



USFWS

Chapter 4

Environmental Consequences

- Introduction
- Effects on Water Quality and Soils
- Effects on Air Quality
- Effects on the Local and Regional Economy
- Effects on Public Use Opportunities
- Effects on Cultural Resources
- Effects on Native Wildlife and Their Habitats
- Environmental Justice
- Cumulative Impacts
- Relationship between Short-Term Uses and Long-Term Productivity
- Unavoidable Adverse Effects
- Potential Irreversible and Irretrievable Commitment of Resources

Introduction

This chapter describes the foreseeable environmental consequences of implementing the three management alternatives in chapter 2. When detailed information is available, we present a scientific and analytic comparison between alternatives and their anticipated consequences, which we describe as “impacts” or “effects.” When detailed information is not available, we base those comparisons on our professional judgment and experience.

As you read our descriptions of impacts, we ask that you also keep in mind the relative size of the refuge in proportion to the entire Gulf of Maine ecosystem. The refuge now comprises 5,293 acres, a relatively small land base compared to the 26-million-acre ecosystem. We generally describe the direct and indirect environmental effects on a finer, or more local, geographic scale, because those are easier to determine with certainty. However, refuge lands are not isolated units, and our predictions on the extent or duration of impacts may be less accurate when considering their influence on the larger, surrounding landscape. In other words, we may have overstated some effects in their larger geographic context.

Although the refuge composes only 0.02 percent of the ecosystem, we developed all of the alternatives to contribute to conservation goals in a larger, geographic context. Their proposed species and habitat actions are consistent with the state, regional, ecosystem and watershed conservation plans identified in chapter 1. At varying levels, each would contribute positively to that landscape-scale conservation.

When we lack reliable, quantitative information, we use the terms “positive,” “negative,” and “neutral” as qualitative measures of how an action could impact resources of concern. A positive impact implies an action we predict would enhance or benefit the resources under consideration and help accomplish goals and objectives over the short (<15 years) or long term (>15 years). A negative impact would be detrimental to a resource over the short or long term, possibly affecting our ability to achieve goals and objectives. A neutral impact means either (a) no discernible effect, positive or negative, on the resources under consideration; or, (b) positive and negative effects would cancel each other out.

We analyze and compare each of the three alternatives for their impacts on water quality and soils, air quality, the local and regional economy, public use opportunities, cultural resources, and wildlife and their habitats. Tables 4.1 through 4.6 summarize the effects we predict for each alternative, and present a side-by-side comparison. This chapter also addresses environmental justice and cumulative impacts. Finally, it identifies irreversible or irretrievable commitments of resources and the relationship of short-term uses to long-term productivity.

Effects on Water Quality and Soils

Protecting the water quality and ecological integrity of the tidal rivers and their estuaries along Maine’s southern coast requires a partnership among government, civic groups, conservation organizations, and residents throughout the entire watershed. Wetland impacts, including filling for development, are regulated and restricted by local, state, and federal laws. However, they afford the uplands minimal protection. Freshwater wetlands are biologically diverse, and support common and rare species. Not only are upland areas around wetlands vital for sustaining the health of a freshwater wetlands system, but also, contiguous freshwater wetlands and sufficient uplands are vital in maintaining water quality of downstream saltmarsh ecosystems.

Coastal Maine is the most important resource for the tourism and recreation industries in the state (Colgan and Plumstead 1995). Commercial and private development along Maine’s

coast continues to increase, with additional development of the waterfront for summer homes, piers, and docks. Direct impacts on coastal habitats include filling, dredging, dragging, riprapping, damming, covering, impounding, scraping, or other physical alterations (Ward 1999). That development, combined with associated human activities, can degrade water quality and remove natural vegetation, resulting in increased soil disturbance and erosion, increased storm water runoff, and changed hydrology patterns. Although individual building projects may appear small and those losses minimal, their cumulative effect is significant, and often diminishes habitat quality for native species.

Stormwater is the water that runs along the ground or through pipes. As that water moves across lawns, driveways, roofs, roads, and parking lots, it collects sediment, bacteria, chemicals, debris, and more, until it finally discharges into fresh water and saltwater habitats. The Casco Bay Estuary Project finds that stormwater may be the single greatest contributor of contaminants in the bay. Nationwide, stormwater is one of the leading causes of water pollution. The two primary sources of contaminated stormwater are point and non-point source pollution. Point sources carry stormwater through direct, identifiable means such as pipes. Non-point sources include runoff from land or groundwater seepage that enters rivers and estuaries from paved areas, malfunctioning septic systems, and other sources. National studies estimate that non-point source pollution contributes up to 60 percent of stormwater pollutants. The most common sources of pollution from stormwater runoff throughout the refuge include residential development, construction, and roadways. Industrial sites, commercial development, and agriculture also contribute to stormwater runoff near some divisions.

The Pew Oceans Commission, an independent panel, says “oceans are in crisis” (Pew Oceans Commission 2003). The threats include nonpoint source pollution (e.g., oil runoff from streets and driveways and nitrogen release), point source pollution (e.g., waste from feedlots and passenger cruise ships), invasive species, aquaculture (e.g., the accidental escape of fish, nitrogen, phosphorus and fecal matter discharge), coastal development, overfishing, habitat alteration from fishing gear that drags the seafloor, bycatch, and climate change. The commission regards the runoff of excess nitrogen from farm fields, animal feedlots, and urban areas as the greatest pollution threat to coastal marine life. That coastal development and associated sprawl each year destroys or endangers 20,000 acres of coastal wetlands and estuaries that serve as nurseries for fish. “Paved surfaces have created expressways for oil, grease, and toxic pollutants into coastal waters” (Pew Oceans Commission 2003).

At the local level, refuge management can help maintain and improve water quality and soils in several ways: (1) acquire wetlands and associated uplands threatened with development; (2) facilitate the protection by our conservation partners of important coastal habitats; (3) exchange technical information on best management practices with landowners; and (4) restore degraded areas. However, some of the management practices we employ, (such as prescribed fire), have the potential to negatively impact water quality and soils.

In all three alternatives, the refuge will follow carefully designed management plans to prevent or minimize any adverse affects on water quality and soils. Our goal is to restore water quality. We would use wetland restoration techniques according to approved wetlands permits, and restore already degraded ecosystems. We designed trails and parking areas to minimize water quality and soil degradation and maximize interpretive opportunities to build public awareness about protecting those resources.

The boat launch could degrade water quality up and down stream (tidal) through bank or streambed erosion, or introduction of potentially toxic materials. Dormant or unavailable toxins or heavy metals could be in existence in the muddy bottom and could be stirred and

become available to aquatic species. Activities in the vicinity of the launch sites can result in compaction of soils, trampled vegetation and erosion to habitats, especially in riparian zones.

Table 4.1 presents both the beneficial and the potential adverse consequences of our proposed management in the three alternatives.

Table 4.1. The effects of the proposed alternatives on water quality and soils

<i>Alternative A Current Management</i>	<i>Alternative B Our Preferred Alternative</i>	<i>Alternative C</i>
<p>Proposed acquisition of the remaining 3,833 acres within the refuge’s approved acquisition boundary will permanently protect these lands from development.</p> <p>This protection will eliminate or minimize the impacts of point and non-point pollution and other degradation, protecting water quality and soils long-term on the refuge.</p> <p>We will continue to participate in the Mountain to the Sea Conservation Initiative centered on the York River and work with the Wells National Estuarine Research Reserve and their watershed-based initiatives.</p>	<p>Proposed acquisition of the remaining 3,833 acres within the refuge’s approved acquisition boundary and an additional 5,558 acres will permanently protect these lands from development.</p> <p>Alternative B provides a greater ability to eliminate or minimize the impacts of point and non-point pollution and other degradation, protecting water quality and soils long-term on and adjacent to the refuge.</p> <p>We will actively participate as a member of the Board or other Steering Committee for the Mountain to the Sea Initiative, Saco Bay Partners, and Wells National Estuarine Research Reserve and facilitate watershed-wide or multi-town conservation efforts to protect water quality in coastal Maine.</p>	<p>Proposed acquisition of the remaining 3,833 acres within the refuge’s approved acquisition boundary and an additional 11,397 acres will permanently protect these lands from development.</p> <p>Alternative C provides the greatest ability to eliminate or minimize the impacts of point and non-point pollution and other degradation, protecting water quality and soils long-term on and adjacent to the refuge.</p> <p>Similar to alternative B, we will be actively involved and help facilitate land conservation efforts in southern Maine.</p>
<p>Salt marsh restoration practices include plugging or filling ditches, changing culverts to restore tidal flow, and restoring pool, panne, and tidal creek habitat.</p> <p>Upland habitat management actions include mowing, burning, hydro-ax, brush-hog, and mechanical, biological, and chemical controls of invasive species according to an Integrated Pest Management Plan.</p>	<p>In addition to the salt marsh restoration actions in alternative A, this alternative includes control of invasive species using Integrated Pest Management. Control methods may include mowing, burning, biological, direct removal, hand pulling, covering, whipping, chipping, or chemical.</p> <p>Upland habitat management in alternative B also includes silvicultural prescriptions to maintain forest habitats.</p>	<p>Salt marsh restoration and upland habitat management same as alternative B.</p>
<p>The habitat management actions in all three alternatives are intended to restore, maintain, and protect water quality.</p>		
<p>We will continue our current management of restricted public use of the refuge, including parking areas and trails, to minimize soil compaction and erosion and prevent runoff and water quality degradation.</p> <p>Some soil compaction will occur from use of public trails on the refuge, but will be offset by “Leave No Trace” outreach program.</p>	<p>We will continue our current management of restricted public use of the refuge, including locating new parking areas and trails, to minimize soil compaction and erosion and prevent runoff and water quality degradation.</p> <p style="text-align: center;"><i>(continued on next page)</i></p>	<p>Trail impacts are the same as in alternative B.</p>

Table 4.1. The effects of the proposed alternatives on water quality and soils *(continued)*

<i>Alternative A Current Management</i>	<i>Alternative B Our Preferred Alternative</i>	<i>Alternative C</i>
	Some additional soil compaction results from existing and new planned parking areas and trails on refuge lands and on lands proposed for acquisition, but will be offset by “Leave No Trace” outreach program.	
	A new visitor contact station and refuge headquarters will provide enhanced public outreach and environmental education on importance of protecting water quality and other public resources.	
	The boat launch could degrade water quality up and down stream (tidal) through bank or streambed erosion, or introduction of potentially toxic materials. Dormant or unavailable toxins or heavy metals could be in existence in the muddy bottom and could be stirred and become available to aquatic species. Activities in the vicinity of the launch sites can result in compaction of soils, trampled vegetation and erosion to habitats, especially in riparian zones.	
No violations of Federal or State Clean Water Act standards.		

Effects on Air Quality

The release of mercury into the environment has been documented as causing health problems in wildlife and humans. Northern New England and the Canadian Maritime Provinces are subjected to the local, regional, national, and global input of mercury. Historically, 47 percent of the mercury in Maine comes from regional and local sources (Maine Department of Environmental Protection 2002). A research project in 2000 focused on sharp-tailed sparrow nesting ecology, but also sampled blood mercury in a few individuals. Researchers found that salt marsh sparrows captured in the Ogunquit marshes on the refuge showed blood mercury levels comparable to those of tree swallows breeding next to a highly contaminated lake. During limited sampling in 2001, sharp-tailed sparrows at the refuge had the “highest elevated levels of mercury in their blood than any known passerine in the northeast” (Shriver et al. 2002).

The Hubbard Brook Research Foundation released both new and existing information that shows the connections between air emissions of mercury and mercury in fish and other aquatic life (HBRF 2002). HBRF also reported on the impacts of nitrogen pollution from food, wastewater, fertilizers, links between nitrogen pollution and acid rain, air quality, climate change, groundwater contamination, nitrogen saturation in forests, and the eutrophication of coastal waters (Driscoll et al. 2001, 2003). The growing consensus is that global climate change occurs as a result of emissions of carbon dioxide and other greenhouse gases from human activities that may lead to significant impacts across the

United States, including sea-level rise adding stress to coastal communities and ecosystems (Wigley 2004).

Where feasible, refuge activities will help document and remediate the impacts of air pollutants. The refuge positively impacts air quality primarily by protecting natural lands. Natural vegetation and wetlands help offset pollution by acting as filters in the environment. Any potential, negative impacts on air quality from refuge activities are likely to result from using prescribed fire to manage habitat, and attracting visitors in vehicles. Prescribed fires and vehicle emissions directly impact air quality in three principal ways: (1) decreased visibility; (2) increased particulates; and (3) increased pollutants. The State of Maine is addressing vehicle pollutants with programs to reduce automobile emissions. Although refuge visitors' vehicles directly contribute air pollutants, they are not a principal cause of poor conditions. Most refuge visitors are either local residents or summer visitors on vacation in the area.

We project a 66-percent increase in visitation (approximately 200,000 people) with the new administrative complex on the refuge over the next 15 years. Increased visitation and vehicle emissions from all new and existing programs may have long-term negative impacts on air quality. However, that increase in emissions will not have a significant effect on the surrounding residential areas, compared with the urban areas and already high vehicle use nearby. Furthermore, refuge visitation is mostly incidental to other primary destinations.

The new administrative complex would be constructed based on the standard design selection justification. It would be a state-of-the-art active and passive solar facility incorporating various green technologies, such as recycled materials, porous materials for roads and parking, and solar energy. The new energy efficient facility would produce much less air pollution than our current facility.

Visibility and clean air are important natural resource values on the refuge, and their protection would be given full consideration in fire management planning and operations. We would comply with all applicable federal, state, and local air pollution requirements, as specified in section 118 of the Clean Air Act, as amended (42 U.S.C. 7418). Further guidance can be found in the Fire Management Handbook (USFWS 2001). The plan stipulates the required conditions for prescribed fires, to control their size, minimize or eliminate their impacts on visibility, and reduce their potential for adding particulates and pollutants to the air. All of the required conditions are geared toward minimizing smoke emissions, and follow Best Available Control Technology. The following measures would minimize the impacts on air quality from prescribed fires.

- We would only permit burning if the prevailing wind speed, wind direction, and atmospheric conditions would not create nuisance smoke conditions.
- We would identify and address smoke-sensitive areas in our Annual Prescribed Fire Plan, and select wind vectors that would transport smoke and other particulate emissions away from sensitive areas.
- We would conduct prescribed burning only when mixing heights are greater than 1,500 feet, and ventilation rates (mixing height x transport wind speed) is 7,500 or greater. A minimum transport wind speed of 5 mph is recommended. A daily spot forecast is required, and is obtained from the National Weather Service.
- We would not conduct burns if any government agency has issued an air pollution health advisory, alert, warning, or emergency for the area around the refuge.

- We would use backing and flanking fires, when possible, to minimize particulate emissions.
- We would keep media sources informed of fire and smoke dispersal conditions throughout any fire event.

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

Table 4.2 compares the expected impacts on air quality under the three alternatives.

Table 4.2. The effects of the proposed alternatives on air quality

<i>Alternative A Current Management</i>	<i>Alternative B Our Preferred Alternative</i>	<i>Alternative C</i>
<p>Results in the Service acquiring and protecting 3,833 acres of natural land from willing sellers.</p> <p>While difficult to quantify, Service acquisition of these lands would eliminate the direct and indirect threats to air quality associated with increased development, and would permanently maintain the pollution-filtering effects of natural vegetation.</p>	<p>Compared to alternative A, greater benefits to air quality would result from implementing alternative B since an additional 5,558 acres would be permanently protected from development and would continue to filter air pollutants in perpetuity.</p>	<p>Compared to alternative A, substantially greater benefits to air quality would result from implementing alternative C since an additional 11,397 acres would be permanently protected from development and would continue to filter air pollutants in perpetuity.</p>
<p>Potential for contributing direct and indirect short-duration air pollution from prescribed burning; however implementation would adhere to a Fire Management Plan.</p>	<p>Same as alternative A.</p>	<p>Same as alternative A.</p>
<p>Minor contribution to air pollution from refuge visitor vehicle emissions; however, refuge visitation is mostly incidental to other primary destinations.</p>	<p>Slight increase in vehicle emissions predicted from increased visitation in summer and fall tourist seasons; however, refuge visitation is mostly incidental to other primary destinations.</p> <p>Energy efficient visitor facility would reduce the amount of air pollutants generated from administrative offices.</p>	<p>Greatest increase in vehicle emissions predicted from increased visitation on summer and fall; however, refuge visitation is mostly incidental to other primary destinations.</p>
<p>No violations of Federal or State Clean Air Act standards</p>		

Effects on the Local and Regional Economy

Maine's southern and mid-coast regions grew at almost twice the rate of the rest of the state between 1990 and 1996. The natural beauty and rich resources of the shore and ocean draw people to the coastal counties, where most residents live. That biologically rich area, the most densely populated in Maine, is experiencing continued rapid growth (Trust for Public Land and USFWS 2001). Likewise, the need to conserve its rich, natural biodiversity has attracted the Service efforts in wildlife conservation in this area.

Tourism, with the highest percentage along the coast, also has increased substantially in recent years, and is now significant in the Maine economy. In 2000, nonresident visitors to Maine directly and indirectly generated \$8.8 billion in sales of goods and services, more than 116,000 jobs, and \$2.5 billion in total payroll (Maine Office of Tourism, www.visitmaine.com). Our projected 66-percent increase in visitation (approximately 200,000 people) over the next 15 years from the new administrative complex on the refuge may increase the total revenue to the local economy somewhat.

We recognize that there may be losses of property tax revenue to the local communities but expect those potential losses to be offset in part, or entirely, by the Refuge Revenue Sharing program. Table 3.2 in chapter 3 lists revenue sharing payments made to towns in fiscal year 2004. In addition, those lands acquired may provide recreational opportunities that may also generate other revenue in the local areas.

Table 4.3 compares the effects of each alternative on the local and regional economy.

Table 4.3. The effects of the proposed alternatives on the local and regional economy

<i>Alternative A</i> <i>Current Management</i>	<i>Alternative B</i> <i>Our Preferred Alternative</i>	<i>Alternative C</i>
Protecting the remaining 3,833 acres within the approved acquisition boundary will permanently protect these lands from residential and commercial development, thus limiting the burden of the cost of community services such as schools, fire protection, and police had these lands been developed.	The additional land proposed for acquisition will further reduce costs of community services to the 12 communities affected by the refuge.	This alternative protects the greatest amount of land from development and potentially has the greatest effect of minimizing the costs of community services to the 12 refuge communities for these lands.
No appreciable increases in benefits to local economies from refuge visitation through wildlife-recreation expenditures (see "effects on public use opportunities below).	A modest increase in benefits to local economies from wildlife-recreation expenditures through increased refuge visitation (see "effects on public use opportunities" below).	A moderate increase in benefits to local economies from wildlife-recreation expenditures through increased refuge visitation (see "effects on public use opportunities" below).

Effects on Public Use Opportunities

The “National Survey of Fishing, Hunting, and Wildlife-Associated Recreation” (2001) reveals that 975,000 Maine residents and nonresidents 16 years old and older fished, hunted, or watched wildlife in Maine. Of that number, 376,000 fished, 164,000 hunted, and 778,000 participated in wildlife-watching activities, including observing, feeding, or photographing wildlife (USFWS 2003). The refuge was an important destination for some of that wildlife-dependent recreation.

Nearly 100,000 visitors hiked the 1-mile Carson Trail at the Wells headquarters, one of four developed trails on the refuge. Many times in the summer and fall, the parking lot is full or overflowing. The headquarters trail in Upper Wells is the only refuge trail with an informational kiosk. The 2-mile Cutts Island Trail in Brave Boat Harbor Division has trail signs, but no kiosk or restroom. Carry-in boat access only is available on Chauncy Creek, at the intersection of Cutts Island and Seapoint Roads. Parking is available by verbal agreement with the Town of Kittery. The Goose Fare Brook Trail and overlook offer parking, a short, stone-dust trail, and an interpreted observation platform with auto-focus binoculars. The Bridle Path and Atlantic Way and Ted Wells Trails provide views of refuge habitat in Kennebunk and Saco and Old Orchard Beach. Those trails, located on and near refuge property, are maintained by municipal or private non-profit organizations.

Some activities are not compatible with refuge purposes, and are prohibited on the refuge to protect sensitive habitats and wildlife. Prohibited activities include driving off-road vehicles, camping, building fires, horse-back riding, mountain biking, and collecting any plants or animals not covered by a permit. Table 4.4 compares the effects of each alternative on public use opportunities.

Table 4.4. Effects of proposed alternatives on public use opportunities

<i>Alternative A Current Management</i>	<i>Alternative B Our Preferred Alternative</i>	<i>Alternative C</i>
Maintain current access and public use policies on the 10 refuge divisions. The number of hunting permits issued annually is expected to continue to average just over 400 permits. Moody and Biddeford Pool Divisions will continue to be closed to hunting. Bank fishing will continue at the eight designated sites. Wildlife observation, photography and interpretive opportunities will continue primarily at the headquarters Carson Trail. Refuge staff will provide environmental education curriculum material to local schools upon request and as feasible.	Alternative B will increase opportunities for priority wildlife-dependent public uses, especially in wildlife observation and photography, environmental education and interpretation, and hunting. We propose new interpretive signs and kiosks, nature trails, parking areas, and the new acquisitions will provide expanded hunting opportunities. Appreciable increase in visitation in response to increased visitor services and programs, including new visitor contact station and more school groups participating in environmental education programs.	Same as alternative B, with additional access and public use opportunities on the additional lands to be acquired.

Effects on Cultural Resources

In protecting our cultural and historic resources, we are guided by specific executive orders, policies, laws, regulations, standards, and guidelines. Our efforts to protect and manage cultural resources on the refuge will comply with all appropriate legal mandates. We routinely review and assess our actions likely to affect archaeological and historic sites, under the provisions of section 106 of the National Historic Preservation Act. We are continuing our salt marsh restoration as described in alternative B, objectives 1.1 and 4.2. Table 4.5 compares the effects of each alternative on cultural resources.

Table 4.5. Effects of proposed alternatives on cultural resources

<i>Alternative A Current Management</i>	<i>Alternative B Our Preferred Alternative</i>	<i>Alternative C</i>
Alternative A does not provide sufficient resources for further cultural resource inventories or studies.	Same as alternative A.	Same as alternative A.
Alternative A provides for some additional outdoor recreation planning staff and some improvement in the visitor contact station, enhancing opportunities for cultural resource interpretation and education of known sites.		

Effects on Native Wildlife and Their Habitats

The Rachel Carson refuge and the Scarborough Marsh State Wildlife Management Area encompass about 85 percent of all salt marsh habitat in Maine. Residential and industrial development are encroaching on the salt marshes and affecting the integrity of these fragile systems (Trust for Public Land and USFWS 2001). Habitat conversion to urban and suburban uses, agriculture, and gravel pits, and fragmentation from roads and suburbanization are the primary factors affecting biological diversity in southern Maine (Gawler et al. 1996).

In addition to salt marshes, the refuge supports other coastal habitats, including dune grassland, beach, subtidal and intertidal mudflat, marine open water, tidal river, maritime shrubland and upland forest. Those provide critical buffers for the salt marsh, and shelter many aquatic and upland species of conservation concern. Table 4.6 compares the effects of each alternative on native wildlife and their habitats. Table 4.7 (page xx) compares the acreage of each habitat type we will be managing under each alternative.

Thirty-six species of shorebirds have been reported on the Maine coast, primarily staging for long-distance migration. The numbers of migrant shorebirds peak from mid-May to early June and from mid-July to mid-September (Tudor 2000). Shorebirds using the Maine coast face potential impacts from recreational disturbances, oil spills, resource extraction affecting shorebird food supplies, habitat loss to development, predators, and contaminants (Clark and Niles 2000).

The piping plover, federal-listed as threatened and state-listed as endangered, nests above the high tide line on open sand, gravel- or shell-covered beaches, especially on sand spits and blowout areas in dunes. Fifty percent to 75 percent of the Maine piping plover population nests at three sites on or near the refuge, including Crescent Surf Beach, Goosefare Brook, and Marshall Point at Goose Rocks.

The least tern is a state-listed endangered species. In 2003, Crescent Surf Beach hosted the largest nesting colony (157 pairs) of least terns in Maine.

❖ **Effects from hunting**

Adverse effects on wildlife (waterfowl) populations from hunting are not expected because of the regulations and bag limits set in place by federal and state agencies (USFWS Migratory Bird Office and the Maine Department of Inland Fisheries and Wildlife) that manage the harvest of waterfowl populations. Significant conservation measures and extensive pre- and post-season population monitoring and the institution of Adaptive Harvest Management are safeguards inherent in waterfowl management. Adverse effects on other game species are not expected, because hunting will occur under state regulations. The MDIFW sets harvest limits that take into account game species population data collected by state biologists and wildlife species assessments.

Hunting results in the direct take of the target game up to a daily limit in accordance with state regulations. The direct disturbance of wildlife is expected, as is true for all human-wildlife interactions. Those impacts affect individuals, not populations.

Thirty-six species of shorebirds are reported using the Maine coast primarily as staging areas during long distance migration. The numbers of migrant shorebirds peak from mid-May to early June and from mid-July to mid-September (Tudor 2000), outside hunting seasons. The impacts to wildlife are at a level that will not interfere with wildlife populations. Endangered or threatened species and species of special concern are also present on the refuge. However, no threatened or endangered species are using the areas identified for hunting during hunting seasons. The status of the New England cottontail is being reviewed; its habitat is dense upland thickets. Rabbit hunting is not permitted on the refuge.

❖ **Effects from fishing**

Some wildlife disturbance is created by fishing activity. Disturbance during the summer is limited waterfowl, shorebirds, aquatic species, marsh and wading birds. The fishing access points have been selected to coincide with existing uses to help reduce any additional impact. Wetlands will be minimally impacted by construction of the pier which would serve to promote this priority use on the site.

The federal-listed threatened and state-listed endangered piping plover and several different species of terns are present during the refuge's fishing seasons. Conflicts are avoided by geographically separating the activities. If fishing activities are in conflict with where plovers nest at this beach, the activity will be curtailed until the young plovers fledge. Most fishing pressure is late in the summer and in the fall after plovers and terns have finished nesting. Other threatened and endangered species may be present but will not be affected by fishing.

❖ **Effects from wildlife observation, photography, environmental education, interpretation**

Direct disturbance to wildlife is anticipated, as is true for all human/wildlife interactions. Wildlife observation, photography, environmental education, and interpretation occurring on the refuge can only influence the small proportion of the migratory bird populations which are present on the refuge at any one time. The impacts to other wildlife are at a level that will not interfere with wildlife populations. Location of waysides, layout and construction of trails and overlooks will attempt to minimize habitat degradation. There are no threatened and endangered species known to use the areas identified for wildlife observation, photography, environmental education and interpretation.

❖ **Effects from the boat launch**

Direct disturbance to waterfowl, notably wintering black duck, is likely along the refuge waterways as is disturbance to other waterfowl, wading birds and salt marsh species. Both areas are patrolled and visited frequently by refuge staff. Intense levels of use, should they occur, will result in reexamination of this determination.

In the spring and summer months nesting waterfowl and shorebirds in the immediate area would be affected by launching and paddling. These disturbances, however, would be minimal since restrictions built into execution of this project, i.e. recreational, no-motor boats only, are designed to lessen impacts. Refuge visitors will be inconvenienced by Maine's 9 to 11 foot tidal range.

Refuge visitors could find this activity creates temporary direct disturbance to wildlife and/or habitat which may impact their intended uses. Anglers may take advantage of this launch area to access state-controlled waters. Although the striped bass fishing season is January 1 - December 31, most fishing takes place in the spring and early summer. During peak fishing seasons, any activity can startle or repel fish.

The New England Cottontail occurs in the Spurwink Division and is proposed for listing, however, the rabbit does not occur in the immediate vicinity of the boat launch ramp. Federal-listed threatened piping plover nest on beaches and feed on the mudflats behind the beach, but the birds are not found near either boat launch. Other threatened and endangered species may be present but will not be affected by this activity.

❖ **Effects from cultural resource investigations**

Direct disturbance to wildlife is anticipated, as is true for all human-wildlife interactions. Permitted activities will be conducted in such a manner as to minimize impacts on wildlife. Due to the short time-period for investigations and the ability to schedule these activities, no negative impacts on populations or habitats are anticipated. Threatened and endangered species may be present but will not be affected by this activity.

❖ **Effects from mosquito/fly control**

Generally, refuges will not conduct mosquito monitoring or control, but these activities may be allowed under special use permits. When necessary to protect the health of a human, wildlife, or domestic animal population, we will allow management of mosquito populations on National Wildlife Refuge System (Refuge System) lands using effective means that pose the lowest risk to wildlife and habitats.

❖ **Effects from research by non-Service personnel**

Disturbance to wildlife and vegetation by researchers could occur through observation, banding, and accessing the study area by foot or vehicle. However, standardized special use permit conditions are designed to minimize negative impacts to wildlife, habitat and visitors. The impacts to individual wildlife will not interfere with wildlife populations. It is possible that direct mortality could result as a by-product of research activities. For example, least tern chick mortalities can occur when chicks pile on top of each other and suffer from heat exhaustion and stress. Least terns are territorial and active in nest protection. These birds are easily spooked and will readily fly off their nest when a researcher approaches, even from a long distance. Nest abandonment can leave eggs or chicks vulnerable to heat or predators. Special Use Permit conditions prevent negative impacts on threatened and endangered species.

❖ **Effects from skiing and snowshoeing**

The impacts to wildlife are at a level that will not interfere with wildlife populations. Impacts to habitat are minimal from travel over snow cover. Endangered and/or threatened species and species of special concern are also present on the refuge but not on trails during winter months.

Table 4.6. Effects of proposed alternatives on native wildlife and their habitats

<i>Alternative A Current Management</i>	<i>Alternative B Our Preferred Alternative</i>	<i>Alternative C</i>
<p>Proposed acquisition of the remaining 3,833 acres within the refuge's approved acquisition boundary will permanently protect these lands from development and provide habitat for a wide diversity of native wildlife.</p> <p>The biological program priorities would continue to be piping plover and least tern management, salt marsh monitoring, limited fall shorebird surveys, sharp-tailed sparrow ecology, invasive plant evaluation and eradication, shrubland, thicket and grassland management, and rare plant and animal conservation. These priorities would be continued as completely as possible realizing the limitations of current staffing and partners.</p>	<p>Proposed acquisition of the remaining 3,833 acres within the refuge's approved acquisition boundary and an additional 5,558 acres provides a 61-percent increase in the amount of habitat acres protected beyond the current approved acquisition boundary.</p> <p>This alternative will permanently protect these lands from development, further minimize habitat fragmentation, and provide greater buffers to freshwater and saltwater habitats.</p> <p>This alternative expands the protection of habitats around refuge divisions, and creates a new division around the biologically diverse and ecologically significant York River.</p> <p>Alternative B will enhance the quality and sustainability of current biological programs and protect habitats for species of management concern. The protection of coastal habitats, including salt marsh, tidal rivers, and beach-dune, will remain our top priority (Goal 1). We will broaden our understanding and management of other critical habitats and species of concern that use these habitats. The refuge will continue to evaluate and use the most cost-effective and environmentally sound techniques to manage habitats and conserve wildlife and plants. In addition, we will strengthen our biological inventory and monitoring program to allow us to better evaluate our programs and make more informed decisions.</p> <p>Hunting, fishing, wildlife observation, photography, environmental education, interpretation, boat launch, cultural resource investigations, mosquito/fly control, research by non-Service personnel, skiing and snowshoeing will have some impacts on wildlife, but will not affect populations.</p>	<p>Proposed acquisition of the remaining 3,833 acres within the refuge's approved acquisition boundary and an additional 11,397 acres will permanently protect these lands from development, and this is the alternative that affords the greatest protection of habitat and wildlife trust species.</p> <p>The biological program priorities for alternative C are similar to alternative B.</p>

Table 4.7. Comparison of habitats among the three alternatives based on approved and proposed land acquisition

<i>Habitat</i>	<i>Alternative A Current Management</i>	<i>Alternative B Our Preferred Alternative</i>	<i>Alternative C</i>
<i>salt marsh</i>	Manage up to 3,500 acres	Manage up to 3,845 acres	Manage up to 4,045 acres
<i>dune grassland, beach, rocky shore, tidal river, estuary, bay subtidal, and intertidal habitats and open water/mudflat habitat</i>	Manage up to 1,025 acres	Manage up to 1,100 acres	Manage up to 1,200 acres
<i>maritime shrubland/forest</i>	Manage up to 100 acres	Manage up to 135 acres	Manage up to 385 acres
<i>upland shrubland</i>	Manage up to 500 acres	Manage up to 715 acres	Manage up to 1,215 acres
<i>freshwater wetland and freshwater mudflats/open water</i>	Manage approximately 450 acres	Manage approximately 1,445 acres	Manage approximately 1,845 acres
<i>grassland</i>	Manage up to 125 acres	Manage up to 1,018 acres	Manage up to 1,218 acres
<i>upland forest</i>	Manage up to 3,700 acres	Manage up to 6,691 acres	Manage up to 10,880 acres
<i>pitch pine bog community and rare plant sites</i>	Manage approximately 10 acres and up to 25 sites	Manage approximately 10 acres and up to 45 sites	Manage approximately 10 acres up to 60 sites

Environmental Justice

In accordance with Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” federal agencies must identify and address disproportionately high, adverse effects of their programs, policies, and activities on human health or the environment for minority and low-income populations. After presenting the context of minority and low-income populations in Maine coastal counties, we address environmental justice as it relates to refuge programs.

Maine’s 1,305,728 residents are disproportionately white, according to the U.S. Census 2000 (<http://quickfacts.census.gov>). The refuge lies in two counties that have slightly less (York County) and slightly more (Cumberland County) ethnic diversity than the state as a whole. Cumberland County includes the greater Portland area. See table 4.8 below for details.

Table 4.8. White and minority populations in Maine and two coastal counties

<i>Populations by Percent</i>	<i>Maine</i>	<i>York County</i>	<i>Cumberland County</i>
White	96.9	97.6	95.7
Black or African American	0.5	0.4	1.1
American Indian and Alaska Native	0.6	0.2	0.3
Asian	0.7	0.7	1.4
Hispanic or Latino	0.7	0.7	1.0

Also according to the 2000 national census, 10.9 percent of Maine residents live below the poverty level; the national average is 12.4 percent. Table 4.9 shows the percent of residents living below the poverty level in the same two coastal counties.

Table 4.9. Percent of individual residents living below the poverty level in two coastal counties in southern Maine

	<i>Maine</i>	<i>York County</i>	<i>Cumberland County</i>
<i>Percent Below Poverty</i>	10.9	8.2	7.9

We are not aware that our land acquisition program has caused any adverse health or economic impacts on any specific populations since its inception; and, we predict no future health risks and no significant changes in industry, taxes, or revenues that might affect residents. We do not expect Service land acquisition to impact disproportionately the health or the environment of minority or low-income populations.

We predict that our proposals for public use and access management would not disproportionately affect minority or low-income residents, regardless of the alternative. Given the refuge's proximity to large, more diverse populations (e.g., Portland) than in other parts of the state, we expect our public use and environmental education and interpretation programs to benefit minority and low-income populations.

We described earlier in this chapter the herbicides and prescribed fires that could have health implications, and we predicted that neither would pose a risk to any population. Both would be used on a limited basis, under strict Service guidelines designed to minimize health and safety risks. We would alert refuge visitors and local residents about those activities, and we feel their risks are negligible, regardless of race or income status. We do not predict any impacts from our proposed wildlife population management program on any human populations.

Cumulative Impacts

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

This assessment of cumulative impacts includes other agencies' or organizations' actions if they are interrelated and influence the same environment. Thus, this analysis considers the interaction of activities at the refuge with other actions over a larger spatial and temporal frame of reference. We describe the potential, cumulative impacts of the proposed alternatives below.

❖ Air Quality

We expect none of the proposed alternatives to have significant, cumulative, adverse impacts on air quality in coastal Maine or elsewhere in New England. We expect some short-term, local deterioration in air quality from management-ignited prescribed burns and from refuge visitors' automobile emissions. However, prescribed burns would only occur under the stipulations of a Fire Plan completed by the refuge, specifically designed to minimize air quality impacts. The effect of refuge-related activity, as well as other management activities, on overall air quality in the region is relatively insignificant, compared to the contributions of industrial centers, power plants, and non-refuge vehicle traffic.

With our partners, we contribute to improving air quality through cooperative land protection and management of natural vegetation and wetlands. Protecting land from development and maintaining it in natural vegetation or as natural wetlands ensures those areas will continue to filter out many air pollutants harmful to humans and the environment.

❖ Soils, Hydrology, Wetlands, and Water Quality

A cooperative, watershed-level approach to protecting and managing these resources offers the greatest opportunity to cumulatively improve conditions. We work closely with the Wells National Estuarine Research Reserve, local communities, regional land trusts, and other Gulf of Maine Partners to protect and maintain soils, hydrology, wetlands, and water quality in the watersheds of southern coastal Maine. Chapter 5 lists the many conservation partners we work with on watershed conservation initiatives.

We can contribute to watershed protection in several ways: acquire critical uplands and wetlands threatened with development; support local communities and land trusts in their conservation; and provide technical information and public outreach to landowners and the public on best management practices for protecting watershed resources.

Alternatives A, B, and C all propose to continue our acquisition of the 3,833 acres from willing sellers in the approved refuge acquisition boundary. Alternatives B and C propose the acquisition of an additional 5,558 acres and 11,397 acres, respectively. Both include protecting the biologically diverse and ecologically sensitive York River. Appendix A describes in detail the land acquisition proposal in alternative B, our preferred alternative.

Each of the alternatives proposes various levels of participation in ongoing, watershed-based land protection partnerships. All of the alternatives propose increasing private-public land partnerships, primarily to share technical information on restoration, habitat management, etc. When combined with actions by other federal, state, and local

organizations working in coastal Maine, we expect all of the alternatives to have a positive cumulative effect on soils, hydrology, wetlands, and water quality in their respective watersheds.

❖ **Biological Resources**

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

Since 2000, the refuge has assumed the primary responsibility for monitoring piping plover at several sites on and off the refuge. That involves working cooperatively with private landowners, Maine Audubon Society, state partners, and the Wells National Estuarine Research Reserve to protect nesting plovers on their lands. The three alternatives propose varying levels of increased protection and management of plover and least tern nests on coastal beaches.

We used the Bird Conservation Region plans, Partners in Flight, shorebird, waterbird and waterfowl plans, The Nature Conservancy Ecoregion plans, and state wildlife and natural heritage programs in determining the highest resource priorities for the refuge to protect and manage. That process allows the refuge to focus its conservation and management actions on those resources of concern that are both regionally and locally important. We expect positive cumulative impacts on Neotropical migratory birds, waterfowl, fish, and other wildlife and their habitats from refuge actions.

❖ **Cultural Resources**

We expect none of the alternatives to have significant adverse cumulative impact on cultural resources in Maine. Beneficial impacts would accrue at various levels, depending on the alternative, because of our proposed environmental education and interpretation programs and increased field surveys to identify and protect any sites discovered.

We conducted an archaeological assessment in 1995 to determine the presence or likelihood of historical features on the refuge. Few areas or resources were identified and, since then, only one tract acquired by the refuge had known historical resources.

Under all of the alternatives, management practices on the refuge would consider potential historical resources. Projects requiring excavation are sampled using test pits in the affected area before work begins. Our regional archaeologist reviews annual prescribed burn plans before we implement them and, even then, we select methods to avoid impacts on any resources. We also need to resolve various interpretations of what constitutes a historical resource.

❖ **Human Resources**

We expect none of the alternatives to have significant, adverse, cumulative impacts on the economy of coastal Maine. Although federal land acquisition reduces property tax revenue, it compensates affected towns with refuge revenue sharing payments, and should also reduce the costs of community services. Also, the acquisitions we propose make up only a small portion of any town. We expect increased refuge visitation and increased tourism to bring additional revenues to local communities, but we do not predict a significant increase in overall revenue in any area.

Alternatives B and C will increase opportunities for priority, wildlife-dependent, public uses, especially in wildlife observation and photography, environmental education and interpretation, and hunting. All three alternatives include a proposal for a new, expanded visitor contact station.

Relationship Between Short-Term Uses and Long-Term Productivity

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

All of the alternatives strive to maintain or enhance the long-term productivity and sustainability of natural resources on the refuge. To varying degrees, they propose actions that promote watershed- or ecosystem-wide partnerships aimed at identifying and protecting important coastal habitats. The alternatives strive to protect our federal trust species and the habitats they depend on, evidenced by the limits on public access during certain seasons and in some locations. All three alternatives would maintain the plover and tern protection strategies that have successfully protected those nesting bird populations from human disturbance. Environmental education and interpretation are priorities in each alternative, to encourage refuge visitors and neighbors to support and participate in environmental stewardship.

All of the alternatives propose stepped-up outreach and enforcement to prevent inappropriate, incompatible uses, such as horseback riding, driving ATVs, or dragging boats through the salt marsh. Their purpose is to reduce impacts on wildlife and habitats and enhance the long-term productivity of those sites. Although the intent is the same, alternative A would not provide the staffing or funding levels to ensure that those uses can be eliminated.

The construction of new refuge facilities, such as a visitor contact station, trails, observation platforms, and kiosks, will result in both short- and long-term impacts on soils and vegetation. Those would be localized, confined to the immediate construction sites. The new refuge facilities will provide greater environmental education and interpretation, leading to a more positive land ethic among visitors and surrounding communities. In summary, we predict that all of the alternatives would contribute positively to maintaining or enhancing the long-term productivity of the environment of coastal Maine.

Unavoidable Adverse Effects

Unavoidable adverse effects are those that could cause significant harm to the human environment and cannot be avoided, even with mitigation measures. We considered property tax losses to towns, increased visitation, and prescribed fire as the principal activities that could have unavoidable adverse effects. We described losses in property tax revenue to towns in “Effects on the Local and Regional Economy,” above. Although the impact on individual towns varies, none of the alternatives would contribute to a significant cumulative loss in any one town. Enhanced services and facilities for refuge visitors will draw more people to the area; in particular, we are predicting more groups will attend our increased environmental education and interpretