

## Chapter 4



USFWS

*Eastern elliptio mussel.*

## Environmental Consequences

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## Introduction

This chapter describes the environmental consequences we predict from implementing the refuge management alternatives presented in chapter 3. 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 best professional judgment and experience.

We focus our discussion on the impacts associated with the goals and key issues identified in chapter 1, “Purpose of, 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. The chapter identifies cumulative impacts, any irreversible and irretrievable commitment of resources, and the relationship between short-term uses of the environment and its long-term productivity. At the end of this chapter, table 4.2 summarizes the effects predicted for each alternative and allows for a side-by-side comparison.

### Regional, Historical, and Watershed Context

As required by the CEQ and Service regulations implementing NEPA, we assessed the importance of the effects of the alternatives presented in the draft CCP and EA based on their context and intensity. The context of the impacts ranges from site-specific to broader regional and ecoregional scales (table 4.1). Although refuge lands comprise a small percentage of these larger regional area contexts, all alternatives were developed to contribute towards conservation goals in these larger contexts. For each alternative, we based our evaluation of the intensity of the effects on the following factors:

- The expected degree or percent of change in the resource from current conditions.
- The frequency and duration of the effect during the 15-year planning horizon.
- The sensitivity of the resource to such an effect or its natural resiliency to recover from such an effect.
- The potential for implementing effective preventive or mitigating measures to lessen the effect.

Table 4.1. Existing Context for Impacts Analyses at Sunkhaze Meadows NWR and Carlton Pond WPA.

**Sunkhaze Meadows Unit**

Atlantic Northern Forest Bird Conservation Region (BCR 14)	88 million acres (137,500 square miles)
Gulf of Maine Watershed	44.2 million acres (69,115 square miles)
Penobscot River Watershed	5.5 million acres (8,610 square miles)
Town of Milford, Penobscot County (Sunkhaze Meadows Unit)	29,300 acres (45.8 square miles)
Sunkhaze Meadows Unit	11,484 acres (17.9 square miles)

**Benton Unit**

Atlantic Northern Forest Bird Conservation Region (BCR 14)	88 million acres (137,500 square miles)
Gulf of Maine Watershed	44.2 million acres (69,115 square miles)
Sebasticook River Watershed	606,000 acres (947 square miles)
Town of Benton, Kennebec County (Benton Unit)	18,200 acres (28.4 square miles)
Benton Unit	334 acres (0.5 square miles)

**Sandy Stream Unit**

Atlantic Northern Forest Bird Conservation Region (BCR 14)	88 million acres (137,500 square miles)
Gulf of Maine Watershed	44.2 million acres (69,115 square miles)
Sebasticook River Watershed	606,000 acres (947 square miles)
Town of Unity, Waldo County (Sandy Stream Unit)	26,800 acres (41.8 square miles)
Sandy Stream Unit	58 acres (0.1 square miles)

### Carlton Pond WPA

Atlantic Northern Forest Bird Conservation Region (BCR 14)	88 million acres (137,500 square miles)
Gulf of Maine Watershed	44.2 million acres (69,115 square miles)
Sebecoocook River Watershed	606,000 acres (947 square miles)
Town of Troy, Waldo County (Carlton Pond WPA)	22,400 acres (35 square miles)
Carlton Pond WPA	1,068 acres (1.7 square miles)

### Management Actions Not Analyzed in Detail

The following list of management activities are not analyzed in detail in this document because they are both trivial in effect and common to all alternatives. These would qualify for categorical exclusion under applicable regulations if independently proposed:

1. Operations and maintenance of existing infrastructure and facilities (unless major renovation is involved).
2. Issuance of new or revised management plans when only minor changes are planned.
3. Law enforcement activities.
4. Nondestructive research, resource inventories, and other resource information collection activities.
5. Routine, recurring management activities and improvements, including managing invasive plants.
6. Small construction projects (for example, fences, berms, small stream and wetland restoration projects, trail maintenance, interpretative kiosks, and development of access for routine management purposes).
7. Minor vegetation plantings.
8. Reintroducing native plants and animals.
9. Minor changes in amounts or types of public use.

“Extraordinary circumstances” as described in 43 CFR 46.215 are exceptions to our categorical exclusions. If any of these exceptions apply, we will conduct further NEPA analysis of the proposed action. Where possible and information is available, we provide discussions of how the below management actions could beneficially or adversely impact refuge resources.

Actions that may require additional NEPA analysis beyond this draft CCP and EA are changes to the hunt program proposed under alternative C and construction or renovation of facilities to accommodate additional staff proposed in alternatives B and C. We will conduct further NEPA analysis on these actions in the future, if needed.

Our analysis first focuses on broad, regional-scale impacts, then examines more refuge-specific impacts. The chapter is organized as follows:

Regional-scale Impacts:

- Air quality
- Hydrologic systems and water quality
- Socioeconomic resources

Refuge-specific Impacts:

- Soils
- Vegetation
- Migratory birds
- Fish
- Mammals
- Other native wildlife (reptiles, amphibians, and invertebrates)
- Threatened and endangered species
- Public use
- Cultural and historic resources

Under each heading we discuss the resource context, benefits, and adverse impacts of management actions that would occur regardless of which alternative is selected, and finally the benefits and adverse impacts of each of the alternatives. We examine the impacts of current and proposed administrative or general operations, habitat management, visitor services, and public uses on each of the physical, biological, and cultural resources noted above.

We end the chapter with discussions on:

- Cumulative impacts.
- The relationship between short-term uses of the human environment and enhancement of long-term productivity.
- Unavoidable adverse effects.
- Potential irreversible and irretrievable commitments of resources.
- Environmental justice

## Impacts on Air Quality

Chapter 2, “Affected Environment,” discusses the status of air quality in the landscape around the refuge and WPA. For the purposes of this draft CCP and EA, we did not estimate the relative amounts of potential air pollutants that would be emitted under each alternative. However, we believe that the impacts of refuge management on air quality would not vary significantly under any of the alternatives. Hence, the discussion of beneficial and adverse effects on air quality has been combined in this section. We predict that refuge land management, regardless of the alternative, would have a net positive effect on air quality. Maintaining vegetative cover, improving energy efficiencies, and limiting public uses to those that are appropriate, compatible, and wildlife-dependent would collectively help reduce any air quality impacts.

We evaluated the management actions the alternatives propose for their potential to improve air quality locally, throughout the region, and globally.

The benefits we considered include:

- Air filtering and carbon sequestration resulting from long-term land protection and conservation.
- The potential of habitat management practices, such as habitat conversion, to contribute to carbon sequestration and reduce greenhouse gases.

The potential adverse effects of the management alternatives we evaluated include:

- Emissions from vehicles or equipment.
- Public uses, including snowmobiling.
- Particulates from burning prescribed fires as a management tool.
- Accumulation of dust and air-borne particulate matter during construction and renovation.

Regardless of which management alternative we select, refuge management activities should not adversely impact regional air quality. None of the alternatives would violate EPA standards and all three would be in compliance with the Clean Air Act.

## Impacts on Air Quality That Would Not Vary by Alternative

### *Benefits*

*Land Protection and Habitat Management*—Long-term benefits for air filtering and carbon sequestration would result from the ongoing land protection encompassed by the refuge and WPA. The long-term growth of vegetation, and their interaction with the soils they grow in, can sequester atmospheric carbon, thereby providing a small reduction in the greenhouse gas.

*Impacts from Public Uses*—For all three alternatives, any human caused sources of emissions from refuge activities and visitor vehicles would be negligible compared to emissions associated with the various land uses in the Bangor and Milford-Orono region and adjacent highways surrounding Sunkhaze Meadows Unit, as well as the Waterville-Unity region surrounding the Benton Unit, Sandy Stream Unit, and Carlton Pond WPA. No major stationary or mobile sources of air pollution are present on Service-owned lands, and none would any be created under any of the alternatives. None of the alternatives are expected to exceed Federal Clean Air Act air quality standards and no Class I air quality areas would be affected.

### *Adverse Impacts*

*Land Protection and Habitat Management*—Under all alternatives, implementing our habitat management strategies involves the use of vehicles, equipment, and power tools that result in carbon emissions at the various refuge units and the WPA. However, the use of these tools and machinery are minimal and infrequent compared to the surrounding land use.

Prescribed burning would continue to be a valuable habitat management tool, under all alternatives. Effects of the refuge's fire management plan were analyzed in a previous NEPA process completed in 2002 (USFWS 2002). With fire, the pollutant of primary concern is particulate matter. Particulates can reduce visibility or cause negative effects on the health of people with respiratory illnesses. Appropriate smoke management can minimize or nearly eliminate both of these negative effects. To mitigate adverse impacts to air quality and human

health, prescribed fire burn plans analyze smoke sensitive groups and locations such as schools, nursing homes, and hospitals and take into consideration wind speed, direction, and mixing heights to channel smoke (water vapor and particulates) away from populated areas, and ability to lift smoke as quickly as possible for maximum dispersal and dilution.

In planning our prescribed burns, we would consider all those factors, and other environmental and geographical factors, as detailed in the refuge's fire management plan (USFWS 2002). An approved prescribed fire plan (also called a "burn plan") must be written for each prescribed fire project on Service property. A burn plan outlines our management objectives, prescription, resources to be used, contingencies, and mitigation required for the prescribed fire. Smoke management guidelines from the EPA (Clean Air Act standards) and State air quality regulations for prescribed burning are used to develop parameters for burning and are an agency requirement. Our burn plans specify no burning when poor atmospheric conditions are forecasted, and we use smoke dispersion and air quality information generated by the National Weather Service. We are required to obtain a "Spot Weather Forecast" prior to implementing any prescribed burn.

We understand that fires (both prescribed burns and wildfires) affect air quality and consequently may affect area residents. Because of these potential impacts to the airshed, we limit the size of our burn units for prescribed fires. Impacts on a regional level would also be minimized from burns at Benton and Sandy Stream Units by having small units that can be treated (burned) in a short period of time. Based on our experience, and as described in the fire management plan, we expect prescribed burning would not have noticeable, long-term negative impacts to air quality.

As highlighted throughout this summary, our management actions at the refuge and WPA are infrequent and of such small-scale that they are expected to have minimal impact on refuge and regional air quality.

*Impacts from Public Uses*—Sunhaze Meadows Unit, Benton Unit, and Sandy Stream Unit all contain portions of regional or local snowmobile trails. Sunhaze Meadows Unit contains a portion of the State of Maine ITS network: an extensive snowmobile trail network that connects Maine to neighboring states and Canada. This is an historical and an existing use of the refuge, and only small portions of the trails cross refuge lands. Additional outreach activities under alternatives B or C could result in a minor increase in snowmobile use and associated emissions on refuge trails. We believe that levels of snowmobile use have been fairly constant over the last 10 years or so and we do not intend to target snowmobile groups for outreach activities; therefore, we expect any change in snowmobile use and associated emissions would be negligible.

Similar to our land management activities, our visitation to the refuge and WPA are of such small-scale with only slight increases projected across all alternatives. They are expected to have minimal impact on refuge and regional air quality.

## Impacts on Air Quality Under Alternative A (Current Management)

In addition to *Impacts on Air Quality That Would Not Vary by Alternative*:

### *Benefits*

*Land Protection and Habitat Management*—Continued management of refuge and WPA land are expected to help reduce any future direct and cumulative air quality impacts. Maintaining natural vegetative cover on up to 11,876 acres at all three units of Sunhaze Meadows NWR and 1,068 acres at Carlton Pond WPA would continue to provide long-term air filtering and carbon sequestration benefits. Public uses would be limited only to those activities that are appropriate, compatible, and wildlife-oriented. Collectively, these management actions would help reduce the potential for additional human-caused sources of emissions in the surrounding landscape.

Trees have been shown to reduce the concentration of ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, and particulate matter less than 10 and 2.5 microns in diameter, primarily through direct uptake and adhesion to stems and leaves (Escobedo et al. 2007). With respect to greenhouse gases responsible for climate change, plants absorb carbon dioxide and as a result, vegetated areas can act as an important carbon sink (Heath and Smith 2004). This “carbon sequestration” is essentially the process by which plants take up carbon dioxide through photosynthesis, after which it is stored in plant biomass (wood) and in the soil. Generally, succession to forest stores the most carbon, and the rate of sequestration declines as trees mature (Heath and Smith 2004).

*Impacts from Public Uses*—Alternative A would continue to include minimal trail maintenance, periodic updating and replacing of refuge signs, and habitat management that would continue to contribute negligibly to regional emissions. We expect no change over current, baseline levels of emissions under this alternative.

### *Adverse Impacts*

*Land Protection and Habitat Management*—Under all alternatives we would continue to use mowing and prescribed burning, if deemed appropriate, at the Benton Unit and Sandy Stream Unit. Grasslands can function as carbon sinks if plant biomass is converted to soil (Buyanovsky and Wagner 1998). Mowing vegetation and prescribed burning can also lead to a temporary and localized suspension of particulate matter. However, the limited extent of these activities occurring under current refuge management is of negligible impact on local air quality.

*Impacts from Public Uses*—The regional vehicle emissions resulting from the approximately 6,300 visitors to Service-owned lands and WPA lands would continue to be negligible in comparison to ambient air quality and emission from the surrounding region.

## Impacts on Air Quality Under Alternative B (Service-preferred Alternative)

### *Benefits*

*Land Protection and Habitat Management*—Long-term benefits for air filtering and carbon sequestration from land protection and management would be similar to those in alternative A. In addition, the conversion of 3 acres of grassland to forest at the Benton Unit and 2 acres of

shrubland to riparian forest at the Sandy Stream Unit would have a small benefit to air quality by reducing the overall need for mowing to maintain grassland and shrubland habitat.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—At Sunkhaze Meadows Unit and Benton Unit, land management and construction activities related to increasing habitat management and expanding visitor service infrastructure would cause short-term, localized air quality effects from construction vehicles and equipment. Vehicles and motorized equipment release several air pollutants. However, the frequency and intensity vehicles and machinery are anticipated to remain relatively low.

Under this alternative, the potential conversion of up to 22 acres of conifer forest to grassland at the Benton Unit would add more minor impacts to air quality due to the forest clearing and then subsequent prescribed burning and mowing required to maintain the area as grassland. Minor changes in burn program are within the limits presented in the fire management plan. Minor changes in mowing may have negligible effects.

*Impacts from Public Uses*—Across all refuge units and the WPA, expanding refuge programs and outreach efforts, and improving facilities and exhibits, is expected to slightly increase visitation over the 15-year period of the plan. A marginal increase in local vehicle emissions would result from the increase in visitation, but it would be negligible in comparison to ambient air quality and emissions from land uses surrounding Service-owned lands and nearby Interstate 95.

### **Impacts on Air Quality Under Alternative C**

The benefits and impacts to air quality under alternative C are the same as those previously described under alternative B, except:

#### ***Benefits***

*Land Protection and Habitat Management*—The conversion of 3 acres of grassland to forest at the Benton Unit and 2 acres of shrubland to riparian forest at Sandy Stream Unit would have a small benefit to air quality by reducing the overall need for mowing to maintain grassland and shrubland habitat.

#### ***Adverse Impacts***

*Land Protection and Habitat Management*—At the Sunkhaze Meadows Unit, the conversion of 715 acres of northern hardwood mixed forest and conifer forest to young forest early successional habitats would result in extensive use of machinery and vehicles. In evaluating the impacts of this conversion, we did not quantify exact levels of emissions. However, we do understand that a conversion of this size has air emission impacts related to the use of equipment and machinery. Heavy equipment would be necessary to conduct tree harvesting and land clearing needed for removing mature forest cover and allowing shrub and sapling growth desired under this alternative; however, this conversion would occur over 45 years. Central Maine (including lands surrounding the Sunkhaze Meadows Unit) contains an extensive commercial logging industry. According to the Maine Forest Service, nearly 500,000 acres of Maine's forests

are logged each year (MFS 2012). By comparison, the clearing of 715 acres at Sunkhaze Meadows Unit would equate to 0.1 percent of this annual total. As such, the overall impact to air quality relative to the broader landscape of Maine would be negligible.

*Impacts from Public Uses*—Visitation is expected to increase slightly more under alternative C when compared to alternative B. However, the overall frequency and intensity vehicles and machinery would still remain relatively low.

Short-term impacts from vehicle and machinery emissions would be greater when compared to alternative B. Additional trail creation and ongoing maintenance at both Sunkhaze Meadows Unit and Benton Unit would result in increased use of chainsaws, vehicles, and machinery. New trail creation at both of these outlined in alternative C would result in a combined total of 5 miles of additional trails. Despite that increase in clearing, maintenance, and access associated with these trails, the overall increase in emissions is still considered negligible when compared to other regional sources.

## Impacts on Hydrology and Water Quality

As discussed in chapter 2, the refuge and WPA include numerous waterways and other open waters. Management alternatives proposed for the refuge and WPA were evaluated and compared based on their potential to help maintain and improve the hydrology and water quality of the streams, ponds, and impoundments found within the refuge and WPA.

We evaluated the benefits of the following actions that would protect or restore hydrology or maintain or improve water quality:

- Land protection and conservation that would provide watershed benefits by limiting land clearing and changes in local hydrology.
- Habitat management activities and projects that would improve water quality.
- Maintaining the existing water control structure at Carlton Pond WPA.
- Improved cooperation with partners to influence water quality.

We evaluated the effects of the following actions with the potential to cause adverse effects on hydrology and water quality:

- Use of herbicides to manage invasive species.
- Habitat management activities and projects and temporary vegetation removal.
- Constructing visitor services facilities and infrastructure.
- Recreational use that may lead to increased erosion or siltation.

All three alternatives would comply with the Clean Water Act.

## Impacts on Hydrology and Water Quality That Would Not Vary by Alternative

### *Benefits*

*Land Protection and Habitat Management*—Conservation and protection of natural vegetation and soils on all units of Sunkhaze Meadows NWR and Carlton Pond WPA would continue to

benefit water quality in the Penobscot River and Sebasticook River watersheds. Maintaining these resources limits development in those portions of each watershed and acts as a buffer against nonpoint source pollution in the surrounding landscape. The benefits of wetlands to water quality are well established, and include trapping, recycling, and exporting sediments, nutrients, organic materials, and contaminants (Carter 1996).

Under all alternatives, we would protect natural hydrology at Sunkhaze Meadows Unit, Benton Unit, and Sandy Stream and manage hydrology at Carlton Pond to benefit State-listed species.

We would continue to manage the water control structure at Carlton Pond WPA to maintain existing water levels within Carlton Pond itself.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—None of the proposed management activities at the refuge or WPA under the three alternatives are expected to have long-term adverse effects to local or regional hydrology and water quality. None would violate Federal or State standards for contributing pollutants to water sources. None of the alternatives include new changes to refuge or WPA hydrology; therefore, no adverse impacts are expected on refuge or WPA hydrology.

Regardless of the alternative selected, we would continue to identify and control invasive plant species. We would use integrated pest management, which employs a variety of mechanical, biological, and chemical means of controlling invasive plants, but our experience to date suggests that the use of herbicides would continue to be part of our invasive species control program.

The risk that herbicides used on refuge and WPA uplands would reach wetlands is small. The level of review that Service policy requires before we can apply any chemical on refuge lands ensures that the environmental risk is minimized, and that all facets of the proposed use have been examined and justified. All products are used according to label instructions to minimize impacts on ground and surface waters. In addition, only herbicides specifically approved for aquatic application are used on or near refuge waters. When used appropriately, these products should not have direct or indirect negative impacts on water quality.

In managing the refuge and WPA, we would closely monitor and mitigate all of our routine activities that could result in chemical contamination of water directly through leakage or spills or indirectly through soil runoff. These include control of weeds and insects around structures, use of chemicals for deicing walkways and roads, and use of soaps and detergents for cleaning vehicles and equipment. Our personnel take precautions to minimize the potential for chemicals and petroleum products from becoming a water quality problem. As part of regular maintenance activities, some grease and cleaning chemicals could be washed off vehicles and equipment. This is not expected to impact water quality because we would use best management practices (e.g., ensure vehicles are cleaned away from refuge and WPA wetlands and nearby waters) to minimize potential impacts.

## **Impacts on Hydrology and Water Quality Under Alternative A (Current Management)**

### *Benefits*

Same as *Impacts on Hydrology and Water Quality That Would not Vary by Alternative*.

### *Adverse Impacts*

*Land Protection and Habitat Management*—Large scale land clearing, such as the annual mowing of the Benton Unit’s grasslands, increases the potential for added runoff and soil erosion for a short time until vegetation reestablishes. By implementing BMPs, it would help us reduce the potential for specific short-term impacts resulting from these activities on all refuge units and the WPA.

*Impacts from Public Uses*—Current visitation to the refuge and WPA is small; nearly 6,300 visitors annually participate in some use on one of the refuge units or WPA. Most public uses, including wildlife observation, snowmobiling, photography, environmental education, and interpretation occur on established roads, boardwalks, trails, or other visitor facilities (e.g. observation platform). Some off trail public uses are authorized by the refuge manager including berry picking, hunting, cross-country skiing, and snowshoeing. In general, refuge visitation is low and most visitors choose to stay on established trails. Therefore, we expect only negligible adverse impacts to refuge and WPA water quality associated with public use.

## **Impacts on Hydrology and Water Quality Under Alternative B (Service-preferred Alternative)**

### *Benefits*

Benefits to hydrology and water quality under alternative B are similar to alternative A, except:

*Land Protection and Habitat Management*—Working with adjacent landowners to improve riparian buffer protection around Carlton Pond WPA, and working through partnerships with local land trusts to explore acquiring parcels or easements adjacent to Carlton Pond, would help protect and possibly improve water quality in Carlton Pond by preventing erosion and sedimentation into Carlton Pond itself.

Increasing the forested riparian buffer width at Sandy Stream Unit to a minimum of 90 feet would help improve water quality protection through additional shading and buffering effects from surrounding land use, public use, and our management actions.

*Impacts from Public Uses*—Improved access to Sunkhaze Stream would allow a greater number of visitors to experience waters on the refuge. In turn, our hope is that this opportunity and the experiences it provides would help to foster individual stewardship, which can ultimately help benefit water quality through expanded awareness of pollutant impacts and the reliance of fish, wildlife, and people on clean and healthy water.

If found to be suitable under the Wild and Scenic Rivers Act, rivers and streams can be classified as wild, scenic, or recreational. Generally, the classification of the river reflects the level of development at the time of designation, and future development levels must be compatible with such classification. We have tentatively classified the refuge's portion of Sunkhaze Stream and its tributaries as scenic, based on criteria in the Wild and Scenic River Act. This tentative classification allows for protective management purposes prior to a final suitability determination and/or congressional action. This ensures that river values and characteristics are protected (subject to agency policies and standards) until the evaluation process and possible designation is completed. If this stream section is found to be suitable and is eventually designated as a wild and scenic river, the designation would help protect the stream's hydrology and water quality by ensuring we protect its current natural condition. Designation also affords certain legal protection from adverse development, (e.g., no new dams may be constructed) nor would federally assisted water resource development projects be allowed that are judged to have an adverse effect on designated river values.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—The potential conversion of 22 acres of forest to grassland at the Benton Unit could increase short-term potential impacts to water quality in Fowlers Brook compared to alternatives A and C. This area is adjacent to the small stream. If this area is cleared to expand grassland habitat, the cleared lands would be temporarily susceptible over the following 1 to 6 or possibly more months to surface runoff and erosion until sufficient vegetation establishes to provide long-term stabilization. These cleared lands would also require occasional clearing through prescribed burning or mowing, which has potential to cause similar disturbance.

*Impacts from Public Uses*—Under alternative B, there is greater potential for short-term, adverse effects on water quality associated with upgrading or new construction of trails, kiosks, and parking areas, and demolition of existing structures (cabins) on the Sunkhaze Meadows Unit when compared to alternative A. In all cases, best management practices would be followed to minimize any potential adverse effects. As discussed in the introduction to this chapter, additional NEPA analysis would be necessary for at least some of the larger projects proposed under this alternative (e.g., securing facilities for new refuge staff).

In comparison to alternative A, alternative B anticipates a modest increase in additional public use across all refuge units and the WPA. This increase would likely result from attracting new visitors through improved outreach and updated infrastructure, and expanding public use programs and opportunities. This could result in higher levels of vegetation trampling, soil disturbance, and erosion, potentially affecting water quality. However, we expect these impacts to be localized and of minimal. There are no anticipated long-term adverse impacts specific to this alternative.

