energy reserves these birds spend defending their nests, would minimize the susceptibility of nests to predation from other seabirds (i.e. gulls), and should improve the nesting success for a variety of other birds of conservation concern.

On an annual basis, we would evaluate recently acquired islands for inclusion in our waterfowl hunting program. Alternative B includes the same waterfowl hunting program proposed in Alternative A and the impacts would be similar. Generally, we do not anticipate a significant increase in hunting pressure. In addition, the proposed expanded deer hunt on the Petit Manan Point Division would not impact seabirds, wading birds, and waterfowl. The area proposed for hunting is primarily upland, the hunt would occur outside the nesting season for these species, and the hunt area would be located to minimize disturbance to the migrating waterfowl and other birds using the impoundments. Further, with harvest levels set by Federal and State regulations, based on the entire flyway population, we would not expect to negatively affect waterfowl populations over the long-term.

Impacts from Proposed Habitat and Vegetation Management

Open Field: Under Alternative B, we would continue to utilize the habitat management techniques outlined in Alternative A on the six existing and six proposed seabird restoration projects. We would anticipate that some level of vegetation management would be necessary on all of these islands within the next 15 years. Our efforts to reduce the amount of rank vegetation on portions of the islands would increase nesting opportunities for all three species of terns. Vegetation outside of the tern restoration area would be allowed to grow under natural conditions, and would therefore provide suitable nesting habitat for species such as common eider and laughing gulls. The habitat on the non-restoration islands would not be actively managed unless new information or major changes warranted actions to: 1) benefit threatened and endangered species; 2) promote biological diversity; 3) reduce hazardous fuels and debris; or, 4) control invasive or exotic species. Natural forces and plant succession patterns would be the prevailing factors dictating changes to the habitat conditions on the majority of the islands in the Refuge. Over the short-term, these islands would continue to provide important nesting habitat for species of concern. Under Alternative B, we would also continue to create nest burrows for alcids and utilize nest boxes as described in Alternative A to increase nesting habitat for roseate terns.

Forested and Scrub-Shrub: We would maintain forested and scrub-shrub conditions on a number of the islands to provide nesting habitat for wading birds. While we do not anticipate the need for active management in these habitat types over the next 15 years, long-term management may include mechanical and prescribed fire treatment to maintain the scrub-shrub community. This would ensure that the wading birds continue to have a diversity of nesting areas better distributed along coastal islands. These islands would be closed to public visitation during the nesting season, April 1 - August 31.

Freshwater impoundments and saltmarshes: Under Alternative B, we would maintain the existing saltmarsh and estuarine habitat located on Cross Island and Sawyers Marsh, Gouldsboro Bay and Petit Manan Point divisions, to ensure the quality and natural function of the marshes are sustained. Service acquisition of the marshes and the adjacent upland habitat protects these sites from the adverse effects associated with development of surrounding uplands. As a result, these areas would continue to provide a diverse group of waterfowl, shorebirds, and wading birds with high quality foraging and wintering habitat over the long-term.

We would continue to manage the three large wetland complexes (Meadow Brook, Mague Flowage, and Cranberry impoundment) on the Petit Manan Point Division. These areas would provide waterfowl and wading birds with open and shallow water marshes for nesting and foraging. We would evaluate opportunities to introduce additional wild rice into Mague Flowage to further enhance foraging for migrating waterfowl. These wetlands would not be open to hunting and would provide migrating waterfowl with additional high quality forage, in areas free from human disturbance. We would anticipate that enhancing forage quality in this area would contribute to improved body condition and survival rates of migrating waterfowl using this area of the Refuge.

Impacts from Wildlife Populations Management

Bald Eagle: Increasing bald eagle nesting density and distribution along the Maine coast could adversely affect wading bird colonies and common eider nesting areas. Eagles routinely prey on adult and juvenile birds, and have been associated with great blue heron colony abandonment.

Predator Management: Similar to Alternative A, we would continue predator management efforts on all six existing seabird restoration islands. In addition, under Alternative B we would expand these efforts to the six proposed new restoration projects. Specific predator management techniques would be the same as those we described in Alternative A. These efforts would continue to reduce the number of individual predators in a local setting, but the viability of the State or regional predator populations would not be altered as a result of our management actions. The majority of our predator management efforts have been, and would continue to be, targeted at herring and great black-backed gulls on seabird restoration islands. While our control efforts have not significantly altered population levels of gulls, local control of nesting gulls has significantly enhanced population levels for common, Arctic, and roseate terns, Atlantic puffins and razorbills. Management for individual mammal and nocturnal avian predators would also be continued on the 12 restoration projects. Efforts to control individual mammalian and nocturnal avian predators might be extended to other islands as warranted to protect nesting colonies. Information gathered on the islands with predator management programs demonstrates significantly higher levels of site attendance,

population growth, and survival rates for both juvenile and adult seabirds. The species described below would all benefit from continued predator management.

Alcids: Under Alternative B, we would initiate steps to increase the number of active alcid colonies on Refuge islands through the establishment of six additional seabird restoration projects. Our goal would be to increase the number of Atlantic puffins and razorbills by 50% (using 2000 nesting season estimates as a baseline), and maintain a minimum productivity level of 0.5 fledged chicks/pair. We would continue island acquisition, predator control, and if necessary habitat manipulation. Increasing the population size, productivity, and distribution of Atlantic puffin and razorbill colonies would help to secure the long-term viability of these populations, contribute to the overall seabird diversity of the Gulf of Maine, and contribute to MDIFW recovery efforts for these State-threatened species (MDIFW 1999).

Leach's storm-petrel: Under Alternative B, our goal would be to maintain or increase the number of Leach's storm-petrels nesting on Refuge islands and initiate efforts to maintain a productivity level of 0.5 fledged chicks/pair. As warranted by monitoring, we would enhance nesting habitat on the islands by providing structures for petrels to burrow under. Currently, 75% of the petrels in Maine nest on two islands which lie approximately one mile apart (MDIFW 1999). As a result, the birds remain particularly susceptible to catastrophic events such as oil spills or disease. Increasing the population size, distribution, and productivity of the Leach's storm-petrels nesting on Refuge islands would significantly contribute to the long-term viability of this species within the Gulf of Maine.

Laughing gulls: In conjunction with our efforts to reduce the breeding population of laughing gulls on Petit Manan Island as described in Alternative A, we would explore methods to encourage these gulls to initiate nesting on other islands. This would allow the laughing gull population to continue to expand in Maine, without adversely affecting nesting terns. We anticipate this would require herring and great black-backed gull control, as laughing gulls are currently nesting only on islands with active predator management programs.

Common eider: Common eider would continue to benefit from our land protection efforts and "hands-off" approach to habitat management on the majority of the Refuge islands. Predator control efforts on the seabird restoration islands would significantly increase nesting success and duckling survival rates. On the tern restoration islands, efforts to maintain open field conditions for the nesting terns would be limited to portions of the island. This would allow rank vegetation to develop and provide eiders with appropriate nesting habitat.

Common murre: We would continue efforts to establish a common murre breeding colony within Maine. Murre have not bred in Maine for over 100

years and restoring a breeding population in Maine would represent a significant milestone in the effort to restore the biological diversity of the region. As with other seabirds, our management actions would continue to be island protection, predator management, and habitat manipulation as warranted. More information is needed on the limiting factor for this species.

Alternative C

Impacts from Proposed Land Acquisition and Protection

In addition to the 467.1 acres currently within the approved Petit Manan Refuge boundary, the Service would acquire all 151, or portions of larger (>200 acre) nationally significant bald eagle, wading bird, waterfowl, or colonial nesting seabird islands which lack permanent protection by a conservation organization. As a result, the islands would continue to provide long-term nesting, foraging, and migratory habitat for a variety of species of conservation concern. Permanent protection by a conservation organization of these nesting islands has been identified as a high priority in the recovery effort for a large number of these species. Service acquisition would remove all threats associated with development of the islands and uncontrolled public access.

Impacts from Proposed Public Use and Access Management

Management of public access and the resulting impacts would be similar to that described under Alternative B.

Impacts from Proposed Habitat and Vegetation Management

The habitat management objectives and techniques outlined under Alternative B would be expanded to 12 new restoration projects (e.g.18 restoration projects total). We have not yet identified which islands would support the new restoration projects; therefore, it is not possible to thoroughly evaluate the habitat management requirements. We would strive to establish well-distributed sites which provide a diversity of habitats in an effort to accommodate the habitat requirements for these species of concern.

We anticipate that our combined predator control and habitat management efforts on the 18 total restoration projects would result in significant population growth and increased geographic distribution of colonies for common, Arctic, and roseate terns, Atlantic puffins, and razorbills. Generally, we predict common eider and laughing gulls would benefit as well (i.e. increased nesting success and juvenile survival) from our land protection and predator control efforts. On the other hand, the benefits to common eider on a few islands would be diminished by any extensive control of rank vegetation and increased level of human activity that might occur on restoration islands.

Impacts from Proposed Wildlife Populations Management

Under Alternative C, we would continue to use the predator control measures outlined in Alternatives A and B, expanding the scope to include 12 new restoration projects. The consequences would be similar to those discussed in Alternative B. Despite an increased number of islands with gull control, the viability of the State population of herring and great black-backed gulls would not be affected by our actions. Gulls are nesting on hundreds of islands (231 islands for great black-backed and 183 islands for herring gulls) and our control efforts would only occur on the 18 seabird restoration islands. Our actions would be very limited in proportion to the overall state population. However, an individual island population of gulls could be markedly reduced if a new restoration project utilized DRC 1339. It is a very effective avicide specific to gulls, as we have previously discussed.

All of the benefits to specific seabird populations described in Alternative B would also result in Alternative C. This alternative provides permanent protection and management for all known, unprotected, naturally significant seabird nesting islands in Maine.

Alternative D

Impacts from Proposed Land Acquisition and Protection

Under Alternative D, Service acquisition would be limited to the 467.1 acres currently within Petit Manan Refuge's approved boundary. This would leave all 151 unprotected nationally significant bald eagle, wading bird, waterfowl, and nesting seabird islands without the permanent protection afforded by conservation ownership. Our hope would be that our conservation partners would be able to protect some of these islands, reducing the risk of development. Some coastal islands would remain vulnerable to development, and we would likely see gradual habitat loss for a variety of seabird, waterfowl, and wading bird species.

Impacts from Proposed Public Use and Access Management

Under Alternative D, all Refuge islands would be closed to public access year round. Since we currently close the islands to public use during the most sensitive time of year, we would not anticipate that closing the islands to hunting and public access for the rest of the year would offer any significant benefit to most of these birds. Negligible benefits may be realized by migrating birds who would not encounter human disturbance, saving energy reserves.

Impacts from Proposed Habitat and Vegetation Management

Under Alternative D, we would use a custodial approach to habitat management, and minimize surveys and monitoring to conducting only a few high priority seabird species. We would eliminate the use of sheep grazing,

herbicides, mowing, and burning as habitat management tools. The resulting development of rank vegetation and the elimination of lethal predator control measures would result in significant reductions in tern productivity and survival rates. We would not be able to contribute to Service and MDIFW recovery objectives for a diverse group of species. The laughing gull population nesting on Petit Manan Island would likely increase in number and distribution over the next 15 years as a result of increased availability of rank vegetation and decreased control efforts targeted at this species. However, over the long-term we would anticipate a decrease in nesting numbers for all three species of terns and laughing gulls due to the predicted increase in numbers of and predation by herring and great black-backed gulls.

Impacts from Proposed Wildlife Populations Management

We would limit ourselves to non-lethal predator control measures under Alternative D. This change in management practices would significantly reduce our ability to manage and protect alcid and tern colonies along the coast of Maine. Past records indicate that when gull control measures have been eliminated, herring and great black-backed gulls have rapidly repopulated the tern islands. The result has been a reduction in tern productivity or complete abandonment of the island by the nesting terns. Within a short time period we would anticipate an overall reduction or elimination of tern populations on our managed islands. Currently, over 90% of all terns nesting in Maine are nesting on the 10 islands with active gull control. This alternative would significantly reduce our ability to contribute to the recovery efforts outlined in the Roseate Tern Recovery Plan (USFWS 1998), USFWS Tern Plan (USFWS 2002), and MDIFW Species Assessments. The Refuge tern and alcid colonies represent the largest colonies in Maine, and loss of these colonies would significantly affect the population size, geographic distribution, and recovery potential for these and a variety of other seabird species.

We would not manage the laughing gull population on Petit Manan Island. This management action, when combined with a "hands-off" approach to vegetation management, would allow the gull colony to continue expanding across the island. In the short-term, their predation on tern eggs and chicks would increase markedly. We would expect a significant reduction in tern productivity and nesting distribution as a result of this alternative. Over the long-term, we predict laughing gull numbers would also decrease as a result of increased herring and great black-backed gull numbers.

Seabirds, Wading Birds, and Waterfowl - Summary

Alternatives A, B and C would maintain the public access restriction on Refuge islands during the seabird nesting season, which is inclusive of the nesting seasons for wading birds and waterfowl. Alternative D would close all Refuge islands to public use year round. All alternatives would maintain the freshwater impoundments on the Petit Manan Point Division which is important to thousands of migrating waterfowl and wading birds.

Alternative C, with the largest expansion proposal, and with 12 proposed new seabird restoration sites, would provide the greatest benefit to these species. It would also identify important wading bird and waterfowl habitats on the mainland in need of protection, and pursue Service acquisition under a separate authorization, as warranted. Alternative B, with the next largest expansion proposal and 6 proposed new seabird restoration projects, would provide the next greatest benefit, followed by Alternative A with a smaller expansion and continued management of 6 seabird restoration sites. Alternative D does not propose an expansion and would dramatically scale back current seabird restoration efforts on the 6 sites.

Effects on Other Native Wildlife of Management Concern

The majority of our biological survey efforts to date have focused on bird species which breed or winter on the Refuge. Current information indicates that 218 species of birds breed in Maine (Gawler et. al. 1996), while 114 species have been confirmed breeding on the Refuge. In addition, we have recorded 320 species of birds on, or adjacent to, the Refuge during some portion of the year.

The Refuge islands stretch over 200 air-miles of the coastline, functioning as stepping stones along the Atlantic Coast migratory bird pathway. Preliminary data indicates that coastal islands may play a significant role as migratory stopover and feeding sites for many species of migratory birds (R. Suomala pers. comm. and Drury and Goodhue 1998).

Alternative A (Current Management)

Impacts from Proposed Land Acquisition and Protection

Alternative A includes Service acquisition of the 467.1 acres currently within the approved Petit Manan Refuge boundary and 30 additional nationally significant unprotected nesting islands. Although the primary purpose for acquisition is to protect nesting habitat for seabirds, wading birds, waterfowl, and bald eagles, a wide variety of wildlife species would also benefit from this land protection effort. These include Neotropical migrants, shorebirds, raptors, mammals, reptiles, and amphibians. The migrating bird species, in particular, would benefit from reduced threat of development on coastal islands.

Acquisition of the 95 acre Sawyers Marsh, adjacent to the Refuge's Sawyers Marsh Division would ensure that this area would continue to provide valuable nesting, feeding, and migratory habitat to a variety of wetland-dependent species of concern. We have already acquired much of the surrounding upland habitat, and purchasing the saltmarsh secures the core of this valuable habitat area.

Impacts from Proposed Public Use and Access Management

The seasonal public access restriction to nesting islands would benefit many other island residents as well, namely nesting and migrating birds.

Other species, such as amphibians, reptiles, or small mammals, would likely be unaffected by the closures.

As we previously described for Alternative A, we would continue to educate local rockweed harvesters about Service regulations (50 CFR27.51(a)) and enforce regulations that protect vegetation within national wildlife refuges from harvesting. Protecting rockweed and the variety of invertebrates that can be found on the plants would provide migratory and wintering populations of waterfowl and shorebirds with a rich diversity of forage species (Bannerman 1960, Mawhinney 1999, Mittelhauser 2000). Maintaining intertidal plants and their associated invertebrates should help waterfowl and shorebird species maintain or enhance their body conditions during various stages of their annual cycles, and, most importantly, during migration.

Sawyers Marsh and Gouldsboro Bay divisions are open to hunting of migratory game birds and waterfowl, and small and big game. Bois Bubert Island is open to white-tailed deer hunting. Petit Manan Point Division would remain closed to all hunting. Based on observations by our staff and discussions with local hunters, the number of individuals hunting on these divisions is small. We believe that the number of animals harvested from the Refuge Complex is also small, and we would therefore not expect any significant regional or State population decline to result from our hunt program.

Impacts from Proposed Habitat and Vegetation Management

Under Alternative A, we would not implement significant changes to habitat types. We expect that the diversity of habitats currently found on the Refuge would continue to maintain the wide array of avian species with the necessary breeding, foraging, roosting, migratory, or wintering habitat they require.

Grassland Breeding Birds: Under Alternative A, we would actively maintain open fields and blueberry barrens, benefitting grassland birds on Petit Manan Point Division through the use of prescribed fire and mowing as previously described for Alternative A in the section: Effects on Vegetation and Habitat. We would continue to utilize spring (April and May) and fall (September, October, and November) burning schedules in an effort to avoid the migratory bird nesting season. We would maintain 65 acres in early-successional open field habitat (i.e. blueberry barrens and native, cool season grasses) through a three- to five-year rotation of prescribed burning and mowing among the 11 units. This effort would stimulate blueberry production and nutrient recycling, rejuvenating grassland communities used by migratory and nesting songbirds, small mammals and white-tailed deer. Maintaining the open field/blueberry barren habitat on Petit Manan Point would provide nesting habitat for landbirds of conservation priority within PIF Area 28 such as bobolink, northern harrier, and eastern mead-

owlark, and provide spring "singing" habitat for American woodcock, another species of high conservation priority in this area. Grassland habitat would also be managed on the six seabird restoration islands, benefitting a diverse array of migratory bird species with nesting and foraging habitat.

Neotropical migrants, Shorebirds, and Raptors: Refuge islands play a significant role during Neotropical migrant, shorebird, and raptor migrations. The diversity of habitats and prey species provided by the coastal islands and the inter-tidal areas surrounding the islands offers an extensive foraging base for these species groups. Interestingly, the concentrations of Neotropical migrants and shorebirds feeding and roosting on the islands provide abundant foraging opportunities for raptors.

Our seasonal technicians working on the six seabird restoration islands monitor Neotropical migrant use of the islands, and have documented over 100 species during the brief seabird nesting season. The seabird crews also document raptor (i.e peregrine falcons, bald eagles, and merlins) predation rates on the island and adjacent waters. Limited studies contracted by us indicate that a considerable number of raptors utilize offshore islands as foraging areas during their fall migrations (Drury and Goodhue 1998). Service acquisition and protection of coastal islands and mainland properties outlined in this alternative would assure these areas continue to provide a diverse group of Neotropical migrants, shorebirds, and raptors with critical foraging and roosting areas.

Terrestrial and Marine Mammals: We have not conducted a comprehensive inventory of mammals. When possible, we have live-trapped small mammals on some of our coastal islands as part of our baseline inventory efforts. As expected, terrestrial mammal diversity and abundance on the coastal islands is limited by the distance from the mainland and habitat provided by the islands. The marine waters adjacent to the Refuge provide abundant habitat for a diverse array of marine species, including gray and harbor seals, harbor porpoise, and a variety of whales. Researchers at the University of Maine conduct periodic inventories of seal haul-out and pupping ledges, and then share with us the inventory results.

Harbor Seal
USFWS photo

With the exception of species occurring at the geographic extreme of their range (i.e., lynx), we anticipate that the majority of mammals found in Maine would find suitable habitat on some portion of the Refuge. Generally, we do not predict significant changes to mammalian diversity or overall population levels, since we would not implement significant changes to habitat types. Maintaining the integrity of the upland habitat found across the large geographic span of

the Refuge and reducing the threats associated with development should help to maintain the variety of habitat and foraging conditions required by this diverse group of species. White-tailed deer would continue to benefit directly from our efforts to maintain open fields on Petit Manan Point Division; their browse is significantly improved by this management.

Amphibians and Reptiles: We have recently initiated efforts to document species diversity and abundance of reptiles and amphibians on the Refuge. In Maine, 17 species of reptiles and 17 species of amphibians are documented; however, many of these species reach the northern extreme of their range in southern Maine, and therefore are not found on the mainland portions of the Refuge. The habitat conditions and distance from the mainland limit the diversity of species found on coastal islands. We do not anticipate that any of our management actions on islands would adversely affect species diversity, distribution, or overall population viability. We also believe that this would be true for our mainland divisions. Our limited management of mainland grasslands is timed to avoid late spring and summer breeding seasons. The mosaic of habitat types found on the mainland divisions would continue to provide both the aquatic and terrestrial habitats required by many of the amphibians found in this region of Maine. Most importantly, Service acquisition and protection of coastal islands and mainland properties outlined in this alternative would assure these areas continue to support a diverse group of reptiles and amphibians over the long-term.

Invertebrates: Efforts to inventory invertebrate species on the Refuge have been recently initiated. A Refuge volunteer is currently conducting dragonfly and damselfly surveys on Petit Manan Point Division (Hildreth 2001 and Hildreth 2002). To date, 33 species of Odonates have been documented on the Refuge, several of which are considered rare or a special concern in Maine. Additional efforts have focused on surveying Lepidoptera (butterflies and moths), Diptera (two winged flies and true flies), and Cerambycidae (longhorned beetles) on Petit Manan Point. We have recently initiated extensive spider inventories of several mainland divisions and coastal islands (Jennings 2000, Jennings 2001, and Jennings 2002). To date, 178 species have been documented, including several new records for the state of Maine, and several previously un-described species have been recorded. Service acquisition and protection of coastal islands and mainland properties outlined in this alternative would continue to support a diverse group of invertebrates. Inter-tidal habitat surrounding the Refuge would continue to provide habitat to a diversity of aquatic invertebrates, which in turn provide foraging opportunities for waterfowl and shorebirds.

Freshwater and Marine Fish: We have not documented freshwater fish species in any of the freshwater wetlands found on the Refuge. Many of

these were originally small emergent wetlands that were converted to larger bodies of open water through beaver dam construction and more recently maintained by water control structures. It is unlikely that these wetlands support any significant populations of fish. As such, we predict there would be no impacts to freshwater fish from our management.

However, the marine waters adjacent to the Refuge support a tremendous diversity of marine invertebrates (e.g. lobster, blue mussels, and sea urchins) and fish species (e.g. Atlantic salmon, herring, and haddock). These highly productive waters of the Gulf of Maine are critical to our seabird restoration efforts, as all of the seabirds, wading birds, and waterfowl forage on either fish or invertebrates found in the marine environment. We do not expect that our management under Alternative A would directly impact marine species, except for our restrictions on rockweed harvests, which would be beneficial as rockweed supports aquatic invertebrates which are an important forage item for many waterfowl, shorebirds and seabirds.

Impacts from Proposed Wildlife Populations Management

Under Alternative A, we would continue our limited predator management program targeted at mammalian (i.e. mink) and nocturnal avian predators (i.e. black crowned night heron or great horned owl). The presence of one of these predators on a seabird island can result in significant disruption of the nesting colony, decreased productivity, decreased survival rates for chicks and adults, or colony abandonment. In recent years, the numbers of mammals removed from the seabird colonies has been relatively low, with 0-5 individuals removed from the six combined restoration projects. We would not use live trapping and relocation of mammals, since it is not permitted in the State due to concern of spreading rabies. If possible, non-lethal measures and relocation would be our primary means of dealing with owls.

Under Alternative A, we would continue to respond quickly and efficiently to the presence of these predators on the restoration islands. Mink have been observed killing large number of terns and a single mink is believed responsible for the drastic reduction in the NAS Jenny Island colony that dropped from over 1,000 pairs of terns in 2000, to 59 pairs in 2001 (Hall pers. comm.). Capture and removal efforts are specifically designed to avoid capturing or injuring non-target species. Our predator control efforts would result in increased productivity and survival rates for a variety of seabird species. Since only selected individuals are removed, we would not predict a significant regional or State decline in predator populations.

Alternative B (Service's Preferred Alternative)

Impacts from Proposed Land Acquisition and Protection

In addition to the 467.1 acres currently within the approved boundary, the Service would acquire 87 nationally significant bald eagle, wading bird, waterfowl, or colonial nesting seabird islands which lack permanent protection by a conservation organization. These islands would continue to provide critical nesting, foraging, and migratory habitat for a variety of species of conservation concern. Service acquisition would remove all threats associated with development of the islands. The diversity of habitats protected under this alternative would continue to support a broad group of wildlife species including, but not limited to, Neotropical migrants, shorebirds, raptors, mammals, reptiles, and amphibians.

Impacts from Proposed Public Use and Access Management

With the exception of opening Petit Manan Point to white-tailed deer hunting, and the expansion of waterfowl hunting opportunities to newly acquired islands, the effects of public access on Refuge wildlife would remain similar to those outlined in Alternative A. Both deer and waterfowl hunting seasons and limits are established by State and Federal regulations which account for population trends and future expectations. These ensure that regional and State populations remain viable and self-sustaining. Our hunt programs and the anticipated hunter use would not significantly impact regional or State populations of deer or waterfowl.

Impacts from Proposed Habitat and Vegetation Management

The three Refuge mainland divisions are ecologically diverse, providing both food and shelter to a tremendous variety of resident and migratory species. One of our primary objectives would be to continue to protect and restore critical stopover points for Neotropical migrants, waterfowl, and shorebirds during the spring and fall migrations along the Maine coast.

We would focus management efforts on those habitats that would benefit species identified as priorities under one of the various conservation plans. As would be expected with any habitat action, some species of wildlife would likely benefit, while others may be adversely effected by our actions. Any adverse effects would likely be minimized by the short-term habitat changes (1-2 years) we generally experience with our habitat management actions. We would continue efforts to balance the needs of the diverse array of wildlife species which use the Refuge during some portion of their life cycle. We would continue efforts to document wildlife diversity and abundance on Refuge islands and mainland divisions. We anticipate that all of the species discussed in Alternative A would benefit from permanent protection of these coastal habitats.

In addition to the management actions and consequences described in Alternative A, we would manage the following cover types:

Mature Conifer: We would maintain mature conifer forest habitat on Refuge islands and mainland divisions to provide nesting habitat for bald eagles and landbirds of high conservation priority within PIF Area 28 such as bay-breasted warbler, Cape May warbler, and spruce grouse. Although conifers dominate a large percentage of Maine's forests, most are in commercial forests where the forest industry has favored shorter harvest rotations, creating younger, even-aged forested stands. Our management actions would result in greater structural and age-class diversity and more heterogenous stands than those under commercial harvesting conditions. These older, mixed-aged forests typically have a greater supply of downed and standing dead wood and more diverse vertical structure and canopy gaps (Elliott 1999). While some Neotropical migrant species may benefit from current commercial harvesting practices on private lands (i.e. Wilson's warbler and Lincoln's sparrow), the PIF species mentioned above may be adversely affected. Working with our conservation partners, we would evaluate the most appropriate habitat management actions for landbirds of high conservation priority within PIF 28.

Northern Hardwood-mixed Forest: Under Alternative B, we would maintain northern hardwood-mixed forest habitat to provide nesting habitat for landbirds of high conservation priority within PIF Area 28 such as black-throated blue warbler and Canada warbler. If warranted, our management actions would focus on maintaining a balance of forest age structures, including mid-successional and late-successional forest, and providing structural diversity (shrubs and treefall) within the forest. Managing the forest to provide structural and age-class diversity would also provide a variety of foraging substrates to benefit migrating birds.

Early successional forest/scrub-shrub community: Under Alternative B, we would maintain early successional forest/scrub-shrub habitat dominated by species such as alder and cherry approximately 2' to 10' tall. Our objective would be to provide nesting habitat for landbirds of high conservation priority within PIF Area 28 such as chestnut-sided warbler, American woodcock, and olive-sided flycatcher. In Maine, most land management practices strive to avoid the disturbances which typically create this habitat. As a result, this habitat type and many landbirds associated with it are in decline throughout PIF Area 28. Our management would contribute to reversing these trends, but in all likelihood, due to the size of the Refuge, the overall impact would be a negligible contribution to regional or State populations.

In addition to nesting habitat, these scrub-shrub communities would provide important foraging areas for migratory birds during spring and fall migration. Foraging habitat is considered a vital component of the overall habitat quality during the migration period.

Maritime saltmarsh and estuary: We would maintain the maritime saltmarsh and estuary habitat on Sawyers Marsh and Gouldsboro Bay divisions and Cross Island. These areas provide breeding habitat for species of conservation concern such as Nelson's sharp-tailed sparrow, American black duck, and northern harrier. The saltmarshes and estuaries would also provide important migratory stopover sites for a variety of shorebirds and provide wintering habitat for American black ducks.

Vernal pools: We would continue to inventory and protect all vernal pool habitat identified on Refuge lands to maintain breeding habitat for amphibian species of conservation concern, such as wood frogs and spotted salamanders. Many of the amphibians of concern rely on vernal pool habitat during all or part of their life cycle. Unfortunately, we have not had the resources to complete our vernal pool surveys and document the presence of amphibians in these areas during the breeding season. None of our proposed management actions would adversely affect vernal pool habitat and the species that depend on them.

Impacts from Wildlife Populations Management

Under Alternative B, we would expand our seabird restoration efforts to six new islands. Although the consequences would be similar to those outlined in Alternative A, the scope of the predator management effort would be expanded to include the new projects. Using our current predator removal levels as a baseline, we would anticipate that 5-10 predators/year could be removed from the 12 restoration islands. However, it is important to note that in some years, it may not be necessary to remove any mammalian predators from the islands. This level of predator management would not have any effect on predator population levels in the coastal region of Maine.

Alternative C

Impacts from Proposed Land Acquisition and Protection

In addition to the 467.1 acres currently within the approved boundary, the Service would acquire all, or portions of, 151 nationally significant bald eagle, wading bird, waterfowl, or colonial nesting seabird islands which lack permanent protection by a conservation organization. As a result, the islands would continue to provide valuable habitat for a variety of native species. Service acquisition would remove all threats associated with development of the islands and uncontrolled public access, maintaining habitat quality and minimizing human disturbance.

Impacts from Proposed Public Use and Access Management

The actions and consequences of managing public access would be similar to those outlined in Alternative B. The primary difference is that we would open Petit Manan, Gouldboro Bay, and Sawyers Marsh divisions, Cross and Bois Bubert Island to furbearer trapping. All trapping activities on the

Refuge would be conducted according to State and Refuge regulations. No trapping would be allowed on the mainland during the waterfowl migration season (September through November) to protect the large congregations of waterfowl building up reserves before they head south. We would not anticipate any regional or State population declines in furbearers resulting from opening the Refuge to trapping. State seasons and limits are based on population trends, including the expected future trends, and the need to maintain viable and self-sustaining populations within the estimated habitat capacity.

Impacts from Proposed Habitat and Vegetation Management

The habitat management objectives and techniques outlined under Alternatives A and B would be expanded to 12 new restoration projects (e.g. 18 total projects) under Alternative C. We have not yet identified which islands would support the new restoration projects; therefore, it is not possible to identify specific habitat management actions. In general, we would strive to provide a diversity of habitats on each of the 12 islands in an effort to accommodate the habitat requirements of this diverse group of species. The majority of islands within the Refuge would not be actively managed. As such, we would not anticipate any adverse effects to the resident or migratory species which use the islands.

Impacts from Proposed Wildlife Populations Management

Although the consequences would be similar to those outlined in Alternative B, the scope of the predator management effort would be expanded to include the 12 new projects proposed under Alternative C. Using our current predator removal levels as a baseline, we would anticipate that 10-15 predators/year could be removed from the 18 restoration islands. However, it is important to note that in some years it may not be necessary to remove any mammalian predators from the islands. This level of predator management would not have any effect on State or regional predator population levels.

Alternative D

Impacts from Proposed Land Acquisition and Protection

Under Alternative D, land acquisition would be limited to the 467.1 acres currently unacquired within Petit Manan Refuge's approved boundary. This would leave the nationally significant bald eagle, wading bird, waterfowl, and colonial nesting seabird islands without the permanent protection afforded by conservation ownership. It is possible that the anticipated impacts from development may be lessened through land protection efforts by our conservation partners, but we cannot assume this commitment. As such, some coastal islands would remain vulnerable to development, and we would likely see gradual habitat loss for seabirds, wading birds and waterfowl as these parcels are developed.

Impacts from Proposed Public Use and Access Management

Under Alternative D, all Refuge islands would be closed to public access year round and no hunting would be permitted anywhere on the Refuge. Based on the current light hunting pressure our lands receive, we would not anticipate that closing the islands to hunting and public access would have any effect on the variety or populations of species which utilize the islands throughout the year. With regards to the hunted species such as deer and waterfowl, we also would not anticipate that closing the Refuge to hunting would significantly increase populations of these species. Natural predation rates, emigration to surrounding privately owned lands, and hunting on adjacent lands would be expected to keep the populations within their natural range of variability.

Impacts from Proposed Habitat and Vegetation Management

Under Alternative D, we would utilize a custodial approach to wildlife and habitat management, and minimize survey efforts and data collection. Monitoring efforts would be limited to a few high priority seabird species. We would eliminate the use of sheep grazing, herbicides, mowing, and burning as habitat management tools. The laughing gull population on Petit Manan Island would likely increase in number and nest site distribution as a result of increased vegetative growth and decreased gull control measures.

There would be insufficient staff time and dollars to complete baseline surveys, vegetation mapping, and research programs addressing critical management issues. Without support of our volunteer program, we would be unable to inventory and monitor invertebrates, reptiles, and amphibians. Efforts to document wildlife use of the coastal islands would be limited to the six restoration islands, as little effort would be expended on the other Refuge islands.

Impacts from Proposed Wildlife Populations Management

Under Alternative D, we would limit our efforts to non-lethal predator management techniques. This change in management practices would significantly reduce our ability to manage and protect seabird and wading bird colonies along the coast of Maine. The number of mammalian predators on the seabird islands would likely increase. This increase may be self limiting, however, as the number of seabirds available as prey would likely be substantially reduced. Implementing Alternative D would significantly reduce our ability to contribute to the recovery efforts outlined in the Roseate Tern Recovery Plan (USFWS 1998), USFWS Tern Plan (USFWS 2002), and MDIFW Species Assessments. Predator numbers may increase very slightly on the six intensively managed sites, but overall, we do not predict our actions would result in a significant regional or State population change for any predator species.

Other Native Wildlife of Management Concern - Summary

All alternatives strive to protect native species and habitat diversity. No significant changes to vertebrate or invertebrate population viability or species distribution is predicted under any alternative, even after consideration of the public use, hunting, trapping and predator management proposed actions. Additional protection of native species would be afforded by the proposed Refuge expansions in Alternative, A, B, and C. Alternative C, with the largest expansion proposal, would afford the greatest benefits to native species, followed by Alternative B, then A. Alternative D does not propose an expansion.

Effects of Wilderness Recommendations

Appendix D describes the wilderness review process we undertook for this CCP and how it relates to the management alternatives. In summary, we determined that 13 islands in the Refuge met the minimum criteria for wilderness character, and from these, we identified 8 WSAs. The following WSAs were further studied for their suitability to manage, preserve long-term, and designate as wilderness:

- Outer Heron Island WSA,
- Outer White Island WSA,
- Little Marshall WSA,
- John's Island WSA,
- Bois Bubert Island WSA,
- Inner Sand Island WSA,
- Halifax Island WSA, and
- Cross Island WSA Complex (includes Cross, Inner Double Head Shot, Outer Double Head Shot, Mink, Scotch, and Old Man islands).

In our wilderness study, we evaluated whether we could maintain, over the long-term, the quality of wilderness values and character, without compromising our ability to meet refuge purposes and the Refuge System mission. We considered the impacts from existing and planned resource and public use programs and activities.

It is only in Alternatives B and C that we recommend the eight WSAs for wilderness designation. Since Congress has reserved the authority to make final decisions on wilderness designation, our recommendations are preliminary administrative determinations that will receive further review and possible modification by our Director, the Secretary of the Interior, the President, or Congress. However, the following analysis of impacts is based on the assumption that Congress would accept the recommendation and designate all eight WSAs as wilderness.

Under Alternatives B and C, the eight WSAs would be designated wilderness and managed according to the provisions of the Wilderness Act and Service wilderness management regulations (50 CFR 35) and policy in the

Refuge Manual (6 RM 8). The islands would be managed to accomplish refuge purposes, the Refuge System mission, and to preserve wilderness character, natural values, and outstanding opportunities for solitude and primitive recreation for the use and enjoyment of future generations. We would adjust our refuge management strategies and techniques to comply with wilderness stewardship principles and prevent degradation of wilderness character.

The use of motorized vehicles, motorized equipment, and mechanical transport on WSA islands would be allowed only (1) for emergency purposes or (2) when necessary to meet minimum requirements for the administration of the area as wilderness and to accomplish refuge purposes. The islands, however, would continue to be accessible by motorboat. Proposed or new refuge management activities, including the need to use motorized vehicles, motorized equipment, or mechanical transport for administrative purposes, would be evaluated through a minimum requirements analysis and NEPA compliance to assess potential impacts and identify mitigating measures to protect wilderness character.

Under Alternatives A and D, the eight WSAs would not be recommended for wilderness designation. The islands would be managed to accomplish their original refuge purposes only, in accordance with legal and policy guidance for the Refuge System; the islands would no longer be labeled WSAs and would no longer be specifically managed to maintain wilderness character. The provisions of the Wilderness Act and Service wilderness regulations and policy would not apply.

Impacts of Refuge Management Activities and Refuge Uses on Wilderness Values

In the following discussion, we describe how actions proposed in the alternatives for other Refuge programs would affect the wilderness character of the eight WSAs.

None of the alternatives propose actions that would directly or indirectly jeopardize the roadless character, size, naturalness, or outstanding ecological or scenic features of any of the eight WSAs. This is based on the fact that no actions are proposed which would alter the physical character of any of the islands. For example, no new or expanded administrative, research, or recreational infrastructure is proposed. No changes in land use or land ownership would occur. Further, no habitat manipulations are proposed that would physically change the landscape. Under all alternatives, the islands identified as WSAs would continue to be physically impacted primarily by natural forces.

There are no existing or planned refuge management or administrative activities on any of the WSAs requiring the use of motorized or mechanized equipment. Under Alternatives B and C, any future proposals to use

motorized or mechanized equipment would need to be evaluated through a "minimum requirements analysis." This analysis would determine whether the project or activity is necessary to meet minimum requirements for the administration of the area as wilderness, or to accomplish refuge purposes or the Refuge System mission. If the project is "necessary", further evaluation would identify the minimum tool to accomplish the job. This analysis would not be required in Alternatives A or D.

Under Alternatives A, B, and C, the islands' outstanding opportunities for solitude and primitive recreation would be preserved and available consistent with the seasonal restrictions imposed on seabird and bald eagle nesting islands. Under Alternatives B and C, the establishment of a "limits of acceptable change" program to monitor camping use on Halifax and Bois Bubert Islands would enhance our ability to manage these islands to maintain the highest quality of solitude and primitive recreation. In addition, the implementation of a day-use permit system for groups larger than 6 people under Alternative C would further enhance our ability to manage the islands to maintain outstanding opportunities.

Alternative D would exclude public use and access year round on any Refuge island, including the WSAs. As such, opportunities for solitude and primitive and unconfined recreation could not be experienced by anyone. In other words, there would be no chance for anyone to have a first-hand wilderness island encounter under Alternative D.

Wilderness designation would provide long-term legislative protection for the islands' wilderness character, natural values, and opportunities for solitude and primitive recreation. Under Alternatives B and C, the eight WSAs would be guaranteed this additional level of legislative protection and commitment from the Service to manage the islands to maintain wilderness character and values. The islands would be managed to accomplish refuge purposes, the Refuge System mission, and to preserve wilderness character, natural values, and outstanding opportunities for solitude and primitive recreation for the use and enjoyment of future generations. We would adjust our refuge management strategies and techniques to comply with the provisions of the Wilderness Act, Service wilderness management regulations (50 CFR 35) and policy (6 RM 8), to prevent degradation of wilderness character, natural values, and outstanding opportunities for solitude and primitive recreation.

In summary, under Alternative B or C, all management actions on these islands would be evaluated and modified as necessary to ensure no wilderness values are diminished or lost. In addition, if wilderness designation is approved, we would develop detailed wilderness management plans to sustain their wilderness values in perpetuity. Neither Alternatives A or D affords this additional level of wilderness management and permanent legislative protection.

Impacts to Other Refuge Programs and Refuge Uses

There are impacts, both short and long-term, directly associated with recommending and designating wilderness areas which would occur only under Alternatives B and C. Conversely, there are impacts with not recommending the WSAs, which we describe below.

During our public scoping meetings, some individuals were concerned that formally designating wilderness would dramatically increase visitor use and result in physical impacts to islands. They felt that once these islands were identified on a map as such, their designation would attract a substantial increase in visitation by those outdoor enthusiasts who are drawn to the unique challenges wilderness areas offer. However, we do not predict that a notable increase would occur for several reasons:

1. Several of the islands are either too remote, too small, and/or have no landing sites so are not accessible;
2. For those that are accessible, several have seasonal access restrictions due to nesting seabirds or bald eagles during the peak visitor use season; and,
3. The assumption that if these WSAs are formally designated, visitation will necessarily increase, is not statistically valid according to a review of literature and wilderness studies.

Also during public scoping, some individuals asked whether existing, compatible public uses occurring on WSAs would have to change or be modified to adhere to wilderness management requirements. In particular, there was concern whether priority public uses (i.e. hunting, fishing, wildlife observation, nature photography, and environmental education and interpretation) would be affected. During our wilderness review, we evaluated each of these priority public uses occurring on WSAs and determined none would have to be modified, regardless of the alternative.

All of these programs are currently being implemented in ways that do not degrade wilderness character or values. In addition, the existing and planned programs in the WSAs adhere to the rules and regulations in 50 CFR §35.6 (f). The prohibitions on public use of motorized vehicles (e.g., ATVs) and equipment (e.g., chainsaws), and mechanized transport (e.g., bicycles and game carriers) would not affect any of the existing, compatible public uses. Motorized public access is not currently allowed on Refuge islands, and for all practical purposes, motor vehicles and bicycles are not feasible or even useful on the islands. For example, there is the difficulty in transporting the vehicle or bicycle by boat to the islands. There is also the fact that many of the islands have dense vegetation difficult to maneuver through and trails exist on only the two larger islands. Finally, the small size of most WSA islands precludes the need for these modes of transportation. Bois Bubert is the only proposed wilderness island open to deer hunting and the dense spruce-fir forest prevents the use of wheeled equipment. Also, the relatively short distances to the shoreline

from any point on the island (< 1/2 mile) makes the use of this equipment unnecessary.

Our WSA boundary on Cross and Bois Bubert Islands excludes private lands. In addition, the Bois Bubert WSA boundary excludes the existing rights-of-way, common boat landing, and Lily Pond. Further, all WSA boundaries are delineated at the mean high water mark since the Service has limited jurisdiction in the inter-tidal area.

There are no land uses or existing private or State rights in the WSAs known to us that would affect or limit our ability to manage the islands to maintain wilderness values and character. We have no plans, nor do we foresee a management need, for timber harvest or livestock grazing. There are no active mining claims, oil and gas leases, or other subsurface claims or rights that we have found on the WSAs, nor are we aware of any potential for these resources. Under Alternatives B and C, as the Service acquires the private lands or reserved rights on Cross and Bois Bubert islands, we would use administrative action to incorporate each exclusion into its respective WSA or desginated wilderness area.

We do not anticipate that wilderness designation would affect existing aquaculture facilities or commercial fishing or lobstering activities in State jurisdictional waters. As we described in Chapter 1 and Chapter 4, our Maine Field Office would continue to recommend to the U.S. Army Corps of Engineers (ACOE) that a minimum 1/4 mile no-activity buffer be implemented around Federal-owned islands. However, there is no guarantee that these recommendations would be incorporated into the final permits. We do not know at this time whether the identification of WSAs, or their designation as formal wilderness areas, would guarantee that the ACOE would incorporate the Service buffer recommendation into permits.

Purple sandpipers
USFWS photo

Under Alternatives B and C, wilderness designation of the 8 WSAs would directly suppport the CCP goals and objectives for protecting Federal trust wildlife and the diversity of coastal habitats in several ways. Wilderness designation establishes an additional refuge purpose of protecting wilderness character and values. It would strengthen the Refuge System mission and the refuges' purposes of protecting nesting seabirds and bald eagles and island habitats essential to migrating birds such as raptors, water birds, and shorebirds. It would further insure that the WSAs remain undeveloped and retain their naturalness in perpetuity.

Designation of the eight WSAs would make a unique and significant contribution to the National Wilderness Preservation System (NWPS). Within the current NWPS, the only designated wilderness island on the East Coast north of North Carolina includes North and South Monomoy islands, off of southern Cape Cod. These two islands comprise the 2,600 acre Monomoy Wilderness Area. The wilderness area evolved from a series of small sand-spit barrier islands which are constantly shifting, eroding, and drifting. It is influenced by the warmer saline waters, moderate tides, and moderate climates associated with the Gulf Stream. While some trees less than 15 feet tall occur on the islands, the majority is dune, saltmarsh, or freshwater marsh. The Monomoy Wilderness is noted for its large common and roseate tern nesting colonies, its large and diverse breeding waterfowl populations, and its shorebird migration. The wilderness area has a long history of settlement year round starting with Native Americans (6,000 to 8,000 years ago). This was followed by European settlements in the 18th century, culminating with a small town along the southern end until the 1930's.

The island WSAs recommended for wilderness designation on this Refuge are geologically, geographically, botanically, and culturally distinct from the Monomoy Wilderness. They are formed on igneous and metamorphic bedrock, often perched off the ocean surface creating up to 100 foot cliffs. The dramatic rocky coastlines, over 4,617 off-shore islands, and rich cultural heritage create a unique and incredibly diverse landscape incomparable in the United States. The islands lie in the Gulf of Maine, where cold water and air currents draw from the North Atlantic, and up to 50 foot tidal effects are experienced. Most of the WSA islands are forested with mature spruce-fir stands; the non-forested islands include plant communities more similar to northern boreal or Arctic types.

The Maine Coastal Islands Refuge WSA islands also contrast sharply to Monomoy Wilderness in their history of use and management. Limited human use and occupancy of these islands has occurred because of the challenges with accessing and landing on the islands. Our understanding is that early Native American use of the islands was seasonal, low impact, and mostly confined to near-shore, larger islands such as Bois Bubert and Cross islands. We know that only one of the WSA islands experienced sheep grazing historically, but only limited seasonal occupancy by humans would

have occurred associated with the grazing. In short, these islands have primarily been influenced only by the natural effects of climate and weather.

The Refuge WSAs that support nesting seabirds would also offer a unique opportunity within the NWPS to protect birds such as Atlantic puffin, razorbills, black guillemots, and common eider, which are on the southern geographic limit of their range and not found anywhere else in the United States. Designation would also support recovery of the Federal threatened bald eagle since active nesting occurs on four of the islands.

Environmental Justice

In accordance with Executive Order 12898, Federal Actions to address Environmental Justice in Minority Populations and Low-Income Populations, Federal agencies must identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. After presenting the context of minority and low income populations in Maine coastal counties, we address environmental justice as it relates to the four Refuge programs predicted to have the biggest impact on resources. We obtained our information on minority and low income populations from the U.S. Census Bureau 2000, and used those statistics to assess impacts.

According to the Census Bureau website, "Poverty status is defined by family—either everyone in the family is in poverty or no one in the family is in poverty. The characteristics of the family used to determine poverty status are number of people, number of related children under 18, and whether the primary householder is over age 65. An income threshold is determined given a particular family's set of characteristics; if that family's income is below that threshold, the family is in poverty" (http://www.census.gov/hhes/poverty/povdef.html).

The Census Bureau website uses the term "minority populations" as inclusive of the following races: Black, Hispanic, Asian, Pacific Islander, or American Indian/Alaska Native. Those racial classifications conform to the October 30, 1997, Federal Register Notice entitled, "Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity" issued by the Office of Management and Budget (OMB). Those standards govern the categories used to collect and present federal data on race and ethnicity. The OMB requires five minimum categories for race: American Indian and Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, and White. Some federal surveys include a sixth category, "Some other race," added with OMB approval (http://quickfacts.census.gov/qfd/states/23/23029.html).

Maine's 1,286,670 residents are disproportionately white (96.9%) according to the U.S. 2000 Census (http://quickfacts.census.gov). This statistic remains fairly constant within the four largest counties in coastal Maine as depicted in Table 4-1 below. These are also the same four counties most affected by current or proposed Refuge management.

Table 4-1. Percent* of minority populations in four coastal counties in Maine.

Minority	Hancock County	Knox County	Washington County	York County
Black or African American	0.3%	0.2%	0.3%	0.4%
American Indian and Alaska Native	0.4%	0.2%	4.4%	0.2%
Asian	0.4%	0.4%	0.3%	0.7%
Hispanic or Latino	0.6%	0.6%	0.8%	0.7%

*Percentages are the based on the percent of total county population

According to the 2000 national census, the percent of Maine residents living below the poverty level is 10.9%; the national average is 12.4%. In Table 4-2, we present the percent of residents below the poverty level in the same four coastal counties.

Table 4-2. Percent of families and individual residents living below the poverty level in four coastal counties in Maine.

Type of Resident	Hancock County	Knox County	Washington County	York County
Family	7.0%	5.9%	14.2%	5.9%
Individual	10.2%	8.2%	19.0%	8.2%

Impacts from Proposed Land Acquisition and Protection

We are not aware of any adverse health or economic impacts to any specific populations associated with our land acquisition program since its inception. Since most of our proposed acquisition is off-shore islands, we predict no future health risks and no significant changes in industry, taxes, or revenues which might affect residents. As such, we do not expect that Service land acquisition would disproportionately impact the health or the environment of minority or low-income populations.

The two Passamaquoddy Tribes: Pleasant Point and Indian Township Reservation, have both expressed interest in improving relations with the Service and our staff. We are currently in discussions to determine how we can cooperate in the identification and protection of cultural and natural resources important to them. All alternatives would require that we develop a formal partnership agreement with these Tribes to further validate a mutually-beneficial working relationship.

We expect that there are lands we propose to acquire which contain cultural and natural resources important to these and other Indian Tribes in Maine. At this time, we do not know all lands which may be of special interest to them and/or lands they would like to acquire as Tribal lands. We have shared our land acquisition proposals for their review and comment. We would propose to resolve any conflicts locally or at the Regional Office level, but it is possible that some decisions may be elevated to the

Secretary of Interior. None of the lands in Alternative B, the Service's Preferred Alternative, have recorded pre-historic sites according to the Maine SHPO; although we acknowledge that the majority of these lands have not been surveyed. Alternatives B and C propose to increase our survey efforts at high probability sites, particularly those at risk of erosion. None of our proposed acquisition lands lie near Tribal reservation lands.

Impacts from Proposed Public Use and Access Management

We do not predict that our proposals for public use and access management would disproportionately affect minority or low-income residents, regardless of the alternative. None of the Refuge visitor activities that we propose to eliminate or seasonally restrict on Refuge lands are ones we expect minority or low-income populations would participate in greater proportion than other visitors.

Impacts from Proposed Vegetation and Habitat Management

As we described earlier in this chapter, use of herbicides and prescribed fire are management tools we might employ which could have health implications, and we predicted that neither would pose a risk to any population. Both are used on a limited basis in a given year, if at all, and occur under strict Service guidelines designed to minimize health and safety risks. Refuge visitors and local residents would be alerted to these activities, and since there are few adjacent residents, risks are negligible regardless of one's race or income status.

Impacts from Proposed Wildlife Populations Management

We do not predict impacts to any human populations from our proposed wildlife populations program. This program consists primarily of activities designed to restore seabirds to off-shore islands. These activities include using non-lethal and lethal methods to control wildlife that prey on seabirds. Gulls, mink, great-horned owls, and night herons are examples.

Minority and Low-Income Populations - Summary

Our analysis of environmental justice concludes that we do not predict any of our management alternatives would cause disproportionately high and adverse human health or economic impacts to minority or low-income populations in coastal Maine.

Cumulative Impacts

Cumulative impacts are those impacts on the physical, biological, and human environment resulting from the incremental impact of the proposed actions when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

This cumulative impacts assessment includes other agencies' or organizations' actions if they are inter-related and influence the same environment. Thus, this analysis considers the interaction of activities at the Refuge with other actions occurring over a larger spatial and temporal frame of reference. Potential cumulative impacts for the proposed alternatives are described below.

Air Quality

None of the proposed alternatives are expected to have significant cumulative adverse impacts on air quality in coastal Maine or elsewhere in New England. Some short-term, local deterioration in air quality would be expected from management-ignited prescribed burns and from Refuge visitors' automobile emissions. However, management-ignited prescribed burns would only occur under the stipulations of the Fire EA (2002) completed by the Refuge. These stipulations are specifically designed to minimize air quality impacts. Further, while visitors would primarily access the Refuges by automobile, most would drive less than 50 miles. Most of these visitors are already in the area on vacation and seek out the Refuge for a half-day trip. It is rarely the primary destination for Maine coastal travelers. In other words, the presence of the Refuge should only be accountable for a very small percentage of vehicle emissions generated in this area. Importantly, we predict no additional cumulative impacts to Class 1 air sheds from our actions; the closest Class 1 area being Moosehorn Refuge Wilderness Area, approximately 25 miles to the north in Baring, Maine. We described the results of air quality monitoring studies in Moosehorn Wilderness Area and Acadia National Park in detail in Chapter 3. In summary, Refuge-related activities contribute insignificantly to poor air quality in coastal Maine, which is much more affected by power plants and pulp mills from industrial centers and automobile emissions from populated areas.

With our partners, we contribute to improving air quality through cooperative land protection and management of natural vegetation and wetlands. Protecting land from development, which is happening at an increasing rate in coastal Maine, and maintaining it in natural vegetation or as natural wetlands, assures these areas will continue to filter out many air pollutants harmful to humans and the environment.

Soils, Hydrology, Wetlands, and Water Quality

The greatest past, present, and foreseeable future adverse impact on these watershed resources in coastal Maine is from increasing residential and commercial development. As development along the coast continues, the threats to these Refuge resources, namely coastal saltwater and freshwater wetlands, will increase dramatically. In particular, deteriorating water quality in coastal Maine has become a priority issue for State agencies and local communities. Chapter 3 describes many of these concerns. A cooperative, watershed-level approach to protecting and managing these resources offers the greatest opportunity to cumulatively improve conditions.

We work closely with our Gulf of Maine Coastal Program Office, who are active members of the Gulf of Maine Council on the Marine Environment. As described in Chapter 3, the mission of this international council and its publication, The Gulf of Maine Times, is to maintain and enhance environmental quality in the Gulf of Maine.

We can contribute to the Council's goals, and to improved watershed conditions in three ways: Service acquisition of uplands and wetlands threatened with development, cooperative land protection of important habitat, and technical information exchange with landowners throughout these watersheds.

Alternatives A, B, and C propose to increase Service land acquisition. Alternative C proposes the most ambitious land acquisition strategy, with a proposal to acquire from willing sellers all 151 nationally significant islands not in permanent protection and 153.3 acres of mainland. Alternatives A and B propose acquisition of 30 and 87 islands respectively and 153.3 acres of mainland. Appendix A describes in detail the land acquisition proposal for Alternative B, the Service's Preferred Alternative.

We also work with an impressive array of other conservation partners who are active in developing protection strategies for ecologically significant lands in coastal Maine. Chapter 3 describes 12 partnerships with whom the Service is engaged; all actively working to promote land and resource protection and/or cooperative land management near the Refuge.

Each of the alternatives proposes various levels of participation in ongoing, watershed-based land protection partnerships. All alternatives propose to increase private-public lands partnerships, primarily to share technical information on things like restoration and habitat management techniques. When combined with actions by other Federal, State, and local organizations working in coastal Maine, we expect all of the alternatives to have a positive cumulative effect on soils, hydrology, wetlands, and water quality within their respective watersheds.

Biological Resources

All alternatives are intended to maintain or improve biological resources on the Refuge, in coastal Maine, and within the Gulf of Maine Ecosystem. The combination of our management actions with other organizations' actions could result in significant, beneficial cumulative effects by: (1) increasing protection and management for Federal and State-listed threatened and endangered species; (2) improving uplands and wetlands habitats that are regionally declining; and (3) reducing invasive, exotic plants and animals.

Our staff, the MDIFW, GOMP, National Audubon Society, Maine Audubon Society, and private individuals now cooperate in monitoring and/or managing all of the seabird nesting islands in coastal Maine. The alternatives propose varying levels of increased protection and management for those nesting sites which occur on the Refuge. As we described earlier

in Chapter 4, all of the nesting sites are vital to the continued presence of several nesting seabird species; any loss or degradation of these nesting areas would have a significant adverse cumulative effect on the overall Atlantic coast population. Loss of any island's nesting population would further isolate the remaining nesting areas making them more susceptible to catastrophic loss from such threats as hurricanes, oil spills, and/or disease.

Alternatives A, B, and C propose to manage at least 70 acres of open field and blueberry barrens, 226 acres of successional hardwood forest, and 219 acres of freshwater wetlands on Petit Manan Point Division to maintain the impressive diversity of landbirds, waterbirds, waterfowl, and shorebirds documented here. Alternatives A, B and C propose to establish interpretive, educational and outreach programs on Petit Manan Point to promote conservation and habitat restoration throughout coastal Maine. While the land we affect is very small compared to the entire Maine coast, our objective is to impress other landowners to take positive action as well.

Cultural Resources

We expect none of the alternatives to have significant adverse cumulative impact on cultural resources in Maine. Beneficial impacts would occur at various levels, depending on the alternative, because of proposed environmental education and interpretation programs, and increased field surveys to identify and protect any discovered sites. In Alternatives B and C we would identify high probability sites to survey more intensely and focus on those threatened by erosion from wind and tides. We would also continue to maintain the historic lighthouses and associated structures on the Refuge to the best of our ability given funding levels. We plan to work with the Coast Guard and lighthouse preservation organizations, such as the American Lighthouse Foundation, to cooperate in the protection of historic structures.

Finally, we would also develop a formal partnership with the Passamaquoddy Tribes to establish a mutually beneficial relationship, and improving our knowledge of Tribal history. Acadia National Park is further along in developing a partnership with the Passamaquoddy Tribes. Their objective is to improve their interpretive and education programs on Tribal history and promote a respect for cultural resources in coastal Maine. These programs could potentially reach hundreds of thousands of visitors a year. Educating these Maine coastal visitors on the need to protect cultural resources will benefit our programs as well.

Human Resources

We expect none of the alternatives to have a significant adverse cumulative impact on the economy of coastal Maine. Although Federal land acquisition reduces property tax revenue, affected towns are compensated with Refuge Revenue Sharing payments, and also should realize a reduction in cost of community services as we described earlier in Chapter 4. In

addition, the proposed acquisitions make up only a small portion of any town. We expect increased visitation to the Refuge to bring additional revenues to local communities through increased tourism, but we do not predict this will be a significant increase in overall revenue in any area.

Alternatives A, B and C would maintain the two Maine Island Trail camping sites on Refuge islands. This would ensure that no new gaps in the trail are created and allows this unique boating experience to continue. All other islands would remain open to public day use and access consistent with the established seabird and bald eagle nesting seasonal closures. As new islands are acquired by the Service, these seasonal nesting closures would be imposed and no new camping sites would be allowed. This could have implications to current users of islands proposed for Service acquisition. It is also true that we do not know whether current island owners actually allow public uses that we would restrict. However, from a cumulative impact standpoint, the most islands to be acquired by the Service is 151 under Alternative C. These islands are scattered from the New Hampshire border to Cutler, Maine and represent only 4% of the 4,617 islands along the Maine coast. No one area of the coast would be disproportionately impacted.

Alternatives A, B and C would cumulatively increase priority public use programs related to interpretation, environmental education, wildlife observation and photography in downeast Maine. Few public areas outside of Acadia National Park offer these programs, typically free to the public, and with accessible facilities. This would supplement the private recreational and educational programs offered along the coast and contribute to a diverse mix of opportunities.

Relationship Between Short-term Uses of the Human Environment and Enhancement of Long-term Productivity

This section evaluates the relationship between local, short-term uses of the human environment and maintaining long-term productivity of the environment. By long-term we mean that the impact would extend beyond the 15-year planning horizon of the final CCP. Short-term means less than 15 years.

All of the alternatives strive to maintain or enhance the long-term productivity and sustainability of natural resources on the Refuge. To varying degrees, the alternatives propose actions that promote watershed- or ecosystem-wide partnerships geared to identifying and protecting important coastal habitats. The alternatives strive to protect our Federal trust species and the habitats they depend on, as evidenced by the seasonal public use restrictions during the seabird nesting seasons. Alternatives A, B, and C would maintain the intensive seabird restoration projects that have resulted in important regional increases in these species. Outreach and environmental education are a priority in each alternative to encourage Refuge visitors to be better stewards of our environment.

All alternatives propose stepped-up outreach and enforcement to eliminate existing uses determined to be not appropriate and incompatible, such as ATV use and rockweed harvesting. The purpose is to reduce impacts on wildlife and habitats and enhance the long-term productivity of these sites. While the intent is the same, Alternatives A and D, would not provide the staffing or funding levels to insure these uses can be eliminated.

The dedication of certain areas to maintain arterial roads, trails, visitor facilities on the mainland divisions, and research facilities on the islands represents a loss of long-term productivity on very localized areas, but is not considered significant given the land base. Camping in designated areas would be allowed to continue in Alternatives A, B and C on two islands, but in the latter two alternatives we would monitor it closely, and we would establish thresholds of change which may trigger eliminating this use. Sheep grazing would also be allowed to continue in Alternatives A, B,and C, but similar to camping, we would monitor closely and develop specific operating prescriptions in a special use permit.

In summary, we predict that all alternatives would contribute positively to maintaining or enhancing the long-term productivity of the environment of coastal Maine.

Unavoidable Adverse Effects

Unavoidable adverse effects are those actions which could cause significant harm to the human environment that cannot be avoided, even with mitigation measures. We considered property tax losses to towns, increased visitation and its effects, and prescribed fire as the principle activities that could have unavoidable effects. Actual losses in property tax revenue to towns was described in this chapter in the section: Effects on the Local and Regional Economy. While the impacts to individual coastal towns varies, none of the alternatives would contribute to a significant cumulative loss in any one town. Alternatives A, B, and C predict an increase in visitation at increasing levels, respectively. Enhanced services and facilities for Refuge visitors will draw more people to the area, in particular we are predicting more groups with increased environmental education and interpretive programs. Even under a carefully designed program, increased visitation would result in higher levels of disturbance to wildlife, although most of these would occur in localized areas. We intend to manage our visitor use programs to minimize these effects. The impacts from prescribed burning used in vegetation treatments would impact visual quality for a short time each year (< 7 days), but will be implemented under conditions that comply with State Clean Air Act and Federal EPA standards. As such, the effects would not be significant.

Finally, we will undertake biological monitoring as part of all alternatives, to enable our staff to adapt management actions and address any unforeseen situations. As a result, none of the alternatives would result in a significant unavoidable, adverse environmental impacts.

Potential Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those which cannot be reversed, except perhaps in the extreme long term or under unpredictable circumstances. An example of an irreversible commitment is an action which contributes to a species' extinction. Once extinct, it can never be replaced.

In comparison, irretrievable commitments of resources are those which can be reversed, given sufficient time and resources, but represent a loss in production or use for period of time. An example of an irretrievable commitment is the maintenance of forest and shrubland as open field and grasslands. If for some reason grasslands were no longer an objective, it would gradually revert to shrub land and forest, or the process could be expedited with plantings.

Only a few actions proposed in the alternatives would result in an irreversible commitment of resources. One is committing land to the construction of the proposed new Refuge Administration and Coastal Education Center. All alternatives propose that we continue to pursue this action. A separate environmental assessment will evaluate the site-specific impacts of constructing this facility, once a location is selected.

Another irreversible commitment of resources impacting local communities is Service land acquisition. Alternatives, A, B, and C propose a Refuge expansion at increasing levels, respectively. Once these lands become part of the Refuge, it is unlikely they would ever revert back to private ownership.

The commitment of resources to maintain the freshwater impoundments, grasslands, blueberry barrens, and open fields (Alternatives, A, B, and C only) is very small compared to the benefits derived from the increased biodiversity. On the mainland, these wetlands, grasslands, and fields provide nesting, foraging, and migrating habitat for many migratory bird species of conservation concern. They also benefit Refuge visitors by providing wildlife observation opportunities. On the islands, maintaining grasslands and fields is vitally important to providing high quality seabird nesting habitat.

Black guillemots
USFWS photo

Alternatives A, B, and C would maintain the seasonal, public access closures on nesting seabird islands. Alternative D would close the islands to public use year round. This represents an irretrievable loss of resources for some members of the public visiting the Refuge in the future. However, keeping in mind that the Refuge's primary purpose is to protect migratory bird habitat, the trade-off of reduced public access during the critical seabird nesting season is warranted. In addition, with over 4,617 islands off the coast of Maine, there are likely others that could provide recreational opportunities at times when the Refuge islands are closed.

Table 4-3 Summary of the effects of management alternatives on Refuge resources

Refuge Resources	Alternative A Current Management	Alternative B Service's Preferred	Alternative C	Alternative D
		Physical Resources		
Water Quality and Soils	Service acquisition of 1,501 acres not in conservation ownership increases direct, permanent benefits to water quality and soils productivity Negligible increase in negative impacts from estimated 10% rise in visitation, which would be offset by limited impact monitoring and "Leave No Trace" outreach program Some low intensity, short duration negative effects from annual use of herbicides, and prescribed fire (~ 55 acres) Some localized soil erosion along Metinic Island shoreline from sheep grazing Some soil compaction from use on existing Petit Manan Point trails No violations of Federal or State Clean Water Act standards	Service acquisition of 2,926 acres not in conservation ownership considerably increases direct, permanent benefits to water quality and soil productivity Potential to improve water quality and soil productivity on high visitation and sheep-grazed islands increased monitoring and threshold standards and limits set; no significant negative impacts from estimated increases in visitation since most visitors would be on seabird viewing boat tours Some low intensity, short duration negative effects from annual use of herbicides, and prescribed fire (~110 acres) Some localized, permanent soil compaction from use on existing and planned trails on all 4 mainland divisions; however, designated trail would also reduce "unauthorized" trail use in more sensitive areas No violations of Federal or State Clean Water Act standards	Impacts resemble alternative B except: Service acquisition of 6,930 acres not in conservation ownership greatly increases direct, permanent benefits to water quality and soil productivity Some low intensity, short duration negative effects from the annual use of herbicides and prescribed fire (~ 250 acres) Slight increase in localized soil compaction from construction of at least 2 photo blinds. No violations of Federal or State Clean Water Act standards	Service acquisition of 467 acres not in conservation ownership minimally increases direct, permanent benefits to water quality and soil productivity Increase in direct and permanent benefits to current refuge lands since they would be closed to all public uses; sheep grazing would be eliminated; and, the intensity of seabird restoration work would be greatly reduced Some soil compaction from use on existing Petit Manan Point trails No violations of Federal or State Clean Water Act standards

Table 4-3 Summary of the effects of management alternatives on Refuge resources (cont'd)

Refuge Resources	Alternative A Current Management	Alternative B Service's Preferred	Alternative C	Alternative D
		Physical Resources (cont'd)		
Air Quality	Potential for contributing direct and indirect short-duration air pollution from prescribed burning on up to 55 acres/year; however, implementation would adhere to stipulations in 2002 Fire Plan to minimize effects Increase in direct, long-term benefits from protecting and maintaining over 9,000 acres (existing and expanded Refuge lands) of natural vegetation and wetlands, which act as pollution filters Negligible contribution to air pollution from Refuge visitor vehicle emissions; however, Refuge visitation is mostly incidental to other primary destinations No violation of Federal or State Clean Air Act standards, including no impacts to Class I airshed over Moosehorn Wilderness Area	Same type of impacts as described for alternative A; however, the difference is in the increased levels and distribution of the impact. None of these impacts is considered significant: Prescribed burning would occur on up to 110 acres/year; Over 10,000 acres (existing and expanded Refuge lands) of natural vegetation and wetlands would be protected and functioning as pollution filters Slight increase in vehicle emissions predicted from increased visitation in summer and fall tourist seasons; however, Refuge visitation is mostly incidental to other primary destinations No violation of Federal or State Clean Air Act standards, including impacts to Class I airshed over Moosehorn Wilderness Area	Same type of impacts as described for alternative A; however, the difference is in the considerable increased levels and distribution of the impact. None of these impacts is considered significant: Prescribed burning would occur on up to 250 acres/year; Over 14,000 acres (existing and expanded Refuge lands)of natural vegetation and wetlands would be protected and functioning as pollution filters Greatest increase in vehicle emissions predicted from increased visitation in summer and fall tourist seasons; however, Refuge visitation is mostly incidental to other primary destinations No violation of Federal or State Clean Air Act standards, including impacts to Class I airshed over Moosehorn Wilderness Area	No prescribed burning would occur; no impacts to air pollution from this source No violation of Federal or State Clean Air Act standards, including impacts to Class I airshed over Moosehorn Wilderness Area

Table 4-3 Summary of the effects of management alternatives on Refuge resources (cont'd)

Refuge Resources	Alternative A Current Management	Alternative B Service's Preferred	Alternative C	Alternative D
		Socioeconomic Resources		
Local and Regional Economies	Proposed Refuge island expansion would result in an estimated total of $31,000 property tax increase in affected towns; an overall average rate of 0.04% per town No new commercial seabird viewing opportunities, thus no additional economic outputs No appreciable increases in benefits to local economies from Refuge visitation; hunter- generated expenditures (e.g., equipment purchases, food, lodging, services, etc) would generate revenues estimated to be $66,710/year	Proposed Refuge island expansion would result in an estimated total of $130,000 property tax increase in affected towns; an overall average rate of 0.05% per town Increased direct and indirect economic benefits over the long term from potential establishment of at least 1 new seabird viewing location No appreciable increases in benefits to local economies from Refuge visitation; however, the new refuge hunt on Petit Manan Pt division would generate additional hunter - expenditures (e.g., equipment purchases, food, lodging, services, etc) in local communities of about $6,540/year over current levels	Proposed Refuge island expansion would result in the highest estimated total of $225,000 property tax increase in affected towns; an overall average rate of 0.08% per town Highest increase in direct and indirect economic benefits over the long term from potential establishment of at least 2 new seabird viewing location No appreciable increases in benefits to local economies from Refuge visitation; however, hunter-generated benefits similar to alternative B	No island expansion so no change to current contributions to local and regional economies over the short-term, including property taxes Over the long term, there would be reduced economic outputs from the reduced seabird viewing opportunities and elimination of hunting

Table 4-3 Summary of the effects of management alternatives on Refuge resources (cont'd)

Refuge Resources	Alternative A Current Management	Alternative B Service's Preferred	Alternative C	Alternative D
		Socioeconomic Resources (cont'd)		
Public Access, Educational and Recreational Opportunities	Slight increase in visitation consistent with predictions of increased tourism in surrounding towns (~ 10%); current visitation is 47,000 visitor days annually (50% on seabird viewing boat tours) Maintain current seasonal access restrictions on Refuge islands to protect nesting seabirds or bald eagles All 30 islands proposed for Service acquisition would have seasonal restrictions imposed; a likely change (but extent unknown) from current private ownership No change to compatible, priority public use programs and infrastructure offered; camping would continue on 2 islands on MITA trail	Appreciable increase in visitation in response to increased visitor services programs; namely school groups participating in environmental education programs; visitation would increase to ~ 58,750 visitor days annually Maintain seasonal access restrictions on Refuge islands; modified to allow earlier access on eider and gull-only islands All 87 islands proposed for Service acquisition would have seasonal access restrictions imposed; a change (but extent unknown) from access allowed by current private ownership Marked increase in wildlife observation and photographic opportunities with new trails on Gouldsboro Bay, Sawyers Marsh, and Corea Heath mainland division; also, one potential new seabird viewing site would be established over the long term New hunting opportunity on Petit Manan Pt division and newly acquired islands; however, may occasionally impact use of area by other non-hunting visitors Maintain camping on 2 islands on MITA trail with increased oversight and monitoring	Largest increase in annual visitation predicted, ~ 70,500 visitor days, due to considerable increase in refuge land base Impacts from compatible, priority public use programs resemble alternative B; except expanded environmental education and interpretive programs and 2 potential new seabird viewing sites would be established over the long term All 151 islands proposed for Service acquisition would have seasonal access restrictions imposed; a change (but extent unknown) from access allowed by current private ownership New opportunity offered for furbearer trapping in certain locations under refuge regulations	Major decline in visitation over the long term; dramatic decrease in public access, educational, and recreational opportunities since all islands would be closed to public access year round; also, limited programs would be offered on mainland units Hunting and camping opportunities would be eliminated

Table 4-3 Summary of the effects of management alternatives on Refuge resources (cont'd)

Refuge Resources	Alternative A Current Management	Alternative B Service's Preferred	Alternative C	Alternative D
		Socioeconomic Resources (cont'd)		
Cultural resources	Acquisition of 1,501 acres, including 30 islands not in conservation ownership, would afford permanent protection of cultural sites No violation of National or State Historic Preservation Act standards; however, only minimal maintenance on lighthouse structures Improved relations with Passamaquoddy and other Wabanaki Tribes through development of an MOU	Appreciable increase in permanent protection of cultural sites with proposed acquisition of 2,926 acres, including 87 islands, not in conservation ownership. No violation of National or State Historic Preservation Act standards; increased restoration of historic structures Improved relations with Passamaquoddy and other Wabanaki Tribes through development of an MOU	Greatest increase in permanent protection of cultural sites with proposed acquisition of 6,930, including all or portions of 151 islands, not in conservation ownership. No violation of National or State Historic Preservation Act standards; increased restoration of historic structures Improved relations with Passamaquoddy and other Wabanaki Tribes through development of an MOU	Provides fewest opportunities for additional cultural site protection; however, affords greatest protection from human disturbance on Refuge islands since no public access allowed year-round Improved relations with Passamaquoddy and other Wabanaki Tribes through development of an MOU
Wilderness	No wilderness proposed	Recommends 13 islands in 8 wilderness study areas as part of the National Wilderness Preservation System	Recommends 13 islands in 8 wilderness study areas as part of the National Wilderness Preservation System	No wilderness proposed
		Biological Resources		
Vegetation and Habitats	No change from current habitat management priorities: 1) maintain 6 seabird restoration projects on Refuge islands; continue to use mowing, prescribed burning, herbicides, and sheep grazing as management tools	Expand habitat and management priorities to include: 1) maintain 12 seabird restoration projects on Refuge islands; continue to use mowing, prescribed burning, herbicides, and sheep grazing as management tools	Same a alternative B except: Expand to 18 seabird restoration projects on Refuge islands	Dramatic reduction in management of vegetation and habitats; allow vegetation succession to occur unimpeded. Grasslands and other early successional habitats would change to shrub and early forest habitats over the long-term on mainland. On seabird restoration projects, with reduced management, much would change to raspberry thickets

Table 4-3 Summary of the effects of management alternatives on Refuge resources (cont'd)

Refuge Resources	Alternative A Current Management	Alternative B Service's Preferred	Alternative C	Alternative D
		Biological Resources (cont'd)		
	2) maintain up to 70 acres of open field habitat on Petit Manan Pt division; continue to use mowing and prescribed burning as management tools 3) maintain 3 freshwater impoundments (~ 112 acres) on Petit Manan Pt division	2) maintain up to 100 acres of early successional and open field habitat on Petit Manan Pt division 3) maintain 3 freshwater impoundments (~ 112 acres) on Petit Manan Pt division 4) control invasive plants before they can become established 5) increase protection of rare plant sites by developing site management and monitoring plans 6) increase protection of salt marsh habitats through increased inventories and monitoring 7) maintain forested habitats for species of conservation concern		
Threatened and Endangered Species	Maintain permanent protection of active and historic bald eagle and roseate tern nesting sites on current Refuge lands, including predator control and seasonal closures	Maintain permanent protection of active and historic bald eagle and roseate tern nesting sites on current Refuge lands, including predator control and seasonal closures	Maintain permanent protection of active and historic bald eagle and roseate tern nesting sites on current Refuge lands, including predator control and seasonal closures	Maintain permanent protection of active and historic bald eagle and roseate tern nesting sites on current Refuge lands; however, lack of lethal predator control would likely adversely affect nesting roseate tern

Table 4-3 Summary of the effects of management alternatives on Refuge resources (cont'd)

Refuge Resources	Alternative A Current Management	Alternative B Service's Preferred	Alternative C	Alternative D
		Biological Resources (cont'd)		
	Protect an additional active bald eagle site, and historic bald eagle and roseate tern nesting sites through proposed expansion	Appreciably increase protection of active bald eagle sites; 37 islands in expansion proposal are bald eagle nesting sites, and 2 two are historic roseate tern nesting sites. Refuge expansion proposal provides for bald eagles and roseate terns to expand to new areas	Appreciably increase protection of active bald eagle sites; 101 islands in expansion proposal are bald eagle nesting sites, and 2 are historic roseate tern nesting sites. Refuge expansion proposal provides for bald eagles and roseate terns to expand to new areas	No new sites protected; no new restoration projects
Seabirds, Wading birds, and Waterfowl	Increased, long-term benefits from habitat and vegetation management noted above; nesting and migration habitats to be maintained; predators would continue to be managed at 6 intensively managed seabird restoration sites Increased protection of nesting and migration habitat, through proposed acquisition, including 30 islands	Direct, long-term benefits from habitat and vegetation management noted above; nesting and migration habitats to be maintained; predators would be managed at 12 intensively managed seabird restoration sites Populations and productivity levels to be sustained or increased over baseline year 2000 levels; improved distribution and #'s of seabird colonies over the long-term through proposed acquisition, including 87 islands not in conservation ownership Birds would also benefit from seasonal closures and laughing gull control	Direct, long-term benefits from habitat and vegetation management noted above; nesting and migration habitats to be maintained; predators would be managed at 18 intensively managed seabird restoration sites Populations and productivity levels to be sustained or increased over baseline year 2000 levels; affords greatest opportunity to improve the distribution and #'s of seabird colonies over the long-term through proposed acquisition, including all or portions of, 151 islands not in conservation ownership Birds would also benefit from seasonal closures and laughing gull control	Affords the least benefits to nesting terns as habitat quality would decrease with reduced management at seabird restoration projects Lack of lethal predator control, and fewest acres proposed for acquisition, would likely adversely affect nesting birds

Table 4-3 Summary of the effects of management alternatives on Refuge resources (cont'd)

Refuge Resources	Alternative A Current Management	Alternative B Service's Preferred	Alternative C	Alternative D
		Biological Resources (cont'd)		
Other Native Wildlife of Concern	No appreciable changes to numbers and distribution of native wildlife of concern on existing Refuge lands; however, some loss of individual native wildlife, which are predating on nesting seabirds, and/or are hunted during our regulated hunting seasons No expectation that Refuge management would result in a loss in population viability for any native species of concern Increased, permanent protection of habitat supporting a wide diversity of native wildlife through proposed acquisition, including 30 islands	Same as alternative A except: Appreciable increase in permanent protection of habitat supporting a wide diversity of native wildlife through proposed acquisition, including 87 islands Some additional loss of white-tailed deer with new hunting program on Petit Manan Point; however hunting would not reduce population viability in the State's wildlife management district	Same as alternative B except: Affords the greatest permanent protection of habitat supporting native wildlife through proposed acquisition proposal, including all or portions of 151 islands Some loss of individual animals through furbearer trapping program; however, trapping program would adhere to State seasons	Same as alternative A except: No loss of individual animals to hunting or predator control as these activities would not occur Provides fewest acres of additional permanent protection of habitat through Refuge acquisition (467 acres)