A modest increase in boating would result in a corresponding potential for adverse water quality impacts. The current levels of pollutants from boat fuel and impacts on local aquatic systems are unknown. However, hydrocarbon contamination can be harmful to fish. Most boating is currently (and expected to remain) non-motorized, so we feel there is little contamination coming from this source. We would initiate public outreach and education on littering, pollutants, and

proper waste disposal if the use increases substantially above current use levels to help mitigate water quality impacts. There are no anticipated long-term adverse impacts specific to this alternative.

## Impacts on Hydrology and Water Quality Under Alternative C

### *Benefits*

Benefits to hydrology and water quality under alternative C are the same as alternative B.

### *Adverse Impacts*

*Land Protection and Habitat Management*—The potential conversion of 715 acres of mature mixed hardwood and conifer forest to young forest at the Sunkhaze Meadows Unit could result in short-term potential impacts to water quality in Sunkhaze Stream or adjacent waters. If this acreage is cleared to expand young forest habitat, the cleared lands would be temporarily susceptible over the following 1 to 6 or possibly more months to increased surface runoff and erosion until sufficient vegetation establishes to provide long-term stabilization.

*Impacts from Public Uses*—Similar to alternative B, there is greater potential for short-term adverse effects on water quality associated with upgrading or new construction of trails, kiosks, and parking areas when compared to alternative A. In all cases, best management practices would be followed to minimize any potential adverse effects.

In comparison to alternatives A and B, alternative C anticipates a slightly greater increase in public use when compared to alternative B. This increase would likely result from improved outreach and expanding public use programs and opportunities. As noted under alternative B, this could result in higher levels of vegetation trampling, soil disturbance, and erosion, potentially affecting water quality. However, due to the current lack of disturbance resulting from visitation, we would expect these impacts to be localized and minimal.

## Impacts on Soils

Soils are the structural matrix and nutrient source for plant productivity of habitats found on the refuge and WPA. Soils must be protected to sustain a variety of wetland, riparian, and upland habitats that help meet our habitat management goals. Overall, the soils on the refuge and WPA are productive and in good condition. They have little contamination and are able to support the diversity of habitats that would meet our biological management goals.

We evaluated and compared the management actions proposed for each of the alternatives based on their potential to benefit or adversely affect soils found on the refuge and WPA.

We compared the benefits of the alternatives from actions that would protect soils from erosion, compaction, or contamination or rather restore eroded, compacted, or contaminated soils, including:

- Long-term protection of refuge lands from development.

- Habitat management activities and projects that would improve soils protection, such as expanding riparian buffer areas.
- Visitor service infrastructure management that would reduce impacts to soils, such as trail closures and infrastructure improvements that minimize erosion and compaction.

The potential adverse soil effects of the refuge management alternatives that were evaluated included impacts from:

- Constructing visitor services facilities and infrastructure.
- Habitat management activities and projects, including vegetation removal and conversion, mowing and prescribed fire.
- Providing opportunities for authorized public uses (e.g., hunting, fishing, wildlife observation, photography, environmental education, and interpretation).

### **Impacts on Soils That Would Not Vary by Alternative**

#### ***Benefits***

*Land Protection and Habitat Management*—Healthy soils are critical to nutrient cycling and plant productivity on the refuge and must be protected to sustain the variety of wetland, riparian, and upland habitats. Overall, the soils of the refuge units and WPA are productive and in good condition, with no substantive erosion, compaction, or contamination problems. Regardless of which alternative is selected, we would continue to use best management practices in all management activities to maintain the health and productivity of refuge soils and to minimize erosion, compaction, and other impacts to soils.

Conversion from natural land cover to a developed use with impervious surfaces is considered to have the most severe impacts to soils due to disturbance of the natural soil structure and profile. Under all alternatives, we would strive for the greatest amount of natural cover and the least amount of impervious surface.

Under all three alternatives, the earthen dam at Carlton Pond WPA would be monitored and maintained to ensure public safety, to maintain the dam's function, and to prevent soil erosion that could lead to dam failure and subsequent downstream sedimentation. No designated trails or photo blinds exist or are proposed at Carlton Pond WPA under any of the alternatives; most visitors use canoes or kayaks to access the WPA, and opportunities for observation and photography occur on the adjacent road and access point as well as from a canoe, kayak or other boat on the water. Therefore, little to no adverse impacts to WPA soils is expected.

*Impacts from Public Uses*—Snowmobiling is allowed only on a few designated trails, maintained by local snowmobile clubs. Snowmobile clubs maintain all of the snowmobile trails under special use permits. They maintain about 6 miles of snowmobile trails: 4.6 miles at the Sunkhaze Meadows Unit, 1 mile at the Benton Unit, and 0.5 miles at the Sandy Stream Unit. Carlton Pond WPA does not contain any snowmobile trails. No new snowmobile trails are planned under any of the alternatives. Effects of moving the snowmobile trail at the Sandy Stream Unit is addressed under the discussion for effects under alternative B. Boardwalks that are in disrepair would be restored and small spur trails would be removed to protect the sensitive

wetland soils, as well as offering enhanced wildlife viewing opportunities under all three alternatives. Detailed discussion regarding the potential impacts of snowmobiles on soils can be found within the compatibility determination included for snowmobiling in appendix B.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—Implementing habitat management strategies such as invasive species control may potentially result in localized compaction in areas where vehicles or excessive foot traffic are used in control efforts. Given the infrequent need for invasive species control, we believe that the low level and infrequent duration of these activities has little adverse impact on soil compaction or erosion.

*Impacts from Public Uses*—Public use activities have the potential to impact soils through trampling. Unauthorized uses, such as off-road vehicles or all-terrain vehicles, can indirectly affect soils by loosening surface layers and compressing underlying layers. Coupled with a loss of plant cover, the result can be increased soil erosion (Hammit and Cole 1998). Trampling also decreases the abundance and diversity of soil organisms such as microbes, earthworms, arthropods, snails, and slugs, which often play a major role in nutrient cycling (Liddle 1997). At Sunkhaze Meadows NWR and Carlton Pond WPA off trail use is allowed for pedestrian access (on foot) for the purposes of wildlife observation, photography, berry picking, snowshoeing, cross-country skiing, fishing, and hunting. We believe that the low level of participation and infrequent duration of these activities has little adverse impact on soil compaction or erosion.

Under all alternatives, we would continue to enforce trail use regulations and non-authorized use of motorized vehicles (e.g., ATVs) and bicycles to prevent soil erosion and compaction. Off-road vehicles, such as motorbikes and all-terrain vehicles, which have the potential to cause severe erosion and rutting, are not allowed on the refuge. Bicycling is only allowed along McLaughlin Road.

## **Impacts on Soils Under Alternative A (Current Management)**

### ***Benefits***

*Land Protection and Habitat Management*—Benefits resulting from land protection and habitat management activities are the same as found under *Impacts on Soils That Would Not Vary by Alternative*.

*Impacts from Public Uses*—With our estimated current visitation of around 6,300 visitors per year, we believe the combined visitation to all refuge units and the WPA is low where compared to other refuges in the region. Lower visitation benefits soils by minimizing risks of soil compaction or erosion associated with public use. Alternative A includes no expansion of the trail networks and no installation of new infrastructure or impervious surfaces that would cause additional soil compaction.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—Impacts resulting from land protection and habitat management activities are the same as found under *Impacts on Soils That Would Not Vary by Alternative*.

*Impacts from Public Uses*—Under alternative A, we would continue to have limited ability to patrol public uses and access across all refuge units and the WPA. We would also have minimal opportunity to maintain and repair existing trails at the Sunkhaze Meadows Unit. Some of the trails pass through low-lying areas and wetlands, where boardwalks are in disrepair and side trails are evident. For trail maintenance, we would continue to rely on local volunteers, primarily the Friends of Sunkhaze Meadows NWR and local snowmobile clubs at the various refuge units. The lack of staff however, increases the likelihood of illegal activities (such as trail biking or ATV use) that could lead to soil erosion and disturbance. Alternative A is likely to result in the most severe impacts to soils, given our lack of ability to maintain trails and monitor public uses.

### **Impacts on Soils Under Alternative B (Service-preferred Alternative)**

#### ***Benefits***

*Land Protection and Habitat Management*—Benefits resulting from land protection and habitat management activities are similar to those found under *Impacts on Soils That Would Not Vary by Alternative*.

In addition, under alternative B, the expansion of the forested riparian buffer along Sandy Stream from 25 feet to 90 feet by allowing natural re-growth of mature trees would provide more long-term protection against streambank erosion. Mowing equipment that is used to maintain the current shrub conditions would be kept out of the 90-foot riparian zone, thus reducing the potential impacts of soil compaction by mowing equipment.

*Impacts from Public Uses*—At the Sunkhaze Meadows Unit, the North and South Buzzy Brook Trails (3.0 miles and 2.4 miles, respectively) would be closed under alternative B. These two trails pass through forested wetlands, making them difficult to access and maintain. The closure of these two trails would benefit wetland soils by reducing access in an area that is readily susceptible to compaction.

Although there are no trails or parking access on Service land at Carlton Pond WPA, visitors can access Carlton Pond by canoe or other small boat. The increased presence of refuge staff under alternative B would provide for greater monitoring of public use at the Carlton Pond WPA, providing more protection to soil health compared to alternative A.

At Benton Unit, the proposed eventual increase of refuge staff under alternative B would allow greater monitoring and maintenance of the existing and proposed trails. This would provide greater protection to soil health compared to alternative A. Currently there is no specified public use trail leading from the existing gravel parking lot. As a result, refuge visitors must access the site by walking in any number of paths or directions. This expands the minimal potential for soil compaction and erosion resulting from public use. The proposed 0.25-mile trail would connect

the Benton Unit parking area to the snowmobile trail (which is open to other public uses when not suitable to snowmobiling). This action would concentrate and direct public use, thereby improving protection of soils in grassland and wetland areas.

The proposed eventual increase of refuge staff under alternative B would also provide for greater monitoring of public use at the Sandy Stream Unit. This would provide more protection to soil health as compared to alternative A. An existing snowmobile trail would be re-routed from the center of the property to along the outer edge of the shrubland habitat along Prairie Road. The existing trail corridor would then be allowed to grow back into shrub habitat. The trail currently passes through several low wet areas leading to minor soil erosion and rutting. The Service would work with the local snowmobile club to re-route the trail through drier terrain, minimizing soil compaction and rutting by avoiding wet areas, and thereby reducing the overall impact to soils at the Sandy Stream Unit. The increased presence of refuge staff under alternative B would provide for greater monitoring and maintenance of the rest of the existing trail network to ensure soil impacts are minimized.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—Impacts resulting from land protection and habitat management activities are similar to those found under *Impacts on Soils That Would Not Vary by Alternative*.

*Impacts from Public Uses*—A modest increase in visitation anticipated under alternative B could result in minor increases in soil compaction and erosion. However, greater public use monitoring and trail maintenance under this alternative would likely alleviate or prevent potential problems from overuse or misuse of trails. We would close or restrict access if needed to protect sensitive areas. Boardwalks would be constructed over saturated areas to protect sensitive wetland soils. No construction other than placement of boardwalk pilings would be done in wetlands, so we anticipate only small, localized impacts to wetland soils.

At Sunkhaze Meadows Unit, newly proposed public use improvements including a new trail linking the proposed new Carter Meadow parking area and existing Carter Meadow trailhead would cause some one time, localized soil disturbance and compaction. The proposed Oak Point Trail parking area would impact an area approximately 35 feet by 55 feet in size. The Carter Meadow parking area would impact an area approximately 20 feet by 40 feet. Construction of these parking areas would require vegetation clearing and permanent soil disturbance through minor grading, excavation, placement of crushed gravel, and compaction.

We also anticipate little increased visitation at Carlton Pond WPA, and therefore no changes in adverse impacts are expected when compared to alternative A.

At Benton Unit, the proposed 0.25-mile trail would lead from the gravel parking lot to the existing snowmobile trail, which would create some additional soil compaction along the proposed trail corridor. However, the new trail would more effectively concentrate public use, protecting more sensitive areas of the Benton Unit and reducing the overall potential for soil disturbance. Increased visitation anticipated under alternative B could result in increased soil compaction and erosion along this new trail connection and the existing snowmobile trail.

However, greater monitoring of public uses and enhanced trail maintenance under this alternative would alleviate or prevent potential problems resulting from overuse or misuse of trails.

We anticipate little increased visitation at Sandy Stream and therefore no changes in adverse impacts are expected when compared to alternative A.

## **Impacts on Soils Under Alternative C**

### ***Benefits***

Benefits to soils under alternative C are similar to alternative B.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—Impacts resulting from land protection and habitat management activities are similar to those found under alternative B.

*Impacts from Public Uses*—At Sunkhaze Meadows Unit, North and South Buzzy Brook Trails would remain open under alternative C. Keeping these trails open, as well as their location across wet soils, would result in more localized soil disturbance and compaction compared to alternative B. Similar to alternative B, a proposed new trail linking the new Carter Meadow parking lot to the Carter Meadow Trail loop would cause some new soil disturbance and compaction. Parking areas proposed under alternative C would maintain the size and dimension as presented in alternative B. Increased visitation anticipated under alternative C could result in increased soil compaction and erosion. However, greater public use monitoring and trail maintenance under this alternative would alleviate or prevent potential problems from overuse or misuse of trails. Additional staffing under this alternative would allow monitoring for problems at all units and the WPA. We would close or restrict access if needed to protect sensitive areas.

Under this alternative, we propose creating about 2 miles of additional trails at the Benton Unit. These new trails would necessarily cause soil disturbance and compaction along the trail corridors during construction. However, the trails would be limited to wildlife observation uses such as walking, bird watching, nature viewing, snowshoeing, and cross country skiing. Other uses (already prohibited on this unit), such as mountain biking and off-road wheeled vehicles, would continue to be prohibited. Increased visitation anticipated under alternative C could result in some increased soil compaction and erosion. However, greater monitoring of public uses and enhanced trail maintenance under this alternative would alleviate or prevent potential problems resulting from over-use or misuse of trails.

We anticipate little increased visitation at Sandy Stream Unit and Carlton Pond WPA under alternative C. Therefore, no changes in adverse impacts are expected when compared to alternatives A and B.

## Impacts on Vegetation

Healthy and diverse native vegetation is needed to support the forest, shrubland, grassland, and emergent wetland communities that sustain priority resources found on the refuge and WPA. We evaluated the management actions proposed for each of the CCP alternatives for their potential to benefit or adversely affect the native vegetation and accompanying habitat types found across each refuge unit and the WPA.

We evaluated the benefits of the management actions proposed under the three alternatives that would conserve or restore native vegetation, including:

- Land protection and conservation that would maintain existing vegetation.
- Habitat management activities and projects that would convert vegetation types in portions of the refuge, resulting in the localized gain of certain types of vegetation.
- Increased prevention and control of invasive species.
- Improved cooperation with partners to conduct inventory and monitoring of vegetation.

We also evaluated the potential for adverse impacts to vegetation, including:

- Habitat management activities and projects that would convert vegetation types in portions of the refuge, resulting in the localized loss of certain types of vegetation.
- Activities of refuge and WPA visitors that might directly impact vegetation.
- Construction of public use infrastructure that would result in a localized loss of vegetation.
- Increased recreational use of refuge and WPA lands that could lead to vegetation impacts.

## Impacts on Vegetation That Would Not Vary by Alternative

### *Benefits*

*Land Protection and Habitat Management*—Regardless of which CCP alternative we select, we would continue to conserve the nearly 3,461-acre freshwater wetland-peatland complex at the Sunhaze Meadows Unit. This includes maintaining the mix of open water, freshwater marsh, and beaver marsh, and protecting the ecological integrity of 1,649 acres of peatland.

Under all alternatives and at all refuge units and the WPA, we would continue to respond to reports of invasive species that cause environmental harm, such as decline of native species and disruption of environmental processes. We would continue to employ an integrated pest management approach and use adaptive management to control invasive plant species on all three refuge units and Carlton Pond WPA. We would also continue to promote visitor and public awareness of invasive plant species issues and continue education and interpretation of vegetation to encourage volunteer based control of invasive plant species. Alternatives B and C would directly result in greater invasive plant control on the refuge and WPA if proposed staff are authorized and funded.

At Carlton Pond WPA, we would use the water control structure to maintain the balance of open water (approximately 285 acres) and freshwater marsh (approximately 440 acres) and the 33 acres of peat bog. The earthen dike would be kept free of woody vegetation to maintain its

structural integrity, which is critical to maintaining the open water-vegetation composition of Carlton Pond. There are no differences in the vegetative benefits or impacts among the three alternatives at Carlton Pond WPA.

*Impacts from Public Uses:* Refuge visitation under all alternatives is anticipated to remain relatively low over the 15-year timeframe of this CCP. As a result, under all alternatives, existing vegetation is unlikely to be widely disturbed by on or off trail public uses.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—Some refuge management actions, including invasive species control, would have short-term negative impacts on vegetation, such as removal of plants, herbicide use, trampling, and other potential damage to plant structure. These short-term, adverse impacts would be offset by providing long-term benefits to the diversity and health of the refuge's native plant communities through invasive species control.

Refuge administrative activities and public uses on the Sunkhaze Meadows, Benton, and Sandy Stream Units create some localized adverse impacts to vegetation. Concentrating public access on the trail networks and the use of boardwalks in sensitive areas creates localized damage to vegetation through clearing, trampling, or shading, but it ultimately helps limit potential adverse impacts to surrounding vegetation. Off trail uses such as orienteering, hunting, fishing, or berry picking are allowed on all refuge units and the WPA, but currently only a small number of visitors engage in these activities, and do so infrequently. We anticipate that short-term disturbances to vegetation would be offset by the increased awareness about the importance of native vegetation gained by refuge visitors as part of interpretive and education programming and displays.

*Impacts from Public Uses*—Public use activities have the potential to impact soils through trampling. Unauthorized uses, such as off-road vehicles or all-terrain vehicles, can indirectly affect vegetation by trampling or uprooting plants. The result can lead to increased soil erosion (Hammit and Cole 1998). At Sunkhaze Meadows NWR and Carlton Pond WPA, off-trail use is allowed for pedestrian access (on foot) for the purposes of wildlife observation, photography, berry picking, snowshoeing, cross-country skiing, fishing, and hunting. We believe that the low level of participation and infrequent duration of these activities has little adverse impact on vegetation.

## **Impacts on Vegetation Under Alternative A (Current Management)**

### ***Benefits***

*Land Protection and Habitat Management*— Alternative A would maintain the existing 5,000 acres of northern hardwood–mixed forest and 2,904 acres of conifer forest. Due to the lack of staff under this alternative, natural processes would be the primary mechanism for managing vegetation at the Sunkhaze Meadows Unit. Natural succession, natural disturbances, and site conditions (such as soil type and water conditions) would drive the composition and complexity of the plant communities. This would lead to more mature forest and less young forest over time.

Carlton Pond would continue to sustain 275 acres of conifer and mixed hardwood forest, 440 acres of freshwater emergent wetland, and 33 acres of treed peat bog. Similar to the Sunkhaze Meadows Unit, natural succession, natural disturbances, and site conditions would drive the composition of these plant communities.

At the Benton Unit, 95 acres of grassland would continue to be managed through a combination of mowing and prescribed fire. Without this active management the open grassland would likely revert first to shrubs, and eventually to forest. The refuge would continue to rely on natural processes within the Benton Unit's 155 acres of northern hardwood–mixed forest and conifer forest to maintain those habitats; through natural succession that forest would continue to mature and take on old growth characteristics, as mentioned for Sunkhaze Meadows Unit. The 13 acres of sedge meadow habitat would also be maintained largely through natural processes with occasional management through prescribed fire, mowing, or herbicide treatments that would result in short-term impacts to vegetation, but ultimately support and maintain desired species in these areas.

At the Sandy Stream Unit, the 39 acres of existing shrubland habitat would continue to be managed using primarily mechanical treatments such as mowing (with a brush-hog). Without this active management the shrub habitat would transition into mature forest. The refuge would continue to rely on natural processes within the floodplain forest along Sandy Stream to maintain a mature forest structure beneficial to wildlife and to protect water quality. The 25-foot wide riparian buffer of mature forest along Sandy Stream would continue to provide some riparian vegetation.

*Impacts from Public Uses*— Impacts resulting from public use are similar to those described under *Impacts on Vegetation That Would Not Vary by Alternative*.

### ***Adverse Impacts***

*Land Protection and Habitat Management*— Early successional habitat (such as young, sapling-sized forests) requires active management to maintain, and would be reduced under this alternative. We would not conduct any forest or habitat management to create early successional habitat at the Sunkhaze Meadow Unit. Any early successional habitat on this unit would result primarily from natural disturbances, except for the existing 107 acres maintained by the electric utility companies along the transmission line right-of-way. The utility company periodically clears the woody vegetation along the corridor to keep the lines clear of vegetation. However, under alternative A, this regular maintenance clearing would not necessarily be undertaken in a manner or timeframe that creates early successional habitat beneficial to native wildlife species.

At the Sunkhaze Meadows Unit and Carlton Pond WPA, we would continue to rely on natural processes such as succession, wind throw, or disease to sustain the white cedar woodland fen. Without active management or monitoring of deer browsing and white cedar regeneration, this vegetation type would likely decline over time.

At Benton Unit, the 95 acres of grassland is still small relative to the habitat block size required by some grassland nesting birds, such as upland sandpiper and grassland sparrow, which prefer contiguous grasslands greater than 100 acres (NHFG 2006). The upland forest bisects the

existing grassland, thereby creating grassland patches with more “edge” (shrub or forested borders that structurally divide what would otherwise be open grassland areas). Under alternative A, we would have minimal capacity to monitor the response of nesting birds and plants to the vegetation treatments and adapt management if needed.

The 39 acres of shrub habitat at the Sandy Stream Unit is relatively small and has a large amount of edge habitat. Although shrubland birds are less area sensitive than grassland birds, patch size and edge effects are important to the nesting success of shrub birds (Schlossberg and King 2007, 2008). However, shrubland is an important habitat component within the larger landscape and Sandy Stream provides an opportunity to maintain and manage a shrub patch.

Across all refuge units and at Carlton Pond WPA, early detection of individual plants or small populations of invasive plants would be limited. Under alternative A, the level of invasive species monitoring and control would be modest, relying primarily on volunteer efforts. Early detection of individual plants or small populations of invasive plants would be limited, resulting in a higher probability of invasive plants expanding on the refuge and WPA.

*Impacts from Public Uses*—Impacts resulting from public use are similar to those described under *Impacts on Vegetation That Would Not Vary by Alternative*.

## **Impacts on Vegetation Under Alternative B (Service-preferred Alternative)**

### ***Benefits***

*Land Protection and Habitat Management*—Under alternative B, contingent on proposed staffing, we would increase our invasive species prevention and control efforts through conducting inventory and monitoring efforts to complete early detection of new invasive species. This would improve our ability to prevent invasive species from displacing native species, which support refuge and WPA priority resources.

Refuge staff would work more closely with the electric utility companies to manage the 107-acre transmission line right-of-way at the Sunkhaze Meadows Unit to create and maintain early successional habitat beneficial to migratory and breeding birds of conservation concern, such as chestnut-sided warbler and American woodcock. Improving our coordination with the transmission line company and its contractors would improve shrublands present at Sunkhaze Meadows Unit. This coordination with the parties responsible for vegetation management within the existing right-of-way are intended to result in less overall vegetation removal and would sustain longer term growth of grassland and shrubland within the 107-acre right-of-way.

Refuge staff would also monitor rare plant populations and other exemplary or rare plant communities, including the northern white cedar woodland fen, ensuring their continued viability on the Sunkhaze Meadows Unit where feasible. Increased monitoring would help us better understand what affects this habitat type and develop and implement management actions if needed to protect, maintain, or expand this habitat as needed, both on and off the refuge.

We would manage the 2,904 acres of conifer and 5,002 acres of northern hardwood–mixed forests at Sunkhaze Meadows Unit to promote a self-sustaining, late successional forest. Over

time, this would increase the acreage of older forest and reduce the amount of young forest (less than 40 years old). Older, mature forest and associated structural characteristics, such as large woody debris, large diameter trees, and diverse lichen communities, are limited in the surrounding landscape and across Maine (Hagan and Whitman 2004). Maintaining an emphasis on late successional forest on the refuge complements the surrounding land uses, which are largely cut over forests or rural residential and commercial lands. Late successional forest management also helps protect the ecological integrity of the Sunkhaze Meadows Unit's peatland-wetland complex by providing a large forested buffer around the wetland complex. We would initiate forest health and condition assessments for forests at the Sunkhaze Meadows Unit to inventory and monitor for pests and other threats to help us maintain large areas of forest vegetation.

Similar to the Sunkhaze Meadows Unit, we would conduct a forest health and condition assessment at Carlton Pond WPA and the Benton Unit to determine the current condition of forests and determine if any active forest management is needed to promote a late successional forest. We would also work more closely with partners in the Carlton Pond watershed to protect more wetland and upland habitats. These actions would help protect the existing vegetation of Carlton Pond from potential degradation through introduced pests or invasive species.

At the Benton Unit, the amount of grassland would increase from 95 acres to 114 acres, and the amount of forest would decrease from 226 acres to 207 acres, by potentially converting 22 acres of conifer forest to grassland and allowing 3 acres in the north-central portion of the Unit to revert to forest. Under alternative B, we would evaluate the feasibility and benefit to migratory birds of converting the 22 acres of mature forest in the center of the unit to grassland. Overall, there would be a beneficial increase and continuity of grassland habitat.

The floodplain forest of the Sandy Stream Unit would increase from 19 acres to 21 acres as a result of increasing the forested buffer along Sandy Stream from 25 feet to 90 feet. Under alternative B, we would stop management mowing within the 90 foot buffer and allow the area to eventually transition into mature forest. Shifting the existing snowmobile trail, which currently bisects the shrubland habitat, to the edge of the habitat along Prairie Road would also restore shrub habitat, creating a more connected habitat across the site.

*Impacts from Public Uses*—Impacts resulting from public use are similar to those described under *Impacts on Vegetation That Would Not Vary by Alternative*.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—The emphasis on late successional forest at the Sunkhaze Meadows Unit under alternative B would limit the amount of early successional habitat on the refuge, primarily to the area along the transmission line and any openings created through natural disturbances.

The amount of northern hardwoods-mixed forest at the Benton Unit would increase by 3 acres through conversion of grassland towards a more northern hardwoods-mixed forest over the next few decades. This conversion would result in a corresponding loss of 3 acres of grassland habitat. This loss could be offset if the Service determines through further research to convert the

central 22 acres of forest to grassland habitat, thus increasing grassland from 95 to 114 acres. This conversion would result in a corresponding loss of forest habitat from 226 acres to 207 acres.

The expansion of the riparian buffer at the Sandy Stream Unit from 25 feet to 90 feet would reduce the amount of shrubland habitat from 39 acres to 37 acres and result in a corresponding increase in forest cover over the long term.

*Impacts from Public Uses*—Small infrastructure construction projects, such as boardwalks and kiosk or signage installation at all units, would result in small-scale and localized loss of vegetation. We would take efforts to minimize the impacts of these projects on vegetation.

At the Sunkhaze Meadows Unit, newly proposed public use improvements, including a new trail linking the proposed new Carter Meadow parking area and existing Carter Meadow trailhead, and an additional parking area located at the Oak Point trailhead, would cause a long-term loss of vegetation where implemented. The Oak Point Trail parking area would impact an area approximately 35 feet by 55 feet. The Carter Meadow parking area would impact an area approximately 20 feet by 40 feet. Clearing and construction of these facilities would permanently displace vegetation in these small areas until the infrastructure would eventually be removed.

Visitors to the refuge can be transporters of invasive plants when seeds or other plant parts are moved from one area to another. The modest increase in visitation expected under alternative B would slightly increase the potential for invasive species introductions. Under alternative B, we propose having staff work to educate the visiting public to reduce introductions and would also monitor and control invasive species.

Increased visitation could also potentially result in added off trail usage and impacts as a result of soil compaction and trampling of vegetation. However, we would monitor usage to prevent or correct any unauthorized off-trail use in order to minimize the potential of this adverse impact. The relocation of the snowmobile trail at the Benton Unit would result in a shift of habitat impacts from the central region of the shrubland to the edge along the road. The new trail corridor would necessarily cause destruction of vegetation; however, we believe there would be an overall benefit to shrub vegetation by removing the trail as a fragmenting feature.

## **Impacts on Vegetation Under Alternative C**

### ***Benefits***

*Land Protection and Habitat Management*—At the Sunkhaze Meadows Unit, an additional 715 acres of young forest habitat would be created at Sunkhaze Meadows Unit over the course of the 15-year timeframe of alternative C. This would be achieved through tree harvesting patches totaling 55 acres of conifer forest and 660 acres of northern hardwoods-mixed forest within the existing 7,904 acres of northern hardwood-mixed forest and conifer forest. The patches of young forest, once cut, would be allowed to regrow and succeed to mature forest, creating a shifting mosaic of small forest openings within the surrounding mature forest.

As noted under alternative B, improved coordination with the transmission line companies and its contractors responsible for vegetation management within the existing right-of-way at the Sunkhaze Meadows Unit are intended to result in less overall vegetation removal, and would sustain longer term growth of grassland and shrubland within the 107-acre right-of-way.

Under alternative C, we would allow the 92 acres of grassland at the Benton Unit to succeed naturally to shrubland habitat, and maintain shrub conditions by mowing (with a brush-hog) every 10 years or as needed. Shrub-dependent species are also in decline in this region, and managing for shrub habitat is a Service priority. Managing for shrub shifts the management regime from annual mowing to once every 10 years, thus reducing the intensity and timing of impacts to the vegetation and associated wildlife.

At the Sandy Stream Unit, the 90-foot expanded riparian floodplain forest buffer along Sandy Stream would be enhanced by planting selected native trees typical of riparian forests (and considering potential shift in climate) within this corridor. This would benefit the floodplain forest by speeding up natural processes and also help ensure the appropriate native species populate the new forest growth. Similar to alternative B, shifting the existing snowmobile trail to the edge of the Sandy Stream Unit along Prairie Road would restore a more contiguous shrub habitat.

*Impacts from Public Uses*—Contingent on proposed staffing, alternative C would provide more public outreach and education to refuge visitors on the negative effects of invasive plant species. This would be particularly beneficial at the Sunkhaze Meadows Unit and at Carlton Pond WPA, where boaters have the potential to introduce aquatic invasive species such as Eurasian milfoil and purple loosestrife. We anticipate a larger trained volunteer corps that would assist in invasive plant monitoring and control, benefiting native plant species and associated habitats.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—Creating 715 acres of new young forest habitat at Sunkhaze Meadows Unit would reduce the late successional forest cover by a corresponding amount: the mature forest cover would decrease from 7,904 to 7,191 acres. Although there would be loss of late successional forest characteristics within the 715 acres, the habitat manipulation would impact a small percentage (9 percent) of the overall forest habitat and the young forest would add to the habitat diversity on the Unit. The active management of 715 acres would create increased disturbance to vegetation through use of mechanized harvest equipment. This would be managed through the use of best management practices and by scheduling harvests outside of breeding and migration periods.

The 92 acres of grassland habitat at the Benton Unit would be allowed to transition into shrubland habitat, thus nearly eliminating grassland from this unit. Without the grasslands, a special use permit for haying would no longer be available as a cost-effective management tool. Instead, refuge staff would need to conduct the shrub management every 10 years at some cost.

*Impacts from Public Uses*—Similar to alternative B, a combination of infrastructure improvements, such as parking areas and expanded trails, as well as smaller infrastructure construction projects, such as boardwalks and kiosk or signage installation at all units, would

result in small-scale and localized loss of vegetation. Alternative C would likely result in a larger impact to vegetation from infrastructure improvements, due to a combination of increased maintenance of the Buzzy Brook Trails at the Sunkhaze Meadows Unit as well as the larger 3.4-mile trail network proposed for Benton Unit. We would take efforts to minimize the impacts of these projects on vegetation.

Alternative C anticipates a slightly higher level of visitation compared to alternatives A and B. This increase in vegetation could also potentially result in added off trail usage and impacts as a result of soil compaction and trampling of vegetation. However, we would monitor usage to prevent or correct any unauthorized off trail use, to minimize the potential for this impact to occur.

## Impacts on Migratory Birds

Migratory bird conservation was cited in the founding legislation for both the refuge and WPA. In addition to being the primary purpose of the refuge and WPA, supporting the conservation of migratory bird populations also fulfills a Service priority, because migratory species are considered Service trust species. Migratory birds include waterfowl, shorebirds, wading birds, marshbirds, and landbirds. We evaluated the management actions proposed for each of the CCP alternatives for their potential to benefit or adversely affect migratory bird habitats and use across each refuge unit and the WPA.

We evaluated the benefits of the management actions proposed under the three alternatives that would conserve migratory birds and their habitat, including:

- Land protection and conservation that would maintain existing habitat conditions.
- Habitat management activities and projects that would convert habitat types in portions of the refuge, resulting in the localized gain of certain types of habitat and cover.
- Increased prevention and control of invasive species.
- Increased staff and improved cooperation with partners to conduct inventory and monitoring of migratory birds.

We also evaluated the potential for adverse impacts to migratory birds and their habitat, including:

- Habitat management activities and projects that would convert habitat conditions in portions of the refuge, resulting in the localized loss of certain types of habitat.
- Activities of refuge and WPA visitors that might directly impact migratory birds or their habitat conditions.
- Construction of public use infrastructure that would result in a localized impact to migratory birds or their habitat.
- Increased recreational use of refuge and WPA lands that could lead to migratory bird impacts.

## Impacts on Migratory Birds That Would Not Vary by Alternative

### *Benefits*

Under all the alternatives the Service is committed to protecting and managing for migratory birds, in particular species of conservation concern listed in appendix A and their associated upland, wetland, and riparian habitats. However, the benefits to migratory birds vary slightly under each alternative, based on the proportion of different habitat types and the various management strategies employed to create and maintain those habitats.

*Land Protection and Habitat Management*—The following State endangered species have been documented at several refuge units and at Carlton Pond WPA: black tern (Carlton Pond WPA), least bittern (Carlton Pond WPA and Sunkhaze Meadows Unit), and sedge wren (Benton Unit). Under all alternatives, we would continue to rely strongly on our State partners at the MDIFW to help us monitor these populations. We would continue to protect and maintain these species through long-term protection of their habitats. We would continue to manage the water levels at Carlton Pond WPA to benefit the State endangered black terns, bitterns, and other waterfowl and waterbirds of conservation concern.

Invasive species can degrade habitat quality and availability for some species. We would monitor for, and control where feasible, any invasive plant species found on all refuge units and at Carlton Pond WPA. Invasive plants would be one of the primary threats to migratory bird habitat under all the alternatives, and at least some level of invasive species control would occur under all alternatives.

In particular, the freshwater wetland-peatland complex at the Sunkhaze Meadow Unit would continue to provide valuable habitat for waterfowl and marsh birds, such as American black duck, bitterns, sedge wrens, yellow rails, rusty blackbirds, and other songbirds. There is no anticipated difference in the amount and type of wetland habitats at Sunkhaze Meadows, Benton, and Sandy Stream Units, and Carlton Pond WPA, among the alternatives. Therefore, under all alternatives we anticipate no variation in the diversity of wetland-dependent migratory birds across the refuge units and WPA based on habitat composition.

Our furbearer management program at Carlton Pond WPA allows for the control of beavers and muskrats, two species that can damage the integrity of the dike and water level control infrastructure. This infrastructure is key to maintaining habitat for the wetland-dependent migratory birds at Carlton Pond, including the State endangered black tern.

We would also continue to manage the water control structure at Carlton Pond WPA to benefit nesting and migrating birds, including the nesting population of State endangered black tern and nesting American black ducks. Secretive nesting birds such as American and least bittern and rails would continue to benefit from the open water-freshwater complex maintained at Carlton Pond WPA.

*Impacts from Public Uses*—Under all alternatives, we would continue to offer opportunities for visitors to engage in wildlife observation, photography, interpretation, environmental education, fishing, and hunting. Visitors who participate in the refuge and WPA's public use programs, or

those who use the available infrastructure, including trails and the observation platform, gain an improved understanding and appreciation for the numerous species which depend on the refuge for breeding, foraging, and during migration. Additionally, visitors would be more aware of biological facts upon which Service management is based and why these species are important to people and other wildlife. This outcome would help increase public support for refuge and WPA management and habitat protection, as well as the Service and the Refuge System.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—We would expect some disturbance to breeding and migrating birds from trail maintenance, invasive plant control, and habitat management activities at the Sunkhaze Meadows, Benton, and Sandy Stream Units. However, we would conduct most, if not all, of these management activities outside the nesting season and avoid critical breeding and migration periods.

*Impacts from Public Uses*—In general, the presence of humans disturbs most wildlife, which typically results in a temporary displacement without long-term effects on individuals or populations. Disturbance varies by wildlife species involved and the type, level, frequency, duration and the time of year activities occur. Disturbance can cause shifts in habitat use, abandonment of habitat, and increased energy demands on affected wildlife (Knight and Cole 1991). In some cases there is a clear link between the extent of disturbance and either the survival or reproductive success of individuals (e.g. Schultz and Stock 1993), but in many cases disturbance acts in a more subtle way, by reducing access to resources such as food supplies or nesting sites (Gill et al. 1996). Bird flight in response to disturbance can lower reproductive success by exposing individuals and nests to predators. Wildlife disturbance may be compounded by seasonal needs. For example, some species, like warblers, could be negatively affected by disturbance associated with bird watching particularly during the breeding season. When visitors approach nests too closely, they often cause the adult bird to flush exposing the eggs to weather conditions or predators (Banks and Bryant 2007; Miller et al. 2001).

Except for coyote hunting, the refuge and WPA's hunt programs will remain the same under all alternatives. Hunting of waterfowl has occurred on the Sunkhaze Meadows Unit and at Carlton Pond WPA for decades, including prior to refuge establishment. The refuge's hunt program follows Federal and State regulations for annual harvest levels and seasons by species. These regulations are set by the Service for each state based on what harvest levels can be sustained for a species without adversely affecting its overall Atlantic Coast Flyway population. As such, hunting results in individual losses, but the projected cumulative harvest would not jeopardize the viability of any harvested species' population. Some disturbance to non-target wildlife species may occur; however, those impacts should be minimal, because hunting pressure is low and occurs outside the breeding season.

Retriever trials at Carlton Pond WPA are also occasionally allowed (not more than a few days a year) under a special use permit. The dog trials are held in the latter half of August, outside the breeding season of migratory birds and are limited to a small section of the refuge. Given the infrequency and short duration of these activities, as well as the seasonal timing of the events in late summer or early fall, we do not anticipate any substantial or long-term impacts to wildlife. While there are no established boat launch sites on refuge lands, visitors are allowed to hand

carry small boats across refuge lands to launch them. Spring or summer boating activity along Sunkhaze Stream and at Carlton Pond to observe or photograph wildlife may cause some infrequent, localized disturbance to nesting waterfowl and shorebirds. Overall, effects should not be significant, because both the refuge and WPA already experience minimal public use. Additionally, there are no trails, buildings, or other infrastructure at the WPA. American black ducks and other ground nesting birds usually nest in areas that are not easily accessible to boaters. The State-endangered black tern nests in the wetland vegetation near the water, so their nesting locations are monitored and water levels controlled for their benefit. If deemed necessary, signs would be posted to warn photographers and other visitors not to disturb these birds. In addition, wildlife observers and photographers generally seek to minimize disturbance as it interferes with their activity. If disturbance becomes a productivity issue, we would work with the State to implement appropriate protective measures, such as temporarily closing portions of the pond, or temporarily closing refuge lands to boat launching.

Under all alternatives, we would continue to allow seasonal snowmobiling on existing trails at Sunkhaze Meadows Unit, Benton Unit, and Sandy Stream Unit. The snowmobile trails will continue to be maintained by local organizations. Given the time of year (winter), most priority conservation species for the refuge and WPA have migrated away from the refuge and WPA until spring. The snowmobile trail at the Sunkhaze Meadows Unit is located in an upland area, away from sensitive species and habitat, including overwintering habitat (e.g. waterfowl). Snowmobile trails at Sandy Stream and Benton Units are also located away from sensitive wetland habitats. These trails also occur near existing roadways that experience regular passenger vehicle traffic. These trails have been used for many years, and current and expected snowmobile traffic on these trails is not expected to add to the existing levels of disturbance. Therefore, we do not anticipate any additional impacts to migratory birds as a result of continuing this access.

## **Impacts on Migratory Birds Under Alternative A (Current Management)**

### ***Benefits***

*Land Protection and Habitat Management*—Under alternative A, we would continue to rely on natural processes (e.g. succession and disturbance), rather than any active forest management, to maintain the current extent of forest habitat at Sunkhaze Meadows NWR and Carlton Pond WPA. For forest-dependent migratory birds utilizing Sunkhaze Meadows Unit, Benton Unit, and Carlton Pond WPA, mature trees with small scatterings of natural tree falls and other blow downs from natural disturbances create habitat conditions that benefit many migratory birds that rely on a diverse forest structure. Birds that use late successional forest structure, such as boreal chickadee and Cape May and bay-breasted warblers, would likely benefit the most. Migratory birds that use shrub and young forest habitat would continue to minimally benefit from the early successional habitat maintained along the transmission line right of way, and would benefit from any early successional habitat created through intermittent natural disturbances.

Grassland nesting birds would continue to benefit from the annual mowing or periodic burning of the 95 acres of grassland at the Benton Unit. Common species including tree swallows and red-winged blackbirds, and less common species including American kestrel, red-tailed hawk,

and eastern bluebird, also benefit from the current grassland habitat. The grassland provides a habitat type not available elsewhere on the other Sunkhaze Meadows NWR units.

Shrub-nesting birds such as American woodcock and willow flycatcher would continue to benefit from the maintenance of 39 acres of shrub habitat at Sandy Stream Unit. Although small, this shrubland is an important component within the larger agricultural and forested landscape. The 25-foot wide riparian habitat of mature forest along Sandy Stream provides a modest benefit to cavity-nesting birds, such as wood ducks.

*Impacts from Public Uses*—Impacts resulting from public uses and associated management are the same as described under *Impacts on Migratory Birds That Would Not Vary by Alternative*.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—Our lack of staff limits our ability to monitor nesting birds and habitat conditions across all units of Sunkhaze Meadows NWR and Carlton Pond WPA. Similarly, we would have limited capacity to monitor potential impacts of public use, water level changes, or invasive species. This situation increases the probability that invasive plants could become established or expanded at any of the three refuge units and Carlton Pond WPA. Invasive plants are known to degrade habitat for migratory birds.

Under this alternative, we would not actively manage for migratory bird species, such as chestnut-sided warbler and American woodcock, which are dependent on shrubland and young forest early successional habitats at Sunkhaze Meadows Unit. While this unit maintains some areas of this habitat type, the limited availability of resources to manage and maintain these habitat types would likely result in the loss of these transitional habitats as they either convert into more mature forests, or are completely cleared for right-of-way vegetation management purposes.

The lack of staff would continue to limit our ability to manage for State-listed species at Carlton Pond WPA, such as the black tern. We would continue to maintain water levels that support black tern nesting during the breeding season, but we would be limited in our ability to monitor and respond to changes in nesting conditions at Carlton Pond.

The lack of staff would continue to limit our ability to evaluate and monitor Benton Unit grassland bird use for species such as bobolinks, and to modify our management accordingly to better meet wildlife objectives. Due to its size and large amount of edge habitat, the current management approach may not be creating the most optimal habitat conditions for many grassland bird species besides those currently supported (bobolinks, eastern meadowlark, and savanna sparrow). The State-threatened sedge wren has not been observed on the Benton Unit since 1992, when the land was acquired by the Service. The lack of staff to monitor for this species and others, and the limited ability to monitor the sedge meadow habitat, makes it less likely that this species, or other priority conservation species, would be detected on the Benton Unit.

At the Sandy Stream Unit, the relatively small size of the shrubland habitat, and its fragmentation by the bisecting snowmobile trail, would continue to limit the number of nesting migratory birds in this habitat.

*Impacts from Public Uses*—Impacts resulting from public uses and associated management are the same as described under *Impacts on Migratory Birds That Would Not Vary by Alternative*.

## **Impacts on Migratory Birds Under Alternative B (Service-preferred Alternative)**

### ***Benefits***

*Land Protection and Habitat Management*—Under alternative B, the eventual addition of staff would result in additional invasive species control across all refuge units and the WPA. This additional control would help maintain the biological diversity and integrity of existing habitats, including exemplary plant communities such as the northern white cedar woodland fen and freshwater wetland–peatland complex found at the Sunkhaze Meadows Unit. Controlling invasive species also helps maintain the existing native vegetation relied upon by priority refuge migratory bird resources for forage and cover.

Under alternative B, refuge staff would work more closely with the electric utility companies at the Sunkhaze Meadows Unit to manage the 107-acre transmission line right-of-way at the Sunkhaze Meadows Unit to maintain shrubland and grassland (early successional) habitat conditions that benefit migratory birds, such as American woodcock and chestnut-sided warbler. The management emphasis on mature (late successional) forest habitat would benefit a suite of migratory species that relies on the habitat structure associated with mature spruce-fir and mixed hardwood forests. These species would include bay-breasted warbler, Cape May warbler, northern parula, blackburnian warbler, and olive-sided flycatcher. As with all the alternatives, the long-term protection of the 3,461-acre freshwater wetland-peatland complex would protect migratory birds that use these wetland habitats, including American black duck, sedge wren, yellow rail, American and least bitterns, and other migratory waterfowl and waterbirds.

With the eventual addition of refuge staff anticipated under alternative B, we would be able to more effectively monitor bird responses to habitat changes and public uses at all three refuge units and Carlton Pond WPA. In doing so, we would be able to implement an adaptive management approach to adjust management as needed. At the Benton Unit, this approach would include monitoring the effects of grassland mowing or burning on nesting birds. At the Sandy Stream Unit, we would monitor the effects of maintaining shrub habitat and a wider riparian buffer in migratory birds. We would also be able to more effectively monitor bird populations and control and monitor those invasive plants at Carlton Pond WPA that could negatively impact aquatic habitats for migratory species, including the State-endangered black tern and nesting waterfowl and waterbirds. At the Sunkhaze Meadows Unit, we would monitor the potential effects of public use on migratory birds, especially within the wetland-peatland complex.

At the Benton Unit, the conversion of 3 acres of grassland to forest and, if implemented, 22 acres of northern hardwoods-mixed forest to grassland, would increase the grassland habitat from 95 acres to 114 acres. This conversion would potentially benefit grassland nesting birds that prefer larger grasslands, such as eastern meadowlark, grasshopper sparrow, and upland sandpiper.

Expansion of the riparian floodplain forest habitat along Sandy Stream from 25 feet to 90 feet would improve the size of this habitat for some migratory and resident birds, including wood duck, pileated woodpecker, and other cavity-nesting birds. Moving the snowmobile trail to the western border of the Sandy Stream Unit and closing the trail that currently bisects the shrub habitat would improve the overall connectivity of the shrub habitat for species such as American woodcock, willow flycatcher, among others.

*Impacts from Public Uses*—Impacts resulting from public uses and associated management are the same as described under *Impacts on Migratory Birds That Would Not Vary by Alternative*.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—Additional invasive species control proposed across all refuge units and the WPA would result in the application of herbicides and the temporary loss of vegetative cover. Adverse impacts from herbicides are minimized by applying the herbicide per label instructions and implementing the refuge's spill prevention and control measures. The temporary loss of vegetation would occur seasonally and consist of small and localized areas that would have minimal impact on vegetation relied upon by priority refuge migratory bird resources for forage and cover.

The emphasis on late successional forest under alternative B would limit the amount of early successional habitat available at the Sunkhaze Meadows Unit primarily to the transmission line right-of-way and occasional openings created through natural disturbances. Species that depend on young forest or other open habitat, such as American woodcock and chestnut-sided warbler, would be limited by the amount of available habitat.

Adverse impacts for Carlton Pond are the same as those discussed under alternative A.

The loss of 3 acres of grassland at the Benton Unit would have a negligible loss of available habitat for grassland birds. Because this area is currently surrounded by forests on three sides, it provides minimal benefits to nesting grassland birds. The potential conversion of 22 acres of northern hardwoods-mixed forest at the Benton Unit would convert this area from forest to grassland. This conversion is expected to have a small loss of nesting habitat for forest and edge-dwelling species as well as a small loss of migratory stopover habitat for similar species. The increase in grassland from 95 acres to 114 acres would result in a modest increase in disturbance due to an increase in the acres mowed or burned. Because the management occurs outside the breeding season, we anticipate minimal adverse impacts from the increase in management activity.

*Impacts from Public Uses*—A modest increase in visitation is anticipated under this alternative. This increase could potentially result in added off trail usage and impacts as a result of the added presence and disturbance associated with more frequent visitors. However, we would monitor usage to prevent or minimize disturbance to migratory birds across all refuge units and at Carlton Pond. The addition of a 0.5-mile long foot pedestrian trail at the Benton Unit could increase disturbance to grassland nesting birds; however, the trail is proposed to run along the edge of the field. We see a benefit to increasing public pedestrian access at the Benton Unit by increasing public awareness and appreciation of wildlife and associated habitats and the management that is

required to maintain these conditions. Under alternative B, we would increase our public outreach and education to reach visitors with these messages. At the Sunkhaze Meadows Unit we would close trails and maintain other trails to minimize adverse impacts to migratory birds, as well as improve trail signage and interpretive materials to educate visitors about migratory birds and their habitats. We anticipate little change in visitation at Carlton Pond or Sandy Stream.

## Impacts on Migratory Birds Under Alternative C

### *Benefits*

*Land Protection and Habitat Management*—With the eventual addition of refuge staff anticipated under alternative C, we would be able to more effectively monitor bird responses to habitat changes and public uses at all three refuge units and Carlton Pond WPA in a manner similar to alternative B.

An additional 715 acres of young forest early successional habitat would be created at the Sunkhaze Meadows Unit under alternative C, benefiting American woodcock and chestnut-sided warbler and other migratory birds dependent on young forest and similar open habitats. This outcome would be achieved through tree harvesting patches totaling 55 acres of conifer forest and 660 acres of northern hardwoods-mixed forest within the more than 7,191 acres of remaining northern hardwood-mixed forest and conifer forest. The patches of young forest, once cut, would be allowed to regrow and succeed to mature forest, creating a shifting mosaic of small forest openings within a much larger mature forest. Thus, a majority of the forested habitat at the Sunkhaze Meadows Unit would still provide habitat for migratory birds that use mature and older forests. As with alternative B, we would work closely with the utility company to manage the transmission line corridor to benefit species such as American woodcock, chestnut-sided warbler, and other species that use shrub and young forest habitats.

Shrub-dependent birds such as American woodcock, willow flycatcher, eastern kingbird, and eastern towhee would benefit from the conversion of the 92 acres of grassland to shrubland at the Benton Unit as proposed under alternative C. With more refuge staff anticipated under alternative C, we would be able to more effectively monitor bird responses to these habitat changes, including the conversion of grassland to shrubland habitat. Additional staff would also help us manage this transitional habitat type, which would require mowing every 10 years. Current benefits to migratory birds at the Sandy Stream Unit and Carlton Pond WPA would be similar to alternative B under this alternative.

*Impacts from Public Uses*—Impacts resulting from public uses and associated management are the same as described under *Impacts on Migratory Birds That Would Not Vary by Alternative*.

### *Adverse Impacts*

*Land Protection and Habitat Management*—Under alternative C, the amount of mature late successional forest at the Sunkhaze Meadows Unit would be reduced by 715 acres, thus reducing available habitat for migratory birds that depend on older forest conditions. However, the remaining 7,191 acres of mature forest habitat would remain, so the relative change in mature forest habitat is modest compared to the other alternatives. The active tree harvesting within the

715 acres would create some disturbance; however, the harvesting would be scheduled outside breeding season to minimize impacts to migratory birds.

Because of the conversion of 92 acres from grassland to shrubland at the Benton Unit, habitat for grassland dependent birds such as bobolinks would disappear over time on this unit as the grassland would be allowed to revert to shrubland under this alternative.

*Impacts from Public Uses*—Alternative C anticipates a slightly higher level of visitation compared to alternatives B, particularly at the Sunkhaze Meadows Unit and the Benton Unit. Both of these units under alternative C propose maintaining or adding to the trail network. This could also result in added off trail usage and impacts as a result of additional human presence and unintentional disturbance to breeding birds. However, we would monitor usage to prevent or correct any unauthorized off trail use to minimize the potential of this impact.

Extending the coyote hunting season by one month, until the end of April, could have unknown negative effects on breeding birds on the refuge. Many raptor species begin nest building and breeding in March and April and continue into May, such as osprey (Poole 1984, Wetmore and Gillespie 1976), red shouldered hawk (Portnoy and Dodge 1979), and northern goshawk (Speiser and Bosakowski 1991).

Currently, coyote hunting is the only State season where hunting is allowed during the spring and at night as well as during the day. Under this alternative, expanding the coyote hunting season would expand the duration and potentially intensity of authorized off trail use on the refuge. There are several studies documenting disturbance effects of hunting on wildlife (see Sexton and Stewart 2007 for a summary). There are also many studies that document human and canine disturbance of wildlife (e.g., Miller et al. 2001, Banks and Bryant 2007, Lenth and Knight 2008). Cumulatively, noises associated with humans (and dogs) can be disruptive enough to birds to keep them away from their nests (Call 1979, Ratcliffe 1980). The potential for any animal to flee its nest generally increases when the perceived threat approaches more directly (Burger and Gochfeld 1981, 1990, Cooper 1997, 1998). Brief absence by parent birds can lead to missed feedings, predation on eggs or young, or exposure to overheating, chilling, or dehydration of eggs or young (Call 1979, Suter and Joness 1981). Species like the ferruginous hawks tend to desert their nests if adults are exposed to human activity during incubation (White and Thurow 1985). Van Daele and Van Daele (1982) found that incubation at successful osprey nests occurred during 99.5 to 100 percent of daylight hours. For some warblers and similar species, nest guarding by males in response to a disturbance can reduce the rate of egg losses to predation, but the time and energy spent in nest guarding results in time not spent provisioning young or self-feeding. This trade-off can not only cause current offspring to starve, but also impact the parents' survival and future reproduction (Komdeur and Kats 1999). Ground nesting birds may also be affected by disturbance during the nesting season. In the Appalachian Mountains, exposure was a leading cause (44 percent) of ruffed grouse chick mortality – equal to the combined predation by both birds and mammals (Smith et al. 2004). Human disturbance through noise and off trail use during the critical periods of incubation and the early nesting stages can be fatal to embryos and nestlings.

Adverse impacts to migratory birds at the Sandy Stream Unit and Carlton Pond WPA would be similar to alternative B under this alternative.

## Impacts on Fish and Mussels

We evaluated the management actions and public uses each of the alternatives proposed for their potential to beneficially or adversely impact fish and mussel species.

We evaluated the following proposed actions for their potential to cause beneficial impacts on fish and mussels:

- Protecting and managing land that would provide watershed benefits.
- Protecting or restoring emergent wetlands and riparian forest habitats.
- Controlling invasive species.
- Working with partners to improve education and outreach related to fish and mussels present on the refuge and WPA.

We evaluated the following proposed actions for their potential to cause adverse impacts on fish and mussels:

- Habitat management activities or projects that may result in temporary losses of vegetation near waterways.
- Applying herbicides to manage invasive species.
- Increased recreational use of refuge and WPA lands that could lead to fish and mussel impacts.

## Impacts on Fish and Mussels That Would Not Vary by Alternative

### *Benefits*

*Land Protection and Habitat Management*—The staff from Maine Coastal Islands NWR would continue to work with the Service's Fisheries Program to maintain self-sustaining, healthy populations of native fishes at Sunkhaze Meadows NWR and Carlton Pond WPA. This includes American eel and brook trout, which occur on the Sunkhaze Meadows Unit and are species of conservation concern. The federally listed Atlantic salmon occurs downstream from the Sunkhaze Meadows Unit and is discussed under *Impacts on Threatened and Endangered Species*.

At the Sunkhaze Meadows Unit, the wetland-peatland complex, including Sunkhaze Stream and its tributaries, would be protected and maintained under all alternatives. Protecting Sunkhaze Stream and its tributaries benefits a number of warm water and cold water fish species.

Under all alternatives, the Service would continue to rely on our State and Federal partners to help monitor populations of fish in Sunkhaze Stream and to help control the introduction of nonnative species that could affect native fish and mussels. We would continue to protect the health of aquatic habitats including Sunkhaze Stream and its tributaries. Sunkhaze Meadows NWR and Carlton Pond WPA would continue to provide habitat primarily for warm water fish and, to a lesser extent, cold water fish species.

Continuing to manage the water control structure at Carlton Pond WPA to maintain stable water levels would continue to support the existing warm water fishery found within Carlton Pond.

Two State-threatened freshwater mussel species are known to occur on the Sandy Stream Unit: tidewater mucket and yellow lampmussel. Under all alternatives, we would continue to rely strongly on our State partners at the MDIFW and the MNAP to help us monitor these populations. These freshwater mussels depend on well-oxygenated water with minimal waterborne sediments and pollutants, as well as food sources such as algae, bacteria, and plant debris. Protection of the existing streambank and forested buffer along Sandy Stream under all alternatives prevents runoff and erosion from Service-owned land, which helps protect water quality and contributes plant debris to the food chain in Sandy Stream, thus benefiting the freshwater mussels as well as fish.

The Benton Unit has little fish habitat except for Fowler Brook, the small stream that crosses the property. However, long-term protection of the aquatic and surrounding upland habitats at the Benton Unit would continue to protect any fish species found within Fowler Brook.

*Impacts from Public Uses*—We would also continue to work with the MDIFW on outreach, education, and law enforcement related to fisheries. Working together on these needs will help ensure Federal and State regulations are followed, thereby helping to ensure long-term protection of fish and mussels on all refuge units and the WPA. Under all alternatives, we would continue to offer opportunities for visitors to engage in wildlife observation, photography, interpretation, environmental education, fishing, and hunting. Visitors who participate in the refuge's and WPA's public use programs, or those who use the available infrastructure, including trails and the observation platform, gain an improved understanding and appreciation for the numerous species which depend on the refuge including fish and mussel species. Additionally, visitors would be more aware of biological facts upon which Service management is based and why these species are important to people and other wildlife. This outcome would help increase public support for refuge and WPA management and habitat protection, as well as the Service and the Refuge System.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—We do not anticipate any adverse impacts to fish and freshwater mussels from our habitat management activities at any of the refuge units or Carlton Pond WPA.

*Impacts from Public Uses*—Anglers walking along the streambank at the Sandy Stream Unit could lead to erosion and sedimentation. However, we anticipate minimal adverse impacts based on what appears to be a low level of use of this section of the river by anglers.

Fishing does remove individuals from the population. However, the State sets catch limits, designated waters, and fishing seasons to protect the State's fish populations. Given the distribution of these species and the State's estimates of abundance, we do not expect fishing pressure at Sunkhavé Meadows Unit, Sandy Stream Unit, or Carlton Pond WPA to have adverse effects on these species.

Motorized boating at the Sunkhaze Meadows Unit would create some potential impact to water quality through discharge of gasoline and oil and the potential introduction of nonnative plant and animal species carried on the boat. We anticipate these effects to be minimal based on the low levels of boaters using Sunkhaze Stream. Our trails at all three refuge units (there are no trails at Carlton Pond WPA) are located and maintained to minimize any adverse impacts to water quality. Any trail maintenance would therefore have minimal, if any, short-term impacts to aquatic habitats and associated species.

## **Impacts on Fish and Mussels Under Alternative A (Current Management)**

### ***Benefits***

Same as those described under *Impacts on Fish and Mussels That Would Not Vary by Alternative*.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—The lack of staff would continue to prevent us from proactively monitoring fish and freshwater mussel populations at Sunkhaze Meadows NWR and Carlton Pond WPA. Given the lack of staff we would have limited ability to work with other landowners within the Sunkhaze Stream watershed to help protect water quality and habitats that support fish and freshwater mussels of conservation concern.

*Impacts from Public Uses*—Impacts resulting from public uses are similar to those described under *Impacts on Fish and Mussels That Would Not Vary by Alternative*.

## **Impacts on Fish and Mussels Under Alternative B (Service-preferred Alternative)**

### ***Benefits***

*Land Protection and Habitat Management*—Given the proposed increase in staff under alternative B, we would have greater ability to monitor fish and freshwater mussel populations at Sunkhaze Meadows Unit in collaboration with partners. This expanded capacity would provide more information on opportunities to enhance habitat conditions for these species. In addition, we would work more closely with neighboring landowners to encourage land stewardship that protects water quality and aquatic habitats within the Sunkhaze Stream watershed.

Benefits to fish and freshwater mussels would be modestly increased by expanding the riparian buffer from 25 feet to 90 feet along the refuge's 2,000 feet of streambank along Sandy Stream. This expanded buffer would improve our long-term protection against streambank erosion and also provide more permanent benefit from the downed trees and woody cover provided by the forested riparian corridor. Forested buffers of at least 90 feet proposed for Sandy Stream would protect water quality critical to invertebrates and freshwater mussels (Kiffney et al. 2003) and provide shade to the river, which is beneficial to brook trout and other aquatic species (Craig and Dickson 1990).

*Impacts from Public Uses*—Impacts resulting from public uses are similar to those described under *Impacts on Fish and Mussels That Would Not Vary by Alternative*.

### ***Adverse Impacts***

Same as impacts under *Impacts on Fish and Mussels That Would Not Vary by Alternative*

## **Impacts on Fish and Mussels Under Alternative C**

### ***Benefits***

Same as alternative B.

### ***Adverse Impacts***

Same as alternative B.

## **Impacts on Mammals**

We evaluated the management actions and public uses each of the alternatives propose for their potential to beneficially or adversely impact large and small mammals known to utilize refuge and WPA habitats.

We evaluated the following proposed actions for their potential to cause beneficial impacts on wildlife:

- Land protection and conservation that would maintain existing habitat conditions.
- Habitat management activities and projects that would convert habitat types in portions of the refuge, resulting in the localized gain of certain types of habitat and cover.
- Increased prevention and control of invasive species.
- Supporting deer populations through our proposed management for priority refuge and WPA resources.
- Increased staff and improved cooperation with partners to conduct inventory and monitoring of mammals or the habitats that sustain them.

We evaluated the potential of the proposed actions to cause adverse effects on wildlife:

- Habitat management activities and projects that would convert habitat conditions in portions of the refuge, resulting in the localized loss of certain types of habitat.
- Construction of public use infrastructure that would result in a localized disturbance to mammals or their habitat.
- Managing coyote and other hunting seasons.
- Increased recreational use of refuge and WPA lands that could lead to mammal disturbance.

## **Impacts on Mammals That Would Not Vary by Alternative**

### ***Benefits***

*Land Protection and Habitat Management*—Mammals at Sunkhaze Meadows NWR and Carlton Pond WPA consist largely of relatively common species found across the northeast. Most of these species are able to utilize a variety of forested, open land, and wetland habitats, and their

populations on the refuge would not be expected to change under each alternative. Maintaining each of the three Sunhaze Meadows NWR units and Carlton Pond WPA as primarily undeveloped open space provides many of our native mammal species at least a portion of their annual needs of food, water, cover, and space. We anticipate no changes in wetland-dependent mammal species based on habitat conditions under any of the alternatives, since we are proposing no alternatives to existing wetland conditions. At each of the three refuge units, portions of upland habitat types would vary across the alternatives and resulting impacts to mammals are discussed under each of the alternatives. No changes in habitat types are proposed for Carlton Pond WPA under any alternative. As a result, this would maintain existing habitat conditions supporting mammals.

Under all of the alternatives we would maintain the conifer forests that include spruce-fir, hemlock, and northern white cedar forests to benefit a suite of species including white-tailed deer. This includes softwood cover areas identified by MDIFW as deer wintering areas that cover a portion of the Sunhaze Meadows Unit and a small portion of conifer forest at the Benton Unit.

Trapping furbearers at Sunhaze Meadows Unit and Carlton Pond WPA as a management technique would continue under each alternative and is expected to have direct and indirect effects on wildlife. Benefits include the management of populations of furbearers at sustainable levels; overcrowding can make populations more susceptible to disease outbreaks.

*Impacts from Public Uses*—Under all alternatives, we would continue to offer opportunities for visitors to engage in wildlife observation, photography, interpretation, environmental education, fishing, and hunting. Visitors who participate in the refuge’s and WPA’s public use programs, or those who use the available infrastructure, including trails and the observation platform, gain an improved understanding and appreciation for the numerous species which depend on the refuge and WPA including mammals. Additionally, visitors would be more aware of biological facts upon which Service management is based and why these species are important to people and other wildlife. This outcome would help increase public support for refuge and WPA management and habitat protection, as well as the Service and the Refuge System.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—Existing habitat management activities that are aimed at setting back succession, such as invasive species control (all units and the WPA), prescribed burning (Benton Unit), and mowing (Benton and Sandy Stream units), would likely injure or kill some small to medium-sized mammals that are unable to find refuge or otherwise flee. However, we believe the risk to be low since most mammals are able to leave the treatment area or hide. There are no state or federally listed mammal species on the refuge or WPA. Because most mammals present in treatment areas are able to leave or hide, habitat management efforts are of short duration (usually less than a week), and treatment areas are relatively small (generally less than 20 acres), any impacts to mammals at the population level are expected to be minor.

Furbearer management is also expected to affect mammal populations at Sunhaze Meadows NWR and Carlton Pond WPA. We conduct furbearer management according to Maine regulated

seasons and limits for the targeted species. We can also impose any necessary refuge-specific restrictions through the special conditions that may be placed on the trapping special use permits.

Trapping harvests and removes individuals of the species; however, impacts are not expected on these species at the population level. The anticipated direct impacts of trapping on wildlife would be a temporary reduction of furbearer populations in those areas where surplus furbearers exist. The removal of excess furbearers from those areas would maintain furbearer populations at levels compatible with the habitat and with refuge objectives, minimize furbearer damage to facilities and wildlife habitat, minimize competition with or interaction among wildlife populations and species that conflict with refuge objectives, and minimize threats of disease to wildlife and humans.

Maine Department of Inland Fisheries and Wildlife considers most furbearer populations in the State to be stable (Caron 2013 personal communication). However, there is some concern about recent declines in fisher and bobcat harvests around the Sunkhaze Meadows Unit; there is also concern about over harvest of river otters in this area (J. DePue, MDIFW 2013 personal communication). As noted above, trapper reports show that an average of 15 beavers and 11 muskrats have been taken per year between 2001 and 2010. Other than these species, which have a high reproductive capacity, only one bobcat, one coyote, three fisher, four mink, six otters, one raccoon, and two skunks have been taken between 2001 and 2010. Because most furbearer populations are considered to be stable in the State, and because of the low harvest levels of other furbearer species that may not be stable (i.e., bobcat, fisher, and otter), we do not expect the refuge's trapping program to have adverse effects on furbearers at the population level.

Non-target species are sometimes taken incidentally through this trapping program. The experience of the trappers and the selection of the appropriate trap size would reduce non-target captures (Northeast Furbearer Resources Technical Committee 1996, Boggess et al. 1990). Lynx (federally listed, endangered) have not been documented on the refuge. Therefore, potential impacts to lynx are not expected. If lynx are identified on or near the Sunkhaze Meadows Unit, the refuge manager would work with the Service's Ecological Services office and the State of Maine to implement measures to prevent accidental take of lynx.

*Impacts from Public Uses*—An important component of refuge management includes maintaining a careful balance between wildlife conservation and public use. In a 1989 survey conducted by the Service, 82 percent of refuge units allowed wildlife photography and 13 refuges considered it harmful (USFWS 1990).

The primary impacts to wildlife populations from public use on the refuge would be those associated with disturbance and hunting of wildlife. We would expect short-term and long-term adverse effects (e.g., disturbance or mortality) on wildlife populations resulting from public use of trails and from other off trail allowed uses (e.g., berry picking, snowshoeing). Visitors and dogs cause temporary disturbance impacts on resting and foraging wildlife. Disturbances would vary by wildlife species involved and the type, level, frequency, duration and the time of year activities occur. Even when people stay on trails, they would have some effect on the behavior of many wildlife species. Furthermore, adverse effects to wildlife have been shown to be directly proportional to increases in the number of users (Beale and Monaghan 2004). According to the

study, groups of visitors using trails were more likely to cause behavioral changes in the animals studied when compared to individual visitors.

Disturbance can cause shifts in habitat use, abandonment of habitat, and increased energy demands on affected wildlife (Knight and Cole 1991). There is evidence to suggest that species most likely to be adversely affected are those where available habitat is limited, constraining them to stay in disturbed areas and suffer the costs of reduced survival or reproductive success (Gill et al. 2001).

Lenth et al. (2006) found, in areas that prohibited dogs, mule deer were less active up to 50 meters from recreational trails. In areas that allowed dogs, mule deer showed reduced activity within at least 100 meters of trails. The same study found similar adverse effects for small mammals including squirrels, rabbits, chipmunks, and mice. This means that there is a certain area around recreational trails that becomes unsuitable habitat for certain wildlife species, even though the habitat would otherwise be suitable (Lenth et al. 2006).

Wildlife disturbance may be compounded by seasonal needs. For example, causing mammals to flee during winter months would consume stored fat reserves that are necessary to get through the winter. Hammitt and Cole (1998) found white-tailed deer females with young are more likely to flee from disturbance than those without young. Severinghaus and Tullar (1975) suggested that snowmobile disturbance might be energetically costly to deer. Although deer sometimes use snowmobile trails, those trails may not lead to the best foraging areas, or may help to concentrate foraging in a restricted area and contribute to overbrowsing. They recommended keeping snowmobile trails at least 0.5 miles from deer wintering areas. In a controlled experiment, Freddy et al. (1986) found that snowmobiles invoked flight responses in mule deer at distances less than 440 feet. Distances traveled by fleeing deer averaged 330 feet. Deer demonstrated low levels of response (alerting) up to distances of about 1,540 feet. Freddy et al. (1986) suggest that keeping snowmobile trails greater than 1,500 feet from deer would minimize any disturbance. The study found no evidence of increased mortality or impairment of reproduction, but deer may not have been disturbed often enough to show an effect.

The existing snowmobile trails are, at their closest point, approximately 2 miles west of the deer wintering area mapped within the Sunhaze Meadows Unit. This 2-mile buffer consists of northern hardwood-mixed forest and peatland-wetland complex. This exceeds the recommended 0.5-mile buffer recommended by Freddy et al. (1986). At the Benton Unit, the existing snowmobile trail passes through the edge of a mapped deer overwintering area. However, the vegetation in this portion of the site has changed from forest to grassland since it was originally mapped. Therefore, this area does not currently contain suitable habitat for deer overwintering. Instead, the edge of the northern hardwood-mixed forest (where suitable overwintering may occur) is located approximately 500 feet to the north, although most deer likely overwinter further within the mapped deer wintering area, away from the forest edge.

We expect adverse impacts on mammals associated with snowmobiling to remain low for the following reasons: 1) this use is a traditional use of refuge lands and has been occurring for many years, 2) refuge staff have not observed adverse impacts to these species in all of these years, 3) snowmobile trails avoid deer wintering areas, and 4) this use is expected to remain low and is

therefore not expected to be intense or frequent. Under all alternatives, we would continue to monitor the refuge for potential impacts and would limit access or close areas as needed to protect resources. We would also continue to vary from State regulations in that we would not allow baiting on any refuge unit or at Carlton Pond WPA.

All alternatives include a hunt program for a variety of mammals, for example: deer, bear, moose, and coyote. In addition to potential disturbance discussed above, hunting also includes direct take of individuals from a population. MDIFW is responsible for the management of resident wildlife including resident mammal species. They use a variety of methods to assess population levels and develop harvest strategies.

Deer is the most commonly hunted mammal species on the refuge and WPA. Currently, we do not collect harvest data for the refuge and WPA. Wildlife Management District (WMD) 18, which includes the Sunhaze Meadows Unit, had 258 deer harvested. WMD 23, which includes the Benton and Sandy Stream Units and Carlton Pond WPA, had 1,657 deer harvested. As discussed in chapter 2, deer populations vary considerably from region to region in the State largely due to severity of winter conditions, with highest densities found in southern Maine and lowest numbers found to the north. MDIFW allocates a specific number of permits and take methods across 29 individual Wildlife Management Districts based on previous harvest data, and deer abundance aerial surveys to ensure healthy populations of deer within the State.

MDIFW also monitors the State's moose population. Aerial surveys are conducted in nine WMDs to count the number of bulls, cows, and calves. Based on these surveys, MDIFW estimated the 2011 Statewide moose population to be 76,000. These surveys, combined with data collected on female moose reproduction, survival rates obtained by aging teeth, and hunter sight-rate data, allows MDIFW to ensure that the harvest is in keeping with a healthy moose population. In 2011, 2,582 harvested moose were checked into hunt stations; 38 moose were harvested in the WMD which includes the Sunhaze Meadows Unit and 2 moose were harvested in the WMD which includes the Benton and Sandy Stream Units.

For more than 35 years, MDIFW has closely monitored bears to ensure their management decisions are based on current and sound information. Harvest levels are determined based on harvest data and samples of teeth collected which help to show population trends and the number of bears present in the population. The State regulates harvest by setting season length, bag limit, and legal methods of hunting. Most bears are harvested by hunting over bait (75 percent), 22 percent by hunting without bait (includes 6 percent that use dogs), and 3 percent in traps. The total harvest in 2011 was 2,400 with 137 taken in the WMD that includes the Sunhaze Meadows Unit. Eight bears were harvested in WMD 23 which includes Benton and Sandy Stream Units and Carlton Pond WPA. No baiting is allowed on the refuge or WPA and bear trapping is not allowed which reduces harvest compared to surrounding areas.

In Maine, many smaller mammals such as coyote, bobcat, red fox, skunk, gray squirrel, woodchuck, porcupine, and red squirrel are also hunted. Currently the State's coyote population is between 10,000 to 12,000 in the winter and increases to 19,000 in spring. This number decreases due to the low number of pups that survive after birth. The coyote population would likely remain relatively constant unless wolves reestablish themselves in the State and then it is

believed the coyote population would decline (Jakubas 1999). There would need to be mortality rates greater than 70 percent for there to be a reduction in the population (Jakubas 1999). In 2011, 1,623 coyotes were taken in Maine through hunting and trapping, this is about 1.6 percent of the estimated winter abundance. Therefore, the refuge's hunt program is not expected to have a noticeable effect on the population of this species.

The bobcat is a trapped and hunted species that is distributed over most of the State (Morris 1986). The Bobcat Management System is used to manage bobcat populations in the State (McLaughlin 1995). The red fox population is distributed Statewide (Caron 1986) and is considered to be abundant and stable (Jakubas 2004). Red fox are hunted but most of the take for this species is through trapping. Harvests across the State in 2011 through trapping and hunting totaled 922. Population trends for the striped skunk, porcupine, and woodchuck are unknown according to the State of Maine since harvests are not recorded. However, these species are commonly seen on the refuge, the WPA, and throughout the State.

While individual mammals are harvested as part of the refuge and WPA's hunt programs, because of the State's efforts to monitor and regulate harvest of resident mammal species, we do not expect adverse impacts at the population level from harvesting these species.

### **Impacts on Mammals under Alternative A (Current Management)**

#### ***Benefits***

Benefits under alternative A are described above under *Impacts on Mammals That Would Not Vary by Alternative*.

#### ***Adverse Impacts***

Adverse impacts under alternative A are described above under *Impacts on Mammals That Would Not Vary by Alternative*.

### **Impacts on Mammals Under Alternative B (Service-preferred Alternative)**

#### ***Benefits***

*Land Protection and Habitat Management*—Young forest habitats are beneficial to a range of wildlife species including some mammals, such as snowshoe hare and the predators that hunt them including bobcat and coyote. These openings in the forest, both permanent and temporary, often support fruit-bearing shrubs and other plants that provide important food for mammals and other wildlife. Many mammals including coyote, fox, and bear are opportunistic foragers and eat fruits when available. Under alternative B, at the Sunhaze Meadows Unit we would work with the utility company to manage the transmission corridor as early successional habitat to provide both food and cover for mammals and other wildlife.

Under alternative B, we would increase wildlife monitoring and inventory, which would provide more baseline information on wildlife populations, habitat management impacts, and the effects of additional public use on mammals and other wildlife.

If it is feasible, we would convert 22 acres of forested habitat to grassland at the Benton Unit. This minimal increase in grassland would benefit herbivores such as white-tailed deer, woodchuck, and meadow vole by minimally increasing forage area. It would also have minimal benefits for species that hunt for insects and small mammals in these habitats, such as red fox.

*Impacts from Public Uses*—Benefits to mammals resulting from public use under alternative B are described under *Impacts on Mammals That Would Not Vary by Alternative*. Any increase in visitation would improve our ability to provide visitors with a better appreciation and more complete understanding of the wildlife, including mammals, and habitats associated with the refuge and WPA.

### ***Adverse Impacts***

In addition to adverse impacts described under *Impacts on Mammals That Would Not Vary by Alternative*:

*Land Protection and Habitat Management*— If we convert 22 acres of forested habitat to grassland at the Benton Unit, it would decrease the amount of edge habitat on this unit and increase the overall acreage of grassland. Since many mammal species utilize edge habitats, decreasing edge habitat could have adverse impacts on these species. This impact is expected to be minimal as there would still be a substantial amount of edge habitat available on the unit, and this habitat is common locally and regionally.

*Impacts from Public Uses*— Compared to *Impacts on Mammals That Would Not Vary by Alternative*, under alternative B we expect some additional adverse impacts on mammals associated with opening Service lands to a limited number of new compatible uses (commercial guiding and orienteering) and the expected modest increase in visitation associated with additional refuge and WPA programs and events.

The anticipated increase in public use at the refuge and WPA could result in an increased level of disturbance to mammals. At current and projected levels of use, we expect only negligible adverse impacts to refuge mammals from opening the refuge to these additional uses. Given that we have had no requests to date for orienteering and few requests for commercial guiding, we anticipate the numbers of visitors participating in this activity and frequency of occurrence would be low, and would not add appreciably to the impacts associated with other, existing public uses of the refuge. Participants in these new activities would be required to comply with all of the existing stipulations for authorized public uses. In addition, commercial guides would be required to comply with additional stipulations (see appendix B) and would be routinely checked by the refuge law enforcement officer for compliance with regulations and permit conditions. Permit conditions and stipulations are designed to minimize potential impacts.

Similar to opening the refuge and WPA to a limited number of new, compatible uses, we expect only negligible adverse impacts to refuge mammals from increased participation in environmental education and interpretation programs. Service staff would lead some of these programs, ensuring that activities and events were held in away from sensitive resources. Non-Service instructors would need to obtain a special use permit. This would allow refuge staff to place limitations on location(s), number of participants, and number of events to protect refuge

and WPA resources, and to monitor for potential adverse impacts associated with these activities. Although a substantial increase in impacts from increased public use is not expected in the near term, refuge staff would monitor impacts of these uses and respond, if necessary, to conserve the existing high quality of refuge resources. For additional details on these uses, please see appendix B.

## Impacts on Mammals Under Alternative C

### *Benefits*

*Land Protection and Habitat Management*—Alternative C would increase the amount of young forest habitat at the Sunhaze Meadows Unit by 713 acres. These resulting patches of young forest habitat among a matrix of mature forest would benefit many wildlife species, including mammals, by creating additional foraging habitat. Insect and small mammal populations would likely be higher in these openings and thus attractive to mid and large-sized mammals.

*Impacts from Public Uses*—Benefits to mammals resulting from public use under alternative C are the same as those described under alternative B.

### *Adverse Impacts*

*Land Protection and Habitat Management*—Despite the conversion of 715 acres of mature forest to young forest at Sunhaze Meadows Unit under this alternative, it is a relative small area within the more than 7,000 acres of mature forest. Thus, we anticipate only short-term and relatively minor impacts to mammals within the forested habitats. Under alternative C, the 92 acres of grassland habitat at the Benton Division would revert to shrub habitat. This would eliminate that grassy habitat for herbivores and for mammals that forage on small mammals and insects within the grassland.

*Impacts from Public Uses*—Under alternative C, adverse impacts associated with public use are the same as described for alternative B, except under this alternative we would extend the refuge and WPA coyote hunting by one month (to April 30). This expanded season would likely result in additional individual coyotes being taken. However, given the regional population trends as stable or increasing, we do not anticipate a substantial decrease in the local population as a result of expanded hunting at Sunhaze Meadows Unit and Carlton Pond WPA. There would also be some small amount of additional disturbance to other mammal species associated with extending the refuge and WPA coyote hunting season. We would monitor for potential impacts to refuge resources. If adverse impacts are observed, we would review the coyote hunt and modify the hunt program as needed.

## Impacts on Other Native Wildlife (Amphibians, Reptiles, and Invertebrates)

We evaluated the management actions and public uses each of the alternatives proposes for their potential to beneficially or adversely impact reptiles, amphibians, and invertebrates known to utilize refuge and WPA habitats.

We evaluated the following proposed actions for their potential to cause beneficial impacts on reptiles, amphibians, and invertebrates:

- Land protection and conservation that would maintain existing habitat conditions.
- Habitat management activities and projects that would convert habitat types in portions of the refuge, resulting in the localized gain of certain types of habitat and cover.
- Increased prevention and control of invasive species.
- Increased staff and improved cooperation with partners to conduct inventory and monitoring of reptiles, amphibians, and invertebrates or the habitats that sustain them.

We evaluated the potential of the proposed actions to cause adverse effects on reptiles, amphibians, and invertebrates, including:

- Habitat management activities and projects that would convert habitat conditions in portions of the refuge, resulting in the localized loss of certain types of habitat.
- Construction of public use infrastructure that would result in a localized disturbance to reptiles, amphibians, and invertebrates or their habitat.
- Increased recreational use of refuge and WPA lands that could lead to reptiles, amphibians, and invertebrates disturbance.

## **Impacts on Other Native Wildlife That Would Not Vary by Alternative**

### ***Benefits***

*Land Protection and Habitat Management*—The status of amphibians, reptiles, and especially invertebrates on the refuge units and WPA is currently not well known. Across all alternatives, we do not anticipate any major changes in benefits or adverse impacts to these taxa, except under alternative C, which proposes an increase in young forest habitat at Sunkhaze Meadows Unit and a decrease in grassland habitat at the Benton Unit; these are described in more detail below. The aquatic habitats surrounded by upland at Sunkhaze Meadows and Carlton Pond are critical both in habitat structure and water quality to reptiles and amphibians, and they would be maintained under all of the alternatives. In addition, under all of alternatives we would continue to rely strongly on our State partners at MDIFW and the MNAP to help us monitor these wildlife populations.

Two State threatened invertebrate species are known to occur on the Sunkhaze Meadows Unit: Tomah mayfly and pygmy snakefly dragonfly. Under all of the alternatives, we would continue to rely strongly on our State partners at the MDIFW and the MNAP to help us monitor these populations. We would continue to protect and maintain these species through long-term protection of their aquatic habitats.

Habitat management techniques, such as maintaining Carlton Pond water levels, conducting prescribed burning and mowing at Benton, and controlling invasive species throughout the refuge and WPA, would be carried out to improve habitat conditions for a variety of wildlife species, including amphibians, reptiles, and invertebrates.

*Impacts from Public Uses*—Our public outreach information and programs include information on the importance of these taxa to the overall biological diversity of the refuge units and WPA. This inclusion in outreach and education helps increase awareness and appreciation of these species. This increase in understanding helps improve support for our habitat management and land conservation that helps sustain these species.

### ***Adverse Impacts***

*Impacts from Public Uses*—We would expect some localized, short-term and long-term adverse effects (disturbance or mortality) on wildlife populations resulting from public use of trails and from other off trail allowed uses (such as berry picking or snowshoeing). Disturbances would vary by wildlife species involved and the type, level, frequency, duration, and time of year in which activities occur. Even when people stay on trails, they would have some effect on the behavior of many wildlife species. Furthermore, adverse effects to wildlife have been shown to be directly proportional to increases in the number of users (Beale and Monaghan 2004). Because Sunhaze Meadows NWR and Carlton Pond WPA are only expected to have a small rise in visitation under all alternatives, we do not believe that this type of disturbance would rise to a level of concern.

## **Impacts on Other Native Wildlife Under Alternative A (Current Management)**

### ***Benefits***

*Land Protection and Habitat Management*—The maintenance of grassland at the Benton Unit provides direct benefits for reptiles and some amphibians due to the abundant food resources, particularly in older fields, that provide a diversity of plant and invertebrate life, and the complex soils. Several snake species, including brown and garter snakes, use grasslands for foraging, particularly if they are near woodlands with ample cover. Well established grasslands provide a diverse array of nectar sources and plant structures for pollinating, herbivorous, and predatory insects.

*Impacts from Public Uses*—Benefits to other native wildlife resulting from public use under alternative A are similar as those described under *Impacts on Other Native Wildlife That Would Not Vary by Alternative*.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—Under alternative A, the refuge would continue to remain unstaffed, which would prevent Service staff from conducting inventories required to identify amphibians, reptiles, and invertebrate populations present on refuge and WPA lands. In addition, we would be limited in our ability to monitor species response to habitat management, especially in response to maintaining grassland habitat at the Benton Unit and shrubland habitat at Sandy Stream. These habitats are likely to support the most diverse amphibian, reptile, and invertebrate communities compared to upland forest habitat.

*Impacts from Public Uses*—Adverse impacts to other native wildlife resulting from public use under alternative A are similar as those described under *Impacts on Other Native Wildlife That Would Not Vary by Alternative*.

## **Impacts on Other Native Wildlife Under Alternative B (Service-preferred Alternative)**

### ***Benefits***

*Land Protection and Habitat Management*—The increased width of the forested riparian buffer at the Sandy Stream Unit would provide additional protection to the rare mussels within Sandy Stream. A 90-foot riparian forest would also provide additional long-term inputs of leaves, sticks, and other woody material that would benefit aquatic invertebrates within Sandy Stream.

Proposed increases in staffing under alternative B would allow us to inventory and monitor populations of amphibians, reptiles, and invertebrate present on refuge and WPA lands. By completing these inventories and monitoring efforts, we would increase our knowledge and understanding of what species are present and how our management can benefit them.

*Impacts from Public Uses*—Benefits to other native wildlife resulting from public use under alternative B are similar as those described under *Impacts on Other Native Wildlife That Would Not Vary by Alternative*.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—Adverse impacts to other native wildlife resulting from land protection and habitat management under alternative B are similar to those described under alternative A, except that the potential for the addition of staff could eventually improve our inventory and monitoring capabilities, which would improve our ability to manage for amphibians, reptiles, and invertebrates when compared to alternative A.

*Impacts from Public Uses*—Increased visitation expected for all refuge units and the WPA could potentially result in added off trail usage impacts and disturbance to amphibians, reptiles, and invertebrate populations as a result of use. Service staff would continue to monitor usage to prevent or correct any unauthorized off trail use or added disturbance that might influence nesting, particularly of reptiles such as wood turtles.

## **Impacts on Other Native Wildlife Under Alternative C**

### ***Benefits***

*Land Protection and Habitat Management*—The increase in young forest, early successional habitat by 715 acres at the Sunkhaze Meadows Unit would benefit invertebrates, such as pollinating bees and butterflies that prefer open, sunlit habitats. We would expect an overall greater diversity of insects in the early successional openings compared to the mature forest habitats.

The conversion of 92 acres of grassland to shrubland at the Benton Unit would likely increase habitat available for amphibians and reptiles. The effects of converting grassland to shrubland are not well documented by researchers, but the improved mobility and increased leaf litter available as a result of tree sapling and shrub establishment would likely improve conditions for a larger variety of reptiles and amphibians over the current grassland.

*Impacts from Public Uses*—Benefits to other native wildlife resulting from public use under alternative C are similar as those described under *Impacts on Other Native Wildlife That Would Not Vary by Alternative*.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—The conversion of 715 acres of mature forest to early successional, young forest habitat at the Sunhaze Meadows Unit could have adverse impacts on some amphibians, such as red-backed salamanders and spotted salamanders. Amphibian populations in 2- to 20-year-old clearcuts were compared to populations in mature hardwood and hardwood-conifer forests by several studies (Harlow et al. 2000). All seven studies found higher amphibian abundance (2.3 to 9.3 times as many) in mature forest plots. The authors note that amphibian and reptile response to clearcutting varies with forest type, species, and other ecological considerations, such as moisture regime, amount of woody material, and leaf litter available. However, we anticipate that these are short-term impacts, and as the forest matures the amphibians would respond in kind to the habitat changes.

The conversion of the 92 acres of grassland habitat to shrubland habitat at the Benton Unit could adversely affect some amphibian and reptile populations. Leopard frogs prefer wet meadow/grassland habitat and turtles search for disturbed sites with exposed soils. Both of these conditions would likely be less suitable under alternative C. However, the shrub cover would benefit some species, such as wood turtle, which spends much of the non-winter season in shrub cover.

*Impacts from Public Uses*—The expansion of public use trails at the Benton Unit has potential increased adverse effects on forest amphibians. Red efts (the immature stage of red-backed salamanders) move into the upland forests during raining periods and would be exposed to increased pedestrian traffic. However, increased public awareness and outreach by refuge staff would help raise public awareness and minimize adverse impacts.

## **Impacts on Threatened and Endangered Species**

We evaluated the management actions and public uses each of the alternatives proposes for their potential to beneficially or adversely impact federally listed threatened and endangered species known to use refuge and WPA habitats.

We evaluated the following proposed actions for their potential to cause beneficial impacts on federally listed threatened and endangered species:

- Land protection and conservation that would maintain existing habitat conditions.
- Increased staff and improved cooperation with partners to conduct inventory and monitoring of federally listed threatened and endangered species or the habitats that sustain them.

We also evaluated the potential of the proposed actions to cause adverse effects on federally listed threatened and endangered species, including:

- Increased recreational use of refuge and WPA lands that could lead to increased potential for disturbance to federally listed threatened and endangered species.

## **Impacts on Threatened and Endangered Species That Would Not Vary by Alternative**

### ***Benefits***

*Land Protection and Habitat Management*—In December 2000, the wild Atlantic salmon populations in small coastal rivers in downeast Maine were listed as endangered under the federal Endangered Species Act (ESA). In 2009, Atlantic salmon from the Penobscot, Kennebec, and Androscoggin rivers were added to the ESA protection. The Penobscot River is considered to be the best site for successful Atlantic salmon recovery (USFWS 2009). Atlantic salmon migrate up the Penobscot River in summer to fall spawning sites. The lower reaches of Sunkhaze Stream are used by salmon as a holding or staging area during their summer migration north, although they have not yet been recorded on the refuge. Riparian protection and habitat conservation measures proposed throughout each alternative for the Sunkhaze Meadows Unit would maintain the aquatic and riparian habitats in and along Sunkhaze Stream and its tributaries to sustain suitable conditions to seasonally support Atlantic salmon.

The Service is currently reviewing the status of the American eel as a potential candidate for listing under the ESA. The American eel is native to the Sunkhaze Stream system and was documented on the unit in Birch Stream, one of the tributaries. As with salmon, we would maintain all wetlands and associated riparian habitats on the Sunkhaze Meadows Unit to maintain water quality and habitat.

Although recently de-listed from the Federal list, bald eagles are still protected under the Bald and Golden Eagle Protection Act. They are also still listed as State threatened by MDIFW. Under all alternatives, we would continue to maintain nesting and foraging habitat for bald eagles nesting at Sunkhaze Meadows Unit.

*Impacts from Public Uses*—Our public outreach information and programs include information on the importance of these species as listed species and to the overall biological diversity of the refuge units and WPA that support them. This inclusion in outreach and education helps increase awareness and appreciation of these species. This increase in understanding helps improve support for our habitat management and species conservation measures that helps sustain these important populations.

### ***Adverse Impacts***

We do not anticipate any adverse impacts on federally listed species from our habitat management or public use activities at Sunkhaze Meadows Unit or Carlton Pond WPA.

## **Impacts on Threatened and Endangered Species Under Alternative A (Current Management)**

### ***Benefits***

Same as benefits described under *Impacts on Threatened and Endangered Species That Would Not Vary by Alternative*.

### ***Adverse Impacts***

Same as adverse impacts described under *Impacts on Threatened and Endangered Species That Would Not Vary by Alternative*.

## **Impacts on Threatened and Endangered Species Under Alternative B (Service-preferred Alternative)**

### ***Benefits***

*Land Protection and Habitat Management*—With more refuge staff anticipated under alternative B, we would be able to monitor for Atlantic salmon and American eel in the Sunkhaze Stream system. We would also work more closely with surrounding landowners and other partners to encourage land stewardship that protects the water quality within the Sunkhaze Stream watershed.

Similarly, with additional staff, we would be able to monitor populations for breeding and foraging bald eagles located at the Sunkhaze Meadows Unit and at Carlton Pond WPA.

*Impacts from Public Uses*—Benefits to federally listed threatened and endangered species resulting from public use under alternative B are similar as those described under *Impacts on Threatened and Endangered Species That Would Not Vary by Alternative*.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—Adverse impacts to federally listed threatened and endangered species resulting from our land protection and habitat management activities under alternative B are similar as those described under *Impacts on Threatened and Endangered Species That Would Not Vary by Alternative*.

*Impacts from Public Uses*—The anticipated increase in visitors to the Sunkhaze Meadows Unit could generate more potential for disturbance to nesting bald eagles. However, we would minimize any disturbance to nesting eagles through public outreach and by directing visitor use away from active nests.

## **Impacts on Threatened and Endangered Species under Alternative C**

### ***Benefits***

Same as alternative B.

### ***Adverse Impacts***

*Land Protection and Habitat Management*—The proposed increase in early successional habitat in the forested areas of the Sunhaze Meadows Unit would not adversely affect federally listed species, as the tree harvesting would be located away from any active eagle nests and away from Sunhaze Stream and its tributaries.

*Impacts from Public Uses*—The proposed extension of the coyote hunting season by one month in spring could potentially have adverse impacts to breeding bald eagles on refuge and WPA lands. Eagles begin nesting in the winter months and raise their young until they fledge in mid-summer. Expanding coyote hunting, which often relies on off trail access and the use of dogs, has the potential to disturb nesting eagles at a critical period when they are nesting. In northern latitudes, eagles tend to lay eggs during March through mid-April (Buehler 2000). As noted in chapter 3, under objective 4.2 for alternative B, brief disturbances caused by the presence of humans and loud noises can have detrimental effects on nesting raptors and their young. For this reason, we would utilize some of the additional staff eventually added under this alternative to evaluate the location and intensity of coyote hunting on the refuge, to determine its long-term effects.

## **Impacts on Public Use and Access**

Since refuge lands are held in the public trust by the Service, access is generally allowed for compatible, priority wildlife-dependent public uses. Uses are limited when Federal trust resources would be impacted; the activity would detract from achieving refuge purposes or the Refuge System mission; or when administrative resources are not available to ensure a safe, quality experience. Sunhaze Meadows NWR and Carlton Pond WPA are open year round to a variety of wildlife-dependent public uses described previously in chapter 2.

The following section discusses the beneficial and adverse impacts of the three alternatives on the public uses of the refuge and WPA as well as other compatible recreational opportunities. For more specific information on the potential beneficial and adverse impacts of these uses, refer to the attached compatibility determinations (appendix B).

We evaluated the following management actions for their potential benefit or adverse impacts on public use and access that would result from implementing each alternative:

- Continuing to provide access for approved public activities.
- Improvement and/or new construction of visitor infrastructure, and the increased distribution of refuge information, to improve visitor experiences.
- Increased partnerships with local, regional, and State academic and recreational interests to encourage a diversity of sustainable opportunities.
- Increased outreach and Service visibility would promote resource stewardship and outdoor ethics.

We considered the following potential short- and long-term direct, indirect, and cumulative impacts on public use and access that could result from the actions above:

- Conflicts among uses (e.g., conflicts about safety and access)

- More informed public (e.g., about species, their habitats, and their conservation)
- More supportive public (e.g., of the refuge, the Refuge System, and the Service)
- Increases in visitation and its associated effects on the quality of the experiences and our ability to meet the public use demand.

## **Impacts on Public Use and Access That Would Not Vary by Alternative**

### ***Benefits***

Under all alternatives, Sunkhaze Meadows NWR and Carlton Pond WPA would both continue to provide the existing six priority public uses. All three alternatives would continue to provide quality, compatible wildlife-dependent recreation that would allow a diversity of visitors to connect with nature in the outdoors. We would maintain our infrastructure to support those activities and provide safe access to them. Access to wildlife observation would continue to be provided along trails by hiking.

The benefits of providing the existing level of wildlife-dependent activities, with some modest increases under alternatives B and C, include helping meet the existing and future demands for outdoor recreation and education. Hunters, anglers, birders, and photographers would find high quality opportunities to engage their preferred pastimes at all refuge units and the WPA. Under all alternatives, we anticipate visitor use is likely to increase over time as local residents and visitors become more aware of refuge opportunities, and as we progress in creating new facilities and programs.

We would also continue to allow snowmobiling (on designated trails), cross-country skiing, and snowshoeing to facilitate wildlife observation and photography in the winter, when access on foot is difficult. Sunkhaze Stream, its tributaries, and Carlton Pond WPA would continue to be accessible by canoes, kayaks, or other small boats for fishing and wildlife observation. A variety of off trail uses would continue to be allowed at Sunkhaze Meadows NWR including berry picking, orienteering, hunting, fishing, and cross country skiing and snowshoeing in the winter.

By continuing to rely on the Friends of Sunkhaze Meadows NWR to assist with and develop interpretive programming at the Sunkhaze Meadows Unit, we would continue to promote visitation to the refuge despite the lack of staff specifically dedicated to Sunkhaze Meadows NWR and Carlton Pond WPA.

Under all alternatives, Sunkhaze Meadows NWR and Carlton Pond WPA would continue to maintain its current operating hours and remain open year-round from sunrise to sunset.

### ***Adverse Impacts***

Under all alternatives, we expect that public awareness of the refuge would increase over time as population growth increases around the refuge and WPA. We expect this would also result in increased visitation across all refuge units. Depending on the eventual staffing level of the refuge and WPA over time, we may or may not be capable of meeting the demand as it increases: providing programs, creating and maintaining trails and other infrastructure, and providing adequate facilities for increased numbers of visitors (such as parking areas). Whether we would

be capable of meeting the increasing demand depends on our coinciding levels of staffing and the availability of partners and volunteers (such as the Friends of Sunkhaze Meadows NWR) to assist. The current absence of staff would also continue to limit our ability to maintain public use infrastructure, such as trails, boardwalks, kiosks, and interpretive materials over the short term.

The increase in visitation and level of various uses at the refuge could eventually change the quality of experience for many visitors. Some may opt to either forgo certain recreation activities due to issues like overcrowding, which can be a relative term based on the activity or individual, or choose other locations. The refuge is currently utilized by a small portion of the area's visitors, and if the expected increase exceeds the projected 15-year estimate, it could lead to additional impacts on the refuge, WPA, other public lands. We would work to avoid that by continuing to distribute our programs and authorized uses to minimize conflicts among users.

At all units of Sunkhaze Meadows NWR and Carlton Pond WPA, we would continue to limit public access to ecologically sensitive areas such as nesting sites during breeding seasons and high quality wetlands. We would make efforts to minimize the impact on public use and access to those locations and timeframes necessary for adequate species protection. In doing so, this restriction would have a minor localized effect on public accessibility.

## **Impacts on Public Use and Access Under Alternative A (Current Management)**

### ***Benefits***

We would continue to maintain the current minimal level of programs and the variety of public use opportunities on the refuge and WPA. We would not expand permitted uses or programs. We would continue to allow public access for the current public use programs, which would continue to be largely lead by local volunteers and other partners. Service staff would continue to provide minimal maintenance of trails, observation towers, parking areas, and informational signs. Refuge law enforcement would continue to enforce current refuge regulations to provide a safe environment for refuge visitors.

### ***Adverse Impacts***

Under alternative A, the refuge and WPA would continue to remain unstaffed, which would continue to adversely impact public use. Even with current visitation levels, the lack of staff and resources specifically dedicated to Sunkhaze Meadows NWR and Carlton Pond WPA inhibits the availability of public use and access. Trails and other infrastructure such as boardwalks, signs, and parking areas are minimally maintained, which can impact the levels and types of use by visitors throughout the year. Some trails, like the two Buzzy Brook Trails at Sunkhaze Meadows Unit, are naturally becoming inaccessible due to downed trees and overhanging vegetation.

We assume a nominal increase in visitation under alternative A, but less than as expected under alternatives B or C, which include potential additions of staff and public use programming. We envision an increase based on a general growth in awareness of the refuge and WPA over time as well as surrounding population growth. Eventually, the level of use could change the nature of the experience for many visitors. Should that occur, some visitors could choose to give up certain

recreation due to issues of crowding or behavior, or to visit alternate locations. We do not anticipate that projected increases would adversely affect resources or their use or enjoyment by visitors because projected increases are relatively small, and are expected to be spread out over time (i.e., time of day and time of year) and across all refuge units and Carlton Pond WPA.

Across all refuge units, the current lack of staff would continue to prohibit our ability to provide environmental education and interpretive programs across most refuge units and at Carlton Pond WPA. We would continue to rely on the Friends of Sunkhaze Meadows to provide the majority of public use programming at the Sunkhaze Meadows Unit. Reliance on volunteer-based programs such as these, while helpful, would continue to limit our ability to provide regular programs or an array of diverse opportunities.

### **Impacts on Public Use and Access Under Alternative B (Service-preferred Alternative)**

#### ***Benefits***

In addition to the benefits under alternative A:

The additional staff envisioned under this alternative, once they were eventually added, would help update and regularly maintain public use infrastructure such as trails, boardwalks, signage, kiosks, and displays. This would improve the quality of public use opportunities at all refuge units and Carlton Pond WPA.

With the envisioned additional staff, if hired, we would update the refuge Web site with the hunting regulations currently enforced on refuge lands. Additional staff would also help with regular updates to the Web site and to outreach materials for visitors.

Under alternative B, the opportunity for commercial guiding, under authorization by a special use permit, would be provided, which could increase public access and use by individuals who might not otherwise access refuge lands. At this time, we envision largely individuals or small groups (10 or less) engaging in commercial guiding on an occasional or regular basis. Should larger groups become more frequent, or be determined by us to be detrimental to wildlife depending on the timing and location of the activity, we have the ability to control the size of the group in order to ensure its compatibility with other public uses and our habitat goals.

This alternative also improves water access for fishing and wildlife observation at the Sunkhaze Meadows Unit. Improved boating and fishing access points would potentially be developed both on refuge, such as Ash Landing, and off refuge near the mouth of Sunkhaze Stream and on neighboring private land through partnerships. Expanding public use programs and commercial guiding would also potentially create additional opportunities for fishing at Sunkhaze Meadows Unit and Carlton Pond WPA as well.

At Sunkhaze Meadows Unit, we are proposing two new parking areas: one at the entrance of Carter Meadow Road, the second at the Oak Point trailhead. These parking areas together would provide safer access to trails. Currently, pedestrians have to park at the parking area located along the County Road and then walk nearly 0.1 miles along the County Road to access the

Carter Meadow Road and Trail to the south, or 0.25 miles to the north to access the Oak Point Trail. By developing small parking areas at each of the trail and entrances, we would greatly reduce the need for refuge visitors to walk along the County Road, which would improve visitor safety and access.

In addition to the two new parking areas at the Sunkhaze Meadows Unit, we would also create a new trail beginning from the proposed Carter Meadow parking area and paralleling the Carter Meadow Road but in the woods near the creek until it connects with the existing trailhead at the end of Carter Meadow Road. This new trail would create a more scenic access for wildlife observation than the current alternative, which is walking along the gravel road (Carter Meadow Road).

Expanded partnerships with the Friends of Sunkhaze Meadows NWR, surrounding municipalities, the Penobscot Indian Nation, local schools and universities, and other partners would improve the variety and interpretive depth of public use programming, as well as wildlife-dependent recreation and interpretive opportunities.

At the Benton Unit, a 0.3-mile connector trail linking the parking lot and the existing snowmobile trail would be created, which would improve public access to the unit and could result in a slight increase the visitation to Benton Unit for wildlife observation and interpretation.

Relocation of the snowmobile trail at the Sandy Stream Unit is proposed under alternative B. This adjustment would create and maintain a nearly equal length of trail or access to (or through) the site. As a result, we would continue to allow public access in the winter via snowmobile under this alternative.

### ***Adverse Impacts***

We envision a modest increase in visitation under this alternative resulting from increased awareness of the refuge and WPA over time generated by population growth, plus the eventual addition of staff, Web site improvements, and expanded public use programming. While not a large increase, over time the increased level of use could change the nature of the experience for many visitors. Should that occur, some visitors could choose to give up certain recreation due to issues of crowding or behavior, or to visit alternate locations. We do not anticipate that projected increases would adversely affect resources or their use or enjoyment by visitors because projected increases are relatively small, and are expected to be spread out over time (i.e., time of day and time of year) and across all refuge units and Carlton Pond WPA.

At the Sunkhaze Meadows Unit, the North and South Buzzy Brook Trails (3.0 miles and 2.4 miles, respectively) would be closed under alternative B. The closure of these two trails would reduce the long-term availability of public access in that area and would reduce the overall number and miles of trails available to visitors. However, these trails do not currently provide significant public use opportunities. Access to this area is via the privately owned Stud Mill Road, which is sometimes closed to traffic. In addition, the parking area for these trails is behind a refuge gate that is usually locked except during hunting season. Lastly, these two trails pass through forested wetlands, making them difficult to access and maintain.

## Impacts on Public Use and Access Under Alternative C

### *Benefits*

The anticipated benefits under alternative C are similar to alternative B, except:

The eventual addition of staff envisioned under alternative C would provide regular public use programming as well as develop and regularly update interpretive materials and the refuge Web site. At Sunkhaze Meadows Unit, we would develop woodcock management area interpretive materials, which would share the benefits of early successional young forest management and describe the rationale behind the conversion and management of 715 acres of this habitat type with the public. Combined, these improvements would help us expand opportunities for environmental education, interpretation, and wildlife observation and improve our communication about the importance of conservation and the role of the Refuge System.

Coyote hunting season on Service-owned lands would be expanded by one month through April 30. This would slightly increase the availability and duration of this particular available hunting opportunity. All other hunting seasons would be maintained similarly to other alternatives. Under alternative C, at Sunkhaze Meadows Unit, the two Buzzy Brook Trails would continue to be maintained and the current 5.4 miles of trails available to visitors would remain unchanged. Alternative C would also construct the two parking areas and the Carter Meadow streamside trail similarly proposed under alternative B. Opportunities for wildlife observation at the Sunkhaze Meadows Unit would also be increased through renovating the Carter Meadow observation deck and increasing trail maintenance. These actions combined would greatly increase the public use access opportunities available under this alternative. However, because of the difficulty in maintaining the Buzzy Brook Trails previously noted and the corresponding need for additional staff to address that need, this is not considered our preferred alternative.

Expanded partnerships with the Friends of Sunkhaze Meadows NWR, surrounding municipalities, the Penobscot Indian Nation, local schools and universities, and other partners would improve public use programming, as well as wildlife-dependent recreation and interpretive opportunities. As compared to alternative B, this alternative would result in increased programming at Carlton Pond WPA, as well as Benton and Sandy Stream Units.

A network of trails would be created at the Benton Unit to promote that area's use for wildlife observation and interpretive purposes. This trail network would create a network of approximately 3.4 miles of trail and would be expected to increase visitation to Benton Unit more than under alternative B.

### *Adverse Impacts*

The expanded coyote hunting season could potentially conflict with other priority public uses such as wildlife observation and photography. Impacts and conflicts with other uses are anticipated to be minimal, since coyote hunting occurs primarily at night.

Similarly to alternative B, alternative C would result in a slightly higher increase in visitation as compared to alternative B, resulting from added opportunities for public use programming. As

noted previously under alternative B, increased visitation can result in changes in visitor experience. We do not anticipate that the projected increase in alternative C that would adversely affect resources or their use or enjoyment by visitors because projected increases are relatively small, and are expected to be spread out over time (i.e., time of day and time of year) and across all refuge units and Carlton Pond WPA.

## Impacts on the Socioeconomic Environment

We evaluated the socioeconomic effects in terms of the degree to which the proposed alternatives might affect the local economy, social structures, or quality of life of the local communities. To do this, we considered changes in

- Jobs and income to the local community from changes in staffing.
- Jobs and income from temporary construction work on the refuge and WPA.
- Expenditures in the local economy from changes in public uses of the refuge and WPA.
- Availability of opportunities for recreation that are in demand by the public.

### Impacts on the Socioeconomic Environment are Common to all Alternatives

#### *Benefits*

Under each alternative, the refuge and WPA would provide minimal socioeconomic benefits by providing wildlife-dependent recreational opportunities and through the contribution of money to local economies through the purchasing of goods and services within the local community for refuge operations, and spending in the local area by refuge visitors. We will continue refuge revenue sharing payments under all alternatives, as stipulated under current law (16 U.S.C. 715s, as amended). These payments are expected to continue to provide minimal economic benefits to the communities surrounding the refuge and WPA. Recent payments and their contribution to each town are detailed in chapter 2, table 2.18.

Of the management activities that would not vary by alternative, protecting land, maintaining facilities, supporting research and Friends of Sunkhaze Meadows group activities at Sunkhaze Meadows Unit, and implementing existing priority public use opportunities would create small additional socioeconomic benefits for the Milford and Unity areas by providing a destination for wildlife observation, hunting, fishing, photography and other compatible activities. Visitors participating in these activities would purchase goods (e.g., bait, tackle, gas) and services (e.g., hotel accommodations, meals) within the surrounding communities.

#### *Adverse Impacts*

Ownership of property by the Federal Government effectively removes these properties from the local tax base. As long as the Refuge Revenue Sharing Act (16 U.S.C. 715s, as amended) is in effect, the Service would continue to somewhat offset the tax losses by making an annual payment in lieu of taxes to the local governments for all refuge units and the WPA. The amount of this payment is determined by Congress each year; however, recent payments to local governments have not equaled losses in tax revenue and we expect these payments to have negligible effect on the local governments' budgets.

## **Impacts on the Socioeconomic Environment Under Alternative A (Current Management)**

### ***Benefits***

Socioeconomic benefits under alternative A are similar to benefits noted under Common to all Alternatives. Wildlife-dependent recreational activities and other priority public uses would continue to be provided at all refuge units and at the WPA, meeting a substantial level of public demand for these activities and adding to the quality of life of the local community and other recreationists and wildlife enthusiasts in the region.

### ***Adverse Impacts***

Same as those noted under *Impacts on the Socioeconomic Environment are Common to all Alternatives*.

## **Impacts on the Socioeconomic Environment Under Alternative B (Service-preferred Alternative)**

### ***Benefits***

Alternative B would expand and improve opportunities for all six priority public uses.

If the five added staff envisioned under this alternative are eventually added to Sunkhaze Meadows NWR and Carlton Pond WPA, direct benefits to the local economy would be increased in terms of refuge staff jobs, income, and expenditures, and purchases of goods and services for refuge activities. The estimated staffing levels and related incomes that would potentially be added are detailed in appendix F. The proposed addition of staffing and funding would improve our ability to communicate with the community about the values of Service-owned lands and opportunities for recreation under this alternative.

Working with partners to improve access to, and programming for, wildlife observation, hunting, and fishing opportunities would likely contribute economic benefits to the local economy from increased out-of-town visitors and related expenditures within surrounding communities.

Additional refuge programs and surrounding population growth are anticipated to increase visitation modestly over the 15-year period of the plan, compared to alternative A. As a result, local economies would experience minimally increased benefits in terms of retail expenditures for purchasing auto fuel and related expenditures.

Upgrades to refuge management infrastructure and existing facilities, plus new construction projects (parking lots, trails, and signs) would minimally contribute to the local economy for labor, materials, and services.

### ***Adverse Impacts***

Same as those noted under *Impacts on the Socioeconomic Environment are Common to all Alternatives*.

## Impacts on the Socioeconomic Environment Under Alternative C

### *Benefits*

The anticipated benefits under alternative C are similar to alternative B, except:

In addition to the five full-time staff envisioned under alternative B, alternative C also intends to eventually add two seasonal positions specifically dedicated to Sunkhaze Meadows NWR and Carlton Pond WPA. This would further increase benefits to the local economy in terms of jobs, income, expenditures, and purchases of goods and services for Service activities.

Full staffing under this alternative, should it occur, would provide additional refuge programs that are anticipated to increase visitation slightly more over the 15-year period of the plan compared to alternative B. This increase and an increased focus on expanded interpretive and educational programming would result in increased benefits in terms of retail expenditures for purchasing auto fuel and related expenditures compared to the other alternatives.

### *Adverse Impacts*

Same as those noted under *Impacts on the Socioeconomic Environment are Common to all Alternatives*, except:

Conversion of grassland to shrubland proposed at the Benton Unit under this alternative would result in the loss of the small permit fee paid by the local farmer to the refuge for authorization to mow hay on this unit.

## Impacts on Cultural and Historic Resources

### **Impacts on Cultural and Historic Resources That Would Not Vary by Alternative**

Under all alternatives, we would continue to protect all archaeological or cultural resource sites known to be present on Service-owned lands. We would continue to limit public access and management activities near those sites. There are no known historic structures on Service-owned lands. If sites are identified that are eligible for the National Register of Historic Places, we would coordinate their protection with our Regional Archaeologists and the Maine State Historic Preservation Office (SHPO).

These actions would benefit these resources by providing long-term protection against disturbance and provide a location for research and interpretation.

### **Impacts on Cultural and Historic Resources Under Alternative A (Current Management)**

### *Benefits*

Same as those noted under *Impacts on Cultural and Historic Resources That Would Not Vary by Alternative*.

### ***Adverse Impacts***

The lack of staff would continue to limit our ability to inspect and protect known archaeological or cultural resource sites. It also limits our ability to develop partnerships and additional research opportunities to more fully understand the archaeological or cultural landscape of Service-owned lands.

### **Impacts on Cultural and Historic Resources Under Alternative B (Service-preferred Alternative)**

The anticipated benefits under alternative B are the same as alternative A, except:

#### ***Benefits***

New staff would help ensure consistent messaging would be included in both Service-led and partner-sponsored interpretive programming. This would help improve our communication of the significance of archaeological and cultural resources, their significance, and the importance of their protection and interpretation.

Under alternative B, if envisioned staff is added, we would pursue additional work with the Penobscot Indian Nation, the town of Milford, and other interested partners to explore opportunities for developing materials and programming that better interpret cultural resources. This effort would improve interpretive materials and public use programming and help visitors gain appreciation for the historic and cultural significance of Service-owned lands and resources within them.

#### ***Adverse Impacts***

The lack of staff over the short term (or until their eventual addition) would continue to limit our ability to inspect and protect known archaeological or cultural resource sites. This also limits our ability to develop partnerships and additional research opportunities to more fully understand the archaeological or cultural landscape of Service-owned lands. With the eventual addition of staff proposed in alternative B, this potential for adverse impacts would potentially be reduced over the 15-year timeframe of this CCP.

### **Impacts on Cultural and Historic Resources Under Alternative C**

#### ***Benefits***

The anticipated benefits under alternative C are the same as alternative B.

#### ***Adverse Impacts***

The anticipated benefits under alternative C are the same as alternative B.

## Cumulative Impacts

According to the CEQ regulations on implementing NEPA (40 CFR 1508.7), a cumulative impact is an impact on the environment that results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes the other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time.

This cumulative impacts assessment includes the actions of other agencies or organizations, if they are interrelated 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.

### Air Quality

As documented in chapter 2, air quality around the refuge and WPA is generally below exceedance levels for various pollutants. Summers occasionally experience periodic high levels of ozone and particulates. However, these high levels are generally rare and of short duration. Primary sources of air pollutants are from wood burning and mobile sources such as cars, buses, trains, and aircraft. According to a summary produced by Maine's Department of Environmental Protection (DEP), the USEPA estimates that approximately 50 percent of all man-made air toxic emissions come from mobile sources (Maine DEP 2013).

Sunkhaze Meadows NWR and Carlton Pond WPA (combined) receive approximately 6,300 visits each year compared to the 49,000 vehicles per day (or more than 17.8 million vehicles each year) that travel on the nearby Interstate 95 near Bangor (MaineDOT 2011). We predict only a negligible adverse impact on regional air quality from Service activities, due to the small number of proposed staff, limited management activities, and limited vehicular access on refuge or WPA lands. Emissions from Service and visitor vehicles, snowmobiles, and motorized boats would continue to be negligible on Sunkhaze Stream and Carlton Pond. Management actions and public uses at the refuge or WPA would contribute negligibly to regional vehicle emissions compared to other nearby emission sources.

With our partners, we would continue to contribute to improving air quality through cooperative land conservation and management of forests and wetlands. Maintaining Service-owned land in natural upland vegetation or wetlands assures these areas would continue to filter out many of the air pollutants harmful to humans and the environment. We would also encourage the use of air quality BMP's when implementing construction and maintenance of infrastructure or habitat management actions. The combination of land preservation and BMP implementation would continue to minimize our impact on air quality.

### Water Quality

As noted in chapter 2, waters found on Sunkhaze Meadows NWR and Carlton Pond WPA generally sustain good water quality. Sunkhaze Stream and its tributaries are classified as Class AA waters by Maine Department of Environmental Protection (MEDEP MRS Title 38 467

7(C)(8)). This designation is in part sustained by large expanses of wetlands, forest, and other natural landcover across its watershed. Tributaries on or adjacent to the Benton and Sandy Stream Units also sustain water quality designations by the State.

The long-term land protection and management activities proposed under all alternatives would provide broad water quality and hydrology protection by ensuring large areas for groundwater infiltration, buffering of outside inputs and pollution, and providing soil stability.

We anticipate little to no adverse impacts to water quality resulting from refuge management activities under any of the alternatives. Most Service-owned lands provide well-vegetated buffers against adjacent water bodies. Service staff would continue to adhere to best management practices for spill prevention and soil erosion and sedimentation controls when implementing management activities. We would continue to adhere to and update the Sunkhaze Meadows NWR and Carlton Pond WPA spill prevention plan. During proposed activities such as trail expansion, parking lot construction, and land conversion, we would continue to minimize the potential for soil erosion and runoff by implementing a series of BMP's during their implementation. In doing so, we would minimize the already small potential for adverse water quality impacts.

Expanded management, partnerships, and monitoring proposed in alternatives B and C would additionally help to ensure protection of waters located on Service-owned lands.

### **Cumulative Impacts on the Biological Environment**

Our habitat management activities are complemented by the conservation work being completed by partners on lands across the landscape surrounding the refuge and WPA. The Lower Penobscot Forest Project is a 42,000-acre forest located to the east of Sunkhaze NWR that provides a connection to other conserved lands, including the refuge. This forest is jointly managed by TNC, the Forest Society of Maine, and the Maine Department of Conservation. TNC plans to purchase a conservation easement of 12,000 acres along the southeast border of Sunkhaze NWR to establish an ecological reserve. The remaining 30,000 acres will remain in sustainable timber production (TNC 2011). Additionally, the Penobscot Experimental Forest (PEF) is located in the towns of Bradley and Eddington, just south of the Sunkhaze Meadows Unit along the eastern side of the Penobscot River. It is owned in fee by the University of Maine and the U.S. Forest Service (USFS) has a lease to conduct research within the forest. The PEF consisted of 3,855 acres in 2009, with USFS research occurring on over 1,200 acres. The remaining portion of the forest is used by the University for research, teaching, and demonstration activities. The PEF is comprised primarily of mixed-wood stands of mature timber. Between 2001 and 2005, a total of 591 of forest acres were harvested (Morrill and Kimball 2009). Combined, these conservation areas protect and manage mixed age forested habitats across a land area roughly three times the size of the Sunkhaze Meadows Unit.

Long-term forest protection and management for old growth and late-successional mature forests outlined in alternative B would complement the forest conservation efforts of other partners noted. However, our focus on old growth and late-successional forest management would provide one of the largest areas of mature forest protection. Other protected forests noted still include timber management as part of their management objectives. Thus, our focus will help

ensure long-term habitat for species reliant on mature forest habitat, which has generally been lacking across the landscape.

In contrast, under alternative C, conversion of 715 acres of mature forest to early successional young forest would create large blocks of early successional forest, which are also preferred by a suite of species of regional conservation concern. This habitat type is currently provided across the landscape as lands cleared for timber harvests begin to regrow and reestablish forest cover. However, the long-term reliability of this habitat in the surrounding landscape is uncertain. By managing a portion of the Sunkhaze Meadows Unit as early successional forest, we could ensure a sizeable area of this habitat to support breeding and migratory bird populations dependent on this habitat type.

Benton Unit, Sandy Stream Unit, and Carlton Pond WPA are all surrounded by a matrix of privately owned lands with residential homes, agricultural use, and privately managed forests. As highlighted in chapter 1, the Benton and Sandy Stream Units are located within the Unity Wetlands Focus Area. Carlton Pond WPA is located north and east of Unity Pond, just outside of the Unity Wetlands Focus Area. This focus area targets land protection and conservation activities across a range of non-governmental organizations, State, and Federal partners.

Habitat conversions identified for Benton Unit under alternatives B and C would have little consequence on regional populations of species of conservation concern. Under alternative B, the potential conversion of 22 acres of forest to grassland would help create larger grassland area unbroken by trees and shrubs. This would benefit some grassland-dependent species and could potentially result in a few additional species utilizing this habitat type on this unit. The conversion of Benton Unit grasslands to shrublands under alternative C would eliminate all grassland bird use, but instead promote use by species dependent on early successional young forest and shrubland habitats. Again, the overall size of this conversion would have little consequence on regional populations, but would help the refuge improve its efforts in providing beneficial habitat.

All of the proposed alternatives would maintain or improve biological resources on Service-owned lands. The long-term land protection and management activities proposed under all alternatives would complement other neighboring conservation efforts by the State, TNC, Friends of Unity Wetlands, and other organizations. Cumulatively, these large areas of protected lands provide many acres of protected lands for a variety of species.

The extent and type of improvement at the refuge and WPA would vary depending on the final selected alternative. The combination of our management actions with partner actions could result in beneficial cumulative effects by continuing protection of listed threatened and endangered species and other species of concern and their associated habitats, through habitat preservation, management, or in some cases proposed conversion. In particular, we target migrating waterfowl, forest dwelling landbirds, breeding marshbirds, bald eagles, and songbirds. Less than 90 nesting pairs of black tern are known to occur within Maine. Our ongoing habitat management would continue to support Federal and State listed species, including the black tern, which consistently nests at Carlton Pond WPA. We will also continue to provide habitat for many species noted in chapter 2 as rare or declining. Although, for most species, we do not

support as large of a contribution to the regional population as we do with black tern. Ongoing invasive species monitoring and control efforts would limit the spread of exotic species. Over the life of this CCP, we would use a combination of adaptive management and the best science available to manage important habitats, prevent and control invasive species, and promote regionally significant natural communities.

Under each alternative, we would continue to allow activities that result in the direct loss of individual wildlife, such as hunting, fishing, and furbearer management (trapping). While hunting and fishing fall under the priority public use category, we authorize trapping as a management tool. As highlighted in chapter 2, many mammal populations are thought to be stable or increasing. One exception is white-tailed deer, which are at the northern extent of their range near the refuge. Deer populations have slowly declined in recent years. Along with this decline, there has been a corresponding decline in deer harvest numbers. Participation in hunting and furbearer management activities at the refuge and WPA are relatively low. Therefore, we do not expect impacts to these species as a result of allowing these activities. We describe the site-specific impacts of these programs earlier in this chapter and in appendix B, Findings of Appropriateness and Compatibility Determinations. Hunting, trapping, and fishing would not have a significant cumulative impact on the overall species taken. The refuge does not have jurisdiction over WPA waters, only access to them. All of these activities rely on locally reproducing populations and their take would not comprise a regional impact. No cumulative impacts are expected.

### **Cumulative Impacts on the Socioeconomic Environment**

As described earlier, the area surrounding Sunkhaze Meadows NWR and Carlton Pond WPA is largely rural. Land in the vicinity of the Sunkhaze Meadows Unit is almost entirely forested, while areas near the Benton and Sandy Stream Units and Carlton Pond WPA are in agricultural or residential use. Population growth in the counties surrounding the refuge and WPA has historically been low, with a three or four percent increase over the past decade. Despite the rural landscape and historic trend, the lower Penobscot River watershed ranks number one in the nation for projected housing density increases, more than 310,000 acres of its surface area are predicted to be developed in the next three decades (Stein et al. 2005). Economically, the median income of the counties surrounding the refuge and WPA is slightly lower than the national average, yet close to the median income for Maine.

We expect none of the proposed alternatives to have a significant adverse cumulative impact on the economies of the town or counties surrounding Sunkhaze Meadows NWR and Carlton Pond WPA. None of the alternatives alter the demographic or economic characteristics of the local community. We expect a small, but net benefit to the adjacent communities by providing and promoting a natural setting for solitude, connection with nature, and outdoor recreation opportunities.

Under all of the alternatives, the actions we propose would neither disproportionately affect any communities nor damage or undermine any businesses or community organizations. Regardless of which alternative we select, we would continue to pay refuge revenue sharing payments to the communities where the refuge units and WPA are located. However, recent payments to local

governments have not equaled losses in tax revenue, and we expect these payments to have negligible effect on the local governments' budgets.

Fully funding the additional staffing in alternatives B and C would create a small, incremental contribution to the employment and income in the local community. With increased staffing and more emphasis on environmental education, interpretation, and wildlife observation, we expect public use of Service-owned lands to increase. This outcome would increase the number of visits and time spent in the area. Correspondingly, the level of visitor spending is expected to increase in the communities surrounding refuge units.

Our existing and expanding partnerships with local, State, Tribal, and Federal entities around the region are key to successful conservation outcomes and building public understanding and support for this work. With onsite staffing proposed under alternatives B and C, we would be more responsive to our partners, visitors, local communities, schools, and colleges, and others interested in Sunhaze Meadows NWR and Carlton Pond WPA. Under all of the alternatives, we would continue to provide all priority public uses on Service-owned lands.

The proposed conversion of 92 acres of grassland to shrubland under alternative C would result in a small negative economic impact to the local individual farmer who currently mows the existing grassland under a special use permit for haying. Cumulatively, we expect this negative impact to be somewhat offset on a regional scale by the increased visitation anticipated and the associated expenditures by Service staff and visitors.

### **Cumulative Impacts on the Cultural and Historical Environment**

As noted, a number of cultural or historic resources have been identified on Service-owned refuge and WPA lands, and it is likely others are present (Robinson 2012; Spiess, Maine Historic Preservation Commission personal communication 2011). These resources are part of a larger landscape of cultural or historic resources identified along the large river corridors of south and central Maine. We would continue to work with our regional archaeologists and consult with our Regional Archaeologists, the Maine Historic Preservation Commission, and other parties as appropriate to ensure compliance with NHPA and other applicable laws and regulations.

We expect none of the alternatives to have significant adverse cumulative impacts on cultural resources on Service-owned lands or on regional resources surrounding refuge and WPA lands. Our protection of these resources complements the protection efforts being undertaken by State and non-governmental partners on surrounding lands. Depending on the alternative, beneficial effects would vary, because of the changes proposed in habitat management and expected increases in public use. Alternatives B and C would both increase the amount of cultural and historic resource interpretation integrated into environmental education and interpretation. As a result, we would expect a small beneficial increase in awareness and appreciation of these resources under these alternatives.

### **Cumulative Impacts Related to Climate Change**

Department of the Interior Secretarial Order 3226 (January 16, 2009) states that "there is a consensus in the international community that global climate change is occurring and that it should be addressed in governmental decision-making. This order ensures that climate change

impacts are taken into account in connection with Departmental planning and decision-making.” Additionally, it calls for the incorporation of climate change considerations into long-term planning documents, such as this CCP.

The Manomet Center for Conservation Sciences has prepared a report (Whitman et al. 2010) summarizing climate change predictions and their potential impacts on biodiversity for Maine. This report notes several habitat types found on Service-owned lands that are likely to be most susceptible to impacts resulting from anticipated climate change. Aquatic habitats, including coldwater rivers and streams, ephemeral wetlands, and peatlands are expected to be greatly affected by temperature increases and changes in hydrology. A gradual warming trend may cause some cold water streams to become transitional cool or warm water systems. Coniferous forests, including boreal forest types dominated by spruce and eastern hemlock, may be greatly affected by increases in air temperature and by resulting climate-induced outbreaks of pest species. Changes in temperature and increased invasions by pests (both aquatic and land-based) can alter species communities, displace individual plants and animals, and (in extreme cases) eventually lead to localized extinction of species.

The Service is taking a major role among Federal agencies in distributing and interpreting information on climate change. There is a Web site dedicated to this issue at: <http://www.fws.gov/home/climatechange/> (accessed March 2012), which links to the Service’s recently released Strategic Plan for Climate Change. Strategies for adapting to climate change are included in this CCP (USFWS 2010). The plan employs three key strategies to address climate change: adaptation, mitigation, and engagement. Under the preferred alternative presented in this CCP, we would implement a variety of habitat monitoring activities that rely on ecological integrity indices and other protocols that together would help us identify long-term trends and changes in habitats and species use associated with management and climate change. The Association of Fish and Wildlife Agencies developed guidance for states as they update and implement their respective wildlife action plans (AFWA 2009). This publication also includes strategies that would help conserve fish and wildlife species and their habitats and ecosystems as climate conditions change. The broad spatial and temporal scales associated with climate change suggest that management efforts that are coordinated on at least the regional scale would likely lead to greater success. In addition, we would continue to rely on the habitat and species vulnerability assessments and other climate change research developed by the Northeast Climate Impacts Assessment and the Manomet Center for Conservation Science.

In considering climate change impacts and developing corresponding strategies within this CCP, we would address objective 2.4 highlighted in the Service’s Strategic Plan for Climate Change: incorporate climate change in Service activities and decisions. We also address several other objectives through specific actions proposed within this plan. The Wildlife Society (TWS) also published a technical review report in 2004 titled “Global Climate Change and Wildlife in North America” (Inkley et al. 2004). The TWS report provides 18 recommendations to assist land and resource managers in meeting the challenges of climate change when working to conserve wildlife resources (Inkley et al. 2004). Their position is that if land and resource managers collectively implement these recommendations, then cumulatively there would be a positive impact of addressing climate change. Some of the 18 recommendations are not directly applicable to the management of habitats at Sunkhaze Meadows NWR and Carlton Pond WPA.

As such, we discuss our actions relative to addressing some of the pertinent recommendations of the TWS technical report and Service's strategic plan:

### ***Adaptation and Management for Diverse or Changing Conditions***

The habitat management actions described in chapter 3 are intended to promote healthy, functioning native habitats, to protect biological integrity, and maintain the resiliency within these systems to adapt to changing conditions. In its Strategic Plan for Climate Change, the Service recognizes four basic strategies, to climate change adaptation for fish and wildlife resources (based on Millar et al. 2007): resistance, resilience, response, and realignment (USFWS 2010). These strategies are effectively met if we apply our principles of adaptive management whereby we identify the conservation need, deliver the needed action, evaluate the responses to our actions, and realign our management with our monitoring's findings. We intend to implement an adaptive management approach as new information becomes available and our inventory and monitoring actions inform us of changes occurring. Adaptive management requires understanding and baseline data on the refuge and WPA habitats and their species use. Currently, Sunkhaze Meadows NWR and Carlton Pond WPA have very little inventory and monitoring history. Rising to the challenges of climate change and implementation of adaptive management first requires baseline understanding of what the refuge supports, when, and through what contributions. To obtain this information, we propose a series of inventory and monitoring efforts at various refuge units and the WPA to undertake this important first step.

### ***Reduce Nonclimate Stressors on the Ecosystem***

This recommendation, cited by both TWS and the Service, is intended to help species and habitats maintain better resiliency and adaptation against a changing climate. The objectives of our habitat management program are to maintain and enhance the ecological integrity and biological potential on Service-owned lands. Objectives to preserve and manage habitats for native vegetation would help maintain resilience against changes posed by climate change. All alternatives support this recommendation by maintaining ecological function and natural processes.

### ***Maintain Healthy, Connected, Genetically Diverse Populations***

Both TWS and the Service highlight the importance of maintaining large expanses and connected habitats. Small isolated populations are more prone to extirpations than larger, healthy, more widespread populations. Larger tracts of protected land facilitate more robust species populations and can offer better habitat quality in core areas. We would continue to work with our partners at the local, State, Tribal, and university levels to support population inventory and monitoring, and complement our management efforts focused on maintaining and enhancing exemplary natural communities and rare, threatened, and endangered species. Under all alternatives, we would coordinate with other conservation lands and promoting connectivity between area conservation lands as resources allow.

Seavy et al. (2009) highlights the benefits of riparian preservation and restoration and its contribution to migration and connectivity corridors for plants, fish, and wildlife species adjusting to climate change. Under all alternatives we maintain wide natural corridors over land and along waterways to help aid in the connectivity of habitats. In addition, riparian forest expansions promoted under alternatives B and C improve our ability to support these connection

corridors across the surrounding landscape of all refuge units and the WPA. Cumulatively, our proposed actions maintain and enhance connectivity benefits on and adjacent to Service-owned lands.

### ***Prevent and Control Invasive Species***

Climate change may increase opportunities for invasive species to spread, because of their adaptability to disturbance (Inkley et al. 2009; USFWS 2010). Invasive species prevention and control would be essential, including extensive monitoring and control to ensure early detection and rapid response. Invasive species control is a major initiative within the Service (USFWS 2010). In chapter 2, we describe the current extent of invasive species on Service-owned lands, and in chapter 3 we include strategies common to all alternatives for controlling existing and potential invasive plant infestations. Following approval of the CCP, the refuge and WPA will complete an inventory and monitoring plan that would describe monitoring and inventorying strategies to protect against any new infestations.

### ***Select and Manage Conservation Areas Appropriately***

The establishment of refuges, parks, and reserves is used as a conservation strategy to try to minimize the decline of wildlife and habitats in North America. Decisions on locating and managing future conservation areas should take into account potential climate change and variability. We would continue to work with our conservation partners to identify and protect areas that maintain connectivity and biological integrity in the face of climate change and other stressors.

### ***Ensure Ecosystem Processes***

Managers may need to enhance or replace diminished or lost ecosystem processes. Manually dispersing seed, reintroducing pollinators, and treating invasive plants and pests are examples of some ways managers can restore or enhance ecological processes. Our habitat goals and associated objectives under alternative all alternatives include an emphasis on preserving and maintaining ecological processes associated primarily with the peatland-wetland complex and late successional forests on refuge and WPA lands. Alternative A does not include any additional inventory or monitoring actions that might help us better understand these complex processes. Alternative C would address much of the same need, but would alter a significant portion of late successional forest to a more transitional early successional forest habitat. Alternative B focuses instead on preserving and maintaining these ecological systems and improving connectivity and our understanding of these systems through adaptive management.

### ***Use Monitoring and Adaptive Management***

Managers should monitor climate and its effects on wildlife and their habitats and use this information to adjust management techniques and strategies. Given the uncertainty with climate change and its impacts on the environment, relying on traditional methods of management may become less effective. We agree that an effective and well-planned monitoring program, coupled with an adaptive management approach, would be essential to dealing with the future uncertainty of climate change. We have built both aspects into alternatives B and C of this draft CCP and EA. Under all of the alternatives, we would develop a detailed step-down inventory and monitoring plan designed to test our assumptions and management effectiveness as resources

allow. Under all of the alternatives, we intend to use that information to either adapt our management techniques, or reevaluate or refine our objectives as needed.

### **Unavoidable Adverse Effects**

Unavoidable adverse effects are the effects of those actions that could cause harm to the human environment and that cannot be avoided, even with mitigation measures. All of the alternatives would result, to some extent, in minor, localized, unavoidable adverse effects. For example, small construction projects for new parking areas, and boardwalks or signs at Sunkhaze Meadows Unit would produce minor, short-term, localized, adverse effects by removing native vegetation, compacting soils, and disturbing habitat in the project areas. Increased visitation could also have minor unavoidable effects.

Aspects of proposed habitat management would potentially have unavoidable adverse effects as a result of vegetation and soil disturbance. In alternative B, the conversion of 22 acres at the Benton Unit to grassland (if implemented) would result in unavoidable loss of forest habitat, large woody native vegetation, and soil compaction across portions of this area where heavy equipment is used to help clear vegetation. Similarly, clearing of trees across 715 acres at Sunkhaze Meadows Unit under alternative C would also cause unavoidable loss of forest habitat, removal of large woody native vegetation, and create soil compaction. These are small areas compared to the refuge, local, and regional landscapes and we would work to minimize these adverse effects where possible. For example, the 715 acres proposed for young forest management under alternative C include areas that have previously been cleared and are along edges of the current forested habitat. This minimizes loss of existing, mature forest as well as forest fragmentation. We do not believe that any of these effects would rise to a significant level.

Some aspects of wildlife-dependent recreation, such as hunting or fishing, would result in the unavoidable adverse impacts on individual fish and wildlife as a result of providing that activity. However, we would protect populations from adverse effects by requiring all participants follow applicable State and Federal regulations. In addition, we anticipate long-term benefits to species and habitats from connecting people with nature through these activities. In addition, alternatives B and C propose management actions that would result in improved habitat for fisheries and wildlife.

All of these unavoidable adverse effects on the physical and biological environment would be relatively local and more than offset by the long-term benefits for the diversity and ecological health of the broader landscape.

Some impacts on certain individuals or Service neighbors may be unavoidable, but our responsibility is to provide equal opportunities to the American public, not a select few. We believe we have sought a fair balance in minimizing and mitigating adverse impacts while providing quality recreational opportunities to the public. All of what we propose in the arena of public use takes into account opinions expressed during public involvement and input during the planning process.

## Potential Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be undone, except perhaps in the extreme long term. One example is an action that contributes to a species' extinction. Once extinct, it can never be replaced and is an irreversible loss. By comparison, irretrievable commitments of resources are those that are lost for an extended period of time, but could be undone given sufficient time and resources, although there may be a loss in productivity or use for a time. An example of an irretrievable commitment is converting what was once a mature forest and actively managing and maintaining it in an early successional forest habitat condition. If, for some reason, that early successional habitat was no longer an objective, those acres could progress gradually to mature forest again over a period of 70 or more years, or we could determine it best to expedite that reversion by planting shrubs and trees and controlling invasive plants.

Some habitat types on the refuge could be adversely affected. In alternative C, for example, we proposed conversion of 715 acres of late successional forest to early successional habitat at the Sunkhaze Meadows Unit and 92 acres of grassland to shrubland at the Benton Unit. This type of habitat conversion would result in a net loss of late successional forests and grassland that would be unavoidable if those management actions are carried out. By contrast, alternative B has lesser extents of conversion, including 3 acres of grassland converted to late successional forest, and 22 acres of forest potentially converted to grassland at the Benton Unit.

Public use developments proposed under alternatives B and C would result in small localized commitments to infrastructure and their maintenance. Alternatives B and C both propose expansion of trail systems, new parking area, and updated signs and kiosks. Cumulatively, these small improvements would require commitment of occasional resource and staff investment to implement and maintain.

## Environmental Justice

President Clinton signed Executive Order No. 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" on February 11, 1994, to focus Federal attention on the environmental and human health conditions of minority and low-income populations, with the goal of achieving environmental protection for all communities. The order directs Federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high, adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The order is also intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority and low-income communities' access to public information and participation in matters relating to human health or the environment.

We expect none of the three proposed alternatives to have significant adverse cumulative impacts on the economy of the towns or counties in which refuge lies. We would expect none of the alternatives to alter the demographic or economic characteristics of the local community. The actions we propose would neither disproportionately affect any communities nor damage or undermine any businesses or community organizations. All of the alternatives would maintain the existing landscape. Consequently, no adverse impacts would be expected including changes in the community character or demographic composition.

Overall, we expect none of the alternatives would place a disproportionately high, adverse environmental, economic, social, or health effects on minority or low-income persons. Our programs and facilities are open to all who are willing to adhere to the established refuge rules and regulations, we acquire land only from willing sellers, and we do not discriminate in our responses for technical assistance in managing private lands.

## Summary of Environmental Consequences by Alternative

Table 4.2. A Summary of the Foreseeable Consequences of Each Alternative.

<b>Resource or Program</b>	<b>Alternative A Current Management</b>	<b>Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)</b>	<b>Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use</b>
<i>Air Quality</i>	Land management would continue to provide direct and cumulative benefits to air quality by maintaining natural vegetative cover on up to 11,876 acres at Sunkhaze Meadows NWR and 1,068 acres at Carlton Pond WPA.  Limiting public uses to those found to be appropriate and compatible would also continue to benefit air quality by limiting emissions associated with uncontrolled visitation.	Same as alternative A.	Same as alternative A.
	Refuge and WPA land protection would sustain long-term plant growth that would have a small benefit in sequestering carbon and reducing greenhouse gases.	Long-term benefits for air filtering and carbon sequestration from land protection would be similar to those in alternative A.	Long-term benefits for air filtering and carbon sequestration from land protection and management would be similar to those in alternatives A and B.
	Alternative A would include fewer ground-disturbing and management activities that would introduce additional short-term emission sources than alternatives B and C.	Construction activities involved in land management and expanding visitor service infrastructure would cause short-term, localized adverse impacts from construction vehicles and equipment exhausts would occur.	Short-term impacts due to construction emissions would be similar to alternative B.
	The regional vehicle emissions resulting from approximately 6,300 visits to Service-owned lands and WPA lands would continue to be negligible in comparison to ambient air quality and emission from the surrounding region.	Expanding refuge programs and improving facilities is expected to increase visitation modestly. A marginal increase in local vehicle emissions would result from the increase in visitation, but it would be negligible in comparison to ambient air quality and emissions associated with land uses surrounding Service-owned lands.	Air quality impacts would be similar to those described under alternative B, except an increase in visitation would be slightly greater (5 percent) than alternative B.
	Under all of the alternatives, synthetic sources of emissions from refuge activities and visitor vehicles are negligible compared to emissions associated with the variety of land uses around the Bangor and Milford-Orono region and adjacent highways. There are no major stationary or mobile sources of air pollution present on Service-owned lands nor would any be created under any of the alternatives. Adverse impacts are not expected to exceed Federal Clean Air Act air quality standards. No Class I air quality areas would be affected.		

<b>Resource or Program</b>	<b>Alternative A Current Management</b>	<b>Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)</b>	<b>Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use</b>
<i>Hydrology and Water Quality</i>	<p>Long-term benefits for hydrology and water quality would result from protecting streams and other open waters within the approved Service land boundaries.</p> <p>Some negligible risks to water quality from herbicide use in conjunction with invasive plant management. That impact is minimized by using only approved herbicides, having a spill plan, and using the herbicide as instructed by the manufacturer and refuge policy.</p>	<p>Overall impacts would be the similar as for alternative A, except:</p> <p>Increasing the forested riparian buffer width at Sandy Stream Unit to a minimum of 90 feet would help improve water quality protection through additional shading and buffering effects.</p>	<p>Overall impacts would be the same as for alternative B.</p>
<p>None of our proposed management activities should adversely affect local or regional hydrology and water quality. None would violate Federal or State standards for contributing pollutants to water sources; all three would comply with the Clean Water Act.</p>			
<i>Soils</i>	<p>Long-term benefits for soils from protecting lands within the approved Service land boundaries.</p>	<p>Long-term benefits for soils from land protection would be similar to alternative A.</p>	<p>Long-term benefits for soils from land protection would be similar to alternative A.</p>
	<p>Minor soil displacement and loss may result from public use and land management activities.</p>	<p>Short-term soil compaction and erosion from trail maintenance crews and refuge visitors, but impact area limited to existing trails.</p> <p>Closure of two Buzzy Brook Trails would reduce the long-term impact to soils by limiting access in this portion of Service-owned lands.</p>	<p>Same as alternative B, except the Buzzy Brook Trails would remain open and receive regular maintenance. This would increase the potential for additional localized soil compaction and erosion.</p>
	<p>No added trails would prevent impacts to soils.</p>	<p>Construction of a 1.4-mile long connector trail near Carter Meadow Road would result in limited and localized soil disturbance during construction.</p>	<p>Same as alternative B.</p>
	<p>Visitation could potentially result in localized soil compaction or erosion. Service staff would monitor trails to evaluate ongoing impacts and needs to minimize impacts.</p>	<p>Increased visitation under alternative B could result in increased potential for soil compaction and erosion along trails and other access areas. Service staff would monitor trails and access areas to evaluate any impacts as a result of increased use.</p>	<p>Similar to alternative B, except the 5 percent additional increase in visitation compared to alternative B could have a increase the potential for compaction and erosion.</p>
<i>Vegetation</i>	<p>Continue to have minimal coordination with the electric utility companies in regards to right-of-way maintenance.</p>	<p>The Service would work with the electric utility companies to selectively manage the 107-acre transmission line right-of-way to periodically clear tall-growing woody vegetation in order to maintain line</p>	<p>Same as alternative B.</p>

<b>Resource or Program</b>	<b>Alternative A Current Management</b>	<b>Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)</b>	<b>Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use</b>
		clearances required by the Federal Energy Regulatory Commission, and to maintain lower-growing shrub cover for migratory and breeding bird habitat.	
	The current lack of staff would continue to inhibit our ability to assess and manage forests on the refuge and WPA.	Continue to manage forests with a focus on promoting late successional forest vegetation on the refuge and WPA.	Creating an additional 715 acres of early successional habitat on the Sunkhaze Meadow Unit on a 45-year rotation would convert existing mid-to-late successional forest to early successional shrub and sapling vegetation.
	The current lack of staff would continue to inhibit our ability to assess and manage the white cedar woodland fen.	Increased management of the white cedar woodland fen would maintain and/or increase this vegetation cover at Sunkhaze Meadows Unit.	Same as alternative B.
	The current lack of staff would continue to inhibit our ability to assess and understand the management needs for forests on the refuge and WPA.	Conducting a forest health and condition assessment at Sunkhaze Meadows Unit, Benton Unit, and Carlton Pond WPA would increase our understanding and management of mixed hardwood forest vegetation on Service-owned lands.	Same as alternative B.
	Existing grassland areas would remain in place as a result of our annual haying agreement and occasional prescribed burning.	At the Benton Unit, ongoing grassland management would augment the existing mowing regime and focus on increasing native species diversity and improving grassland habitat through invasive species control and prescribed burning. This more intensive management would likely improve the species diversity and grassland bird nesting opportunities within Benton Unit's grassland.	Conversion of 95 acres of grassland to shrubland at the Benton Unit would result in the removal of most of the grassland habitat at this unit.
	Continue to mow the 3-acre patch of grassland along the northern boundary of the Benton Unit.	Conversion of 3 acres of grasslands to forested vegetation at the Benton Unit would result in a slight reduction of grassland habitat and a corresponding increase in forested cover.	Same as alternative B.
	The 22-acres of northern hardwoods-mixed forest within the central portion of the Benton Unit would continue to be supported through minimal management.	The potential conversion of 22 acres (if determined appropriate by staff and site conditions) of northern hardwoods-mixed forest at the Benton Unit would convert this area from forest to a wet-mesic grassland vegetation type.	Same as alternative A.

<b>Resource or Program</b>	<b>Alternative A Current Management</b>	<b>Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)</b>	<b>Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use</b>
	No expansion of the riparian forest would result in maintaining shrub and grass cover.	Expanding the riparian forest buffer along Sandy Stream at the Sandy Stream Unit by ceasing mowing would result in approximately 2 acres of grassland being converted to forest vegetation.	Expanding the riparian forest buffer along Sandy Stream at the Sandy Stream Unit through planting would result in approximately 2 acres of grassland being converted to forest vegetation. Compared to alternative B, there would be slightly higher maintenance required to ensure plantings success and survival.
	The current snowmobile trail would continue to bisect the Sandy stream Unit and fragment the vegetative cover.	Relocation of the snowmobile trail at the Sandy Stream Unit would result in increased connectivity of vegetative cover.	Same as alternative B.
	No additional infrastructure would limit impacts to vegetation.	Infrastructure construction projects, such as boardwalks and kiosk or signage installation, would result in small-scale and localized loss of vegetation.	Same as alternative B.
	Current use would have a minimal impact on the compaction and trampling of vegetation.	A modest increase in visitation over alternative A could potentially result in added off trail usage and impacts as a result of soil compaction and trampling of vegetation. Service staff would monitor usage to prevent or correct any unauthorized off trail use.	An additional 5 percent increase in visitation over alternative B could potentially result in added off trail usage and impacts as a result of soil compaction and trampling of vegetation. Service staff would monitor usage to prevent or correct any unauthorized off trail use.
	<p>Long-term preservation of forested habitat, conservation of high-quality bog and wetland habitat at Sunkhaze Meadows Unit and Carlton Pond WPA would be maintained over the life of the CCP.</p> <p>The 107-acre electric utility transmission line right-of-way would periodically be cleared of all woody vegetation in order to maintain line clearances required by the Federal Energy Regulatory Commission.</p> <p>Preservation of the white cedar woodland fen would maintain and/or result in a slight decrease of this vegetation cover at Sunkhaze Meadows Unit as succession, wind throw, disease, or other impacts affect this cover type.</p> <p>Annual mowing of grasslands at the Benton Unit would result in the temporary removal of biomass as hay vegetation in order to maintain the area as a mix of grass and flowering species.</p>		

<b>Resource or Program</b>	<b>Alternative A Current Management</b>	<b>Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)</b>	<b>Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use</b>
	<p>The mixed assemblage of floodplain forest and shrubland at Sandy Stream would be maintained over the life of the CCP.</p> <p>We would continue to monitor and manage invasive species that cause environmental harm such as decline of native species and disruption of environmental processes. We would continue to employ an integrated pest management approach and adaptive management to control invasive plant species. We would also continue to promote visitor and public awareness of invasive plant species issues which could result in increased management of invasive plant species in the region.</p> <p>Continue education and interpretation of native and invasive vegetation to encourage volunteer based control of invasive species.</p>		
<i>Migratory Birds</i>	<p>Continue to have limited ability to manage for breeding, foraging, and stopover habitat for State-listed and regional priority landbird species as part of refuge wetland, grassland, and forest management.</p>	<p>Same as alternative A.</p>	<p>Long-term preservation of forested habitat at Sunkhaze Meadows Unit and Carlton Pond WPA would be maintained similar to alternative A, plus:</p> <p>Creating an additional 715 acres of early successional habitat on the Sunkhaze Meadow Unit on a 45-year rotation would convert existing mid-to-late successional forest to early successional shrub and sapling vegetation, resulting in a 7 percent loss of forested habitat. Creation of early successional areas would also increase the amount of edge habitat within the remaining forested lands. This would result in a net benefit for shrub and edge-nesting species, and a negative impact on late successional forest species.</p>
	<p>Continue to have minimal coordination with the electric utility companies in regards to right-of-way maintenance.</p>	<p>The Service would work with the electric utility companies to selectively manage the 107-acre transmission line right-of-way to periodically clear tall-growing woody vegetation, and to maintain more permanent lower-growing shrub cover for migratory and breeding bird habitat.</p>	<p>Same as alternative B.</p>
	<p>Short-term, temporary impacts result from human presence on trails, research, and the presence of dogs;</p>	<p>A modest potential increase in visitation could add to the potential for occasional migratory bird disturbance.</p>	<p>Same as alternative B, but the additional 5 percent increase over alternative B</p>

<b>Resource or Program</b>	<b>Alternative A Current Management</b>	<b>Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)</b>	<b>Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use</b>
	however, the requirement to stay on trails and on leash would minimize the extent and duration of impacts.		would result in even greater potential for occasional migratory bird disturbance.
	The existing 95 acres of grassland would continue to provide marginal grassland bird habitat due to its size and configuration.	The potential conversion of 22 acres (if determined appropriate by staff and site conditions) of northern hardwoods-mixed forest at the Benton Unit would convert this area from forest to a wet-mesic grassland, which could create a more contiguous habitat for nesting grassland birds.	Conversion of 92 acres of grasslands to shrubland habitat at the Benton Unit would result in increased shrubland habitat and a corresponding loss in grassland cover. This is expected to have an increase in nesting of species that utilize shrublands along with a corresponding loss of grassland bird nesting.
	Continue to maintain the 3-acre patch of grassland near the northern boundary of the Benton Unit.	Conversion of 3 acres of grasslands to forested vegetation at the Benton Unit would result in a slight reduction of grassland habitat and a corresponding increase in forested cover. This is expected to have a negligible impact on landbird nesting cover.	Same as alternative B.
	The existing riparian forest corridor at the Sandy Stream Unit would continue to provide minimal cover and forage for migrating and nesting birds.	Expanding the riparian forest buffer along Sandy Stream at the Sandy Stream Unit by ceasing mowing would result in approximately 2 acres of shrubland being converted to forest vegetation, which would provide a minor increase in forested nesting cover in the future.	Same as alternative B.
	The existing snowmobile trail would continue to fragment and limit available habitat.	Relocation of the snowmobile trail at the Sandy Stream Unit would result in increased connectivity of available shrub habitat, thereby improving habitat availability for migrating and nesting songbirds.	Same as alternative B.
	We would continue to rely primarily on partners for information regarding species use at the refuge and WPA.	Increased knowledge and understanding of bird populations resulting from various surveys and inventories would help us better quantify effects on birds on Service-owned lands.	Same as alternative B.
	The current low levels of use would continue to have minimal effect on migratory bird use at the refuge and WPA.	Increased visitation could potentially result in added off trail usage impacts and disturbance as a result of use. Service staff would monitor usage to prevent or correct	Expanding the trail network for wildlife observation at Benton Unit could potentially result in added off trail usage

<b>Resource or Program</b>	<b>Alternative A Current Management</b>	<b>Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)</b>	<b>Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use</b>
		any unauthorized off trail use or added disturbance that might influence nesting.	impacts and disturbance as a result of use.  Increased visitation (slightly more of an increase over alternative B) could potentially result in added off trail usage impacts and disturbance as a result of use. Service staff would monitor usage to prevent or correct any unauthorized off trail use or added disturbance that might influence nesting.
	<p>Continued forest preservation would maintain mid-to-late successional forest habitat benefitting a variety of raptor, songbird, and other species that utilize forests for migratory stopover and breeding habitat.</p> <p>Habitat for waterfowl, wading birds, shorebirds, and landbirds at Carlton Pond WPA would remain unchanged amongst all alternatives.</p> <p>Periodic clearing of the 107-acre electric utility transmission line right-of-way of vegetation would result in the temporary loss of shrubs and other woody nesting cover, along with a corresponding increase in temporary grassland habitat.</p> <p>The lack the staff would continue to limit our ability to evaluate and monitor Benton Unit grasslands and to modify our management accordingly to better meet wildlife objectives.</p> <p>Our lack of staff limits our ability to monitor nesting birds and habitat conditions across all units of Sunkhaze Meadows NWR and Carlton Pond WPA. Similarly, we would be unable to monitor potential impacts of public use, water level changes, or invasive species.</p> <p>We would continue to coordinate with MDIFW on information sharing and decision-making recommendations to maintain partnerships in protection of State endangered species.</p>		
<i>Fish and Mussels</i>	The lack of staff inhibits our ability to monitor and evaluate the status of fish and freshwater mussel resources on the refuge and WPA.	Staffing would allow us to improve our monitoring and evaluation of fish and freshwater mussels on the refuge and WPA. This increased knowledge would help us improve our management for these resources.	Same as alternative B.
	The current riparian forest buffer at the Sandy Stream Unit would continue to provide minimal benefits to Sandy Stream in terms of soil stabilization and food web inputs.	Expansion of the forested riparian buffer at Sandy Stream Unit would have a small long-term benefit to fish and freshwater mussel resources within Sandy Stream.	Same as alternative B.

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
	<p>Protection of the existing freshwater wetlands, streams, and other open water areas at Service-owned lands protects and supports a number of aquatic species (see Table 2-10).</p> <p>Continue enforcement against deliberate introductions of nonnative fish, and outreach and education to explain the impacts of those introductions as well as the accidental introductions of invasive plants, pathogens, and exotic, invasive invertebrates.</p> <p>Sunkhaze Meadows NWR and Carlton Pond WPA would continue to provide habitat primarily for warmwater and, to a lesser extent, coldwater fish species.</p> <p>State regulations would be adhered to, which establish species and harvest limits to insure no cumulative impact on any fish populations. Continue to work with the MDIFW on outreach, education and law enforcement related to fisheries.</p>		
<i>Mammals</i>	The current lack of staffing would limit our ability to conduct inventories that would improve our knowledge and understanding of species use on the refuge and WPA.	Increased knowledge and understanding of bird populations resulting from various surveys and inventories would help us better quantify effects on birds on Service-owned lands.	Same as alternative B.
	Maintaining the existing snowmobile route would continue to fragment shrubland habitat at Sandy Stream Unit.	Relocation of the snowmobile trail at the Sandy Stream Unit would result in increased connectivity of available shrub habitat, thereby reducing the proximity and intensity of disturbance on overwintering mammals.	Same as alternative B.
	Maintaining 6,906 acres of mature forest at the Sunkhaze Meadows Unit would sustain habitat suitable for forest dwelling mammals.	Same as alternative A.	Creating an additional 715 acres of early successional habitat on the Sunkhaze Meadow Unit on a 45-year rotation would convert existing mid-to-late successional forest to early successional shrub and sapling vegetation, resulting in a 7 percent loss of forested habitat. Creation of early successional areas would also increase the amount of edge habitat within the remaining forested lands. This would result in a net benefit for shrub and edge-dwelling species, and a negative impact on forest species.
	The existing combination of grassland and forest would benefit a combination of grassland and edge-dwelling mammals.	The potential conversion of up to 22 acres of forest to grassland at the Benton Unit would increase the size and connectivity of grasslands on site. This would have a net benefit for grassland dwelling mammals.	Conversion of 92 acres of grasslands to shrubland habitat at the Benton Unit would result in increased shrubland habitat and a corresponding loss in

Resource or Program	Alternative A Current Management	Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)	Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use
	Short-term, temporary impacts result from human presence on trails, research, and the presence of dogs; however, the requirement to stay on trails and on leash would minimize the extent and duration of impacts.	A modest increase in visitation over alternative A could potentially result in added off trail usage impacts and disturbance as a result of use. Service staff would monitor usage to prevent or correct any unauthorized off trail use or added disturbance that might influence nesting.	grassland cover. This is expected to have an increase in utilization by species that inhabit shrublands.  Increased visitation (slightly more of an increase over alternative B) could potentially result in added off trail usage impacts and disturbance as a result of use. Service staff would monitor usage to prevent or correct any unauthorized off trail use or added disturbance that might influence mammal behavior.
	Sunkhaze Meadows NWR and Carlton Pond WPA would continue to provide habitat for primarily forest and wetland dwelling species, as well as upland grassland and shrubland species.  Continue to coordinate with MDIFW on information sharing and decision-making recommendations to maintain partnerships in protection of mammals utilizing Service-owned lands.		
	<i>Other Native Wildlife (Amphibians, Reptiles, and Invertebrates)</i>	Land protection and management would continue to provide habitats similar to that noted under common to all alternatives.	In addition to impacts and benefits noted under common to all alternatives, long-term preservation of forested habitat at Sunkhaze Meadows Unit and Carlton Pond WPA would benefit mature forest dwelling species.
Maintaining the existing riparian forest at the Sandy Stream Unit would provide minimal benefit to species sensitive to riparian corridor alterations.		Expanding the riparian forest buffer along Sandy Stream at the Sandy Stream Unit by ceasing mowing would result in approximately 3 acres of grassland being converted to forest vegetation. This would provide a minor increase in forested riparian cover in the future	Same as alternative B.

<b>Resource or Program</b>	<b>Alternative A Current Management</b>	<b>Alternative B Increased Habitat Enhancement and Improved Visitor Services (Service-preferred Alternative)</b>	<b>Alternative C Increased Shrub and Young Forest Habitat and Increased Public Use</b>
		benefitting species sensitive to changes in riparian corridors such as wood frogs, eastern red-backed salamanders, and spotted salamanders	
	Maintaining the current grassland and forest would sustain a mix of habitat for reptile and amphibian use at the Benton Unit.	Conversion of 3 acres of grasslands to forest and potentially 22 acres of forest to grassland vegetation at the Benton Unit would result in a slight increase of grassland habitat and a corresponding reduction in forested cover. This is expected to have a negligible impact on reptile and amphibian use.	Conversion of 92 acres of grasslands to early successional habitat at the Benton Unit would result in increased shrubland habitat and a corresponding loss in grassland cover. This is expected to have an increase in utilization by species that inhabit shrublands along with a corresponding loss of grassland species.
	Maintaining the existing snowmobile route would continue to fragment shrubland habitat at Sandy Stream Unit.	Relocation of the snowmobile trail at the Sandy Stream Unit would result in increased connectivity of available shrub habitat. Increased connectivity would improve habitat conditions and use by amphibians (Cushman 2005).	Same as alternative B.
	The current lack of staffing would limit our ability to conduct inventories that would improve our knowledge and understanding of species use on the refuge and WPA.	Increased knowledge and understanding of reptile, amphibian, and invertebrate populations resulting from various surveys and inventories would help us better quantify effects on species utilizing Service-owned lands.	Same as alternative B.
	Short-term, temporary impacts result from human presence on trails, research, and the presence of dogs; however, the requirement to stay on trails and on leash would minimize the extent and duration of impacts.	A modest increase in visitation over alternative A could potentially result in added off trail usage impacts and disturbance as a result of use. Service staff would monitor usage to prevent or correct any unauthorized off trail use or added disturbance that might influence breeding.	Increased visitation (slightly more when compared to alternative B) could potentially result in added off trail usage impacts and disturbance as a result of use. Service staff would monitor usage to prevent or correct any unauthorized off trail use or added disturbance that might influence breeding.
	Sunkhaze Meadows NWR and Carlton Pond WPA would continue to provide habitat for primarily forest and wetland dwelling species, as well as stream and open water associated species.  Under all alternatives we would continue to monitor and manage invasive species that cause environmental harm such as decline of native species and		

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	<p>disruption of environmental processes. The use of herbicides to complete aspects of invasive species management can cause negative impacts to some invertebrates. However, our attempts to minimize use and application of integrated pest management techniques should minimize any impact on invertebrate populations.</p> <p>The preservation of native plants as a result of our land management would sustain vegetation diversity, which in turn would likely improve available habitat for invertebrates. This would continue to sustain State special concern reptile and amphibian species through protection of hibernation, foraging, and breeding habitat.</p>		
<i>Federal Endangered and Threatened Species, including Recently De-listed Species</i>	<p>The low level of public use would continue to have minimal impact on federally listed species on the refuge and WPA.</p>	<p>A modest increase in visitation could potentially result in added off trail usage impacts and disturbance as a result of use. Service staff would monitor usage to prevent or correct any unauthorized off trail use or added disturbance that might influence nesting.</p>	<p>Same as alternative B, except for the added potential for impacts resulting in an additional 5 percent in visitation over alternative B and potential for impacts to nesting eagles from added month of coyote season.</p>
	<p>Under all the alternatives, the Service would work to maintain water quality in Sunkhaze Stream and maintain the aquatic and riparian habitats in and along Sunkhaze Stream and its tributaries to sustain conditions for Atlantic salmon and American eel.</p> <p>Continue to maintain nesting and foraging habitat for bald eagles.</p> <p>We would continue to implement public access restrictions to protect the nesting bald eagles through closure of the nesting sites as necessary.</p> <p>We would continue to coordinate with MDIFW on information sharing and decision-making recommendations to maintain partnerships in protection of endangered species.</p>		
<i>Public Use and Access</i>	<p>The ongoing lack of staffing would limit our ability to maintain and update public access infrastructure.</p>	<p>Increased opportunities for wildlife observation would result from providing additional fishing access points and boardwalks, increasing trail maintenance on remaining trails, and construction of a new trail near Carter Meadow Road.</p>	<p>Same as alternative B.</p>
	<p>North and South Buzzy Brook Trails (3.0 miles and 2.4 miles, respectively) would become increasingly inaccessible as vegetation continues to inhibit trail access.</p>	<p>North and South Buzzy Brook Trails would be closed due to difficulty of ongoing maintenance, resulting in a loss of 5.4 miles of trail.</p>	<p>Benefits would result from keeping the two Buzzy Brook Trails open, which would maintain the current number and miles of trails available to visitors.</p>
	<p>Maintain State seasons for hunting on all refuge and WPA lands, except for the refuge-specific shortened coyote season.</p>	<p>Same as alternative A.</p>	<p>Benefits to hunters would result from expanding the coyote hunting season an extra month on Service-owned lands.</p>

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			Adverse impacts to other priority public uses could result from conflicts from the expanded coyote hunting season.
	Continue to not promote commercial guiding as an allowed use on refuge and WPA lands.	Allowing commercial guiding under a special use permit would potentially result in increased public access.	Same as alternative B.
	Continue to allow pedestrian access off trail and along the existing snowmobile trail at the Benton Unit.	Increased opportunities for wildlife observation and interpretation at Benton Unit would result from creating a connector trail to link the parking lot and the existing snowmobile trail. Benefits would result for the public from staff regularly updating and improving refuge interpretation infrastructure.	Benefits would result from adding approximately two miles of new trail at the Benton Unit, providing more opportunities for that area's use for wildlife observation and interpretive purposes and increased visitation to Benton Unit more than under alternative B.
	Continue to rely exclusively on partners for implementation of interpretive programming at the refuge and WPA.	Additional benefits would result from improved public use programming, as well as wildlife-dependent recreation and interpretive opportunities from expanded partnerships with the Friends of Sunkhaze Meadows, surrounding municipalities, the Penobscot Indian Nation, local schools and universities, and other partners.	Further benefits would result from the expanded partnerships detailed under alternative B, which would include increased programming at Carlton Pond WPA, as well as Benton and Sandy Stream Units, under alternative C.  Further opportunities for wildlife observation at the Sunkhaze Meadows Unit would be provided by replacing the Carter Meadow observation deck and increasing trail maintenance.
	<p>Benefits to public use would result from continuing to provide quality, compatible wildlife-dependent recreation opportunities.</p> <p>Continuing to allow the Friends of Sunkhaze Meadows to assist with and develop interpretive programming that uses refuge lands and encourages visitation and improves the public's connection with nature.</p> <p>Potential adverse impacts would result from continuing to limit public use and access in ecologically sensitive areas to the extent necessary for adequate species protection.</p> <p>Bicycling would continue to be restricted only along McLaughlin Road at the Sunkhaze Meadows Unit.</p>		

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<i>Socioeconomic Environment</i>	Continue to contribute minimally relative to local and much larger Bangor and Milford-Orono area economy, in terms of refuge staff jobs, income, refuge and visitor expenditures, and the purchase of goods and services for refuge activities.	In addition to alternative A,  Improving access to and infrastructure for successful wildlife observation, hunting, and fishing would contribute to increased economic benefits to the local economy generated from increased out of town visitors and related expenditures.  Upgrade and new construction projects would also contribute to the local economy for labor, materials, and services.	Same as alternative B.
	Continue to meet a substantial level of public demand in providing wildlife-dependent recreational activities, adding to the quality of life of the local community and other recreationists and wildlife enthusiasts in the region.	Additional refuge programs and surrounding population growth would modestly increase visitation compared to alternative A. As a result, local economies would experience minimally increased benefits in terms of retail expenditures for purchasing auto fuel and related expenditures.	Additional visitation (slightly more of an increase over alternative B) and an increased focus on expanded interpretive and educational programming would result in increased benefits in terms of retail expenditures for purchasing auto fuel and related expenditures as compared to other alternatives.
	Continue to not provide additional environmental education, staff-led interpretation, or wildlife photography opportunities.	Adding four staff specifically for Sunkhaze Meadows and Carlton Pond WPA would increase benefits for the local economy in jobs, income, expenditures, and purchases of goods and services for refuge activities.  Staffing and funding would improve our ability to communicate with the community about the values of Service-owned lands and opportunities for recreation under this alternative.	In addition to alternative B, adding two seasonal positions (in addition to four full-time staff as proposed under alternative B) specifically for Sunkhaze Meadows and Carlton Pond WPA would increase benefits for the local economy in jobs, income, expenditures, and purchases of goods and services for Service activities.
	We would continue to maintain existing opportunities for hunting and fishing and not provide any expansion of opportunities.	In addition to alternative A, improvements in infrastructure would benefit access to hunting and fishing opportunities.	Same as alternative B, except that the coyote hunting season would be extended by another month in spring.
	Of the management activities that would not vary by alternative, the following would benefit or adversely affect the socioeconomic environment of Service-owned lands: protecting land, maintaining facilities, supporting research and Friends of Sunkhaze Meadows NWR group activities at Service-owned lands, and implementing existing priority public use opportunities.		

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<i>Cultural and Historic Resources</i>	Same as common to all alternatives.	Same as alternative A, except ensuring consistent messaging in partner-sponsored interpretive programming would improve our communication of the significance of cultural resources and the importance of their protection and interpretation.	Same as alternative B.
	Rely primarily on partners to organize and implement cultural resource interpretive materials and programming.	Work with the Penobscot Indian Nation to explore opportunities for developing materials and programming to better interpret cultural resources would result in improved interpretive materials and programming and help visitors to gain appreciation for the historic and cultural significance of Service-owned lands and resources within them.	Same as alternative B.
	The current low level of visitation would continue to pose little or no threat to existing cultural or archaeological sites on the refuge and WPA.	An expected increase in visitation to all Service-owned lands is anticipated under alternative B. Increased visitation could potentially result in added off trail usage and disturbance, which could potentially degrade or disturb archaeological and cultural resource sites. Service staff would monitor usage to prevent or correct any unauthorized off trail use that may threaten archaeological and cultural resources.	Same as alternative B.
	<p>Under all alternatives, we would continue to protect the archaeological or cultural resource sites known to be present on Service-owned lands.</p> <p>Several archaeological or cultural resource sites are known on Service-owned lands. There are no known historic structures on Service-owned lands.</p> <p>If we should identify sites eligible for the National Register, we would coordinate their protection with our Regional Archaeologists and the Maine State Historic Preservation Office (SHPO).</p>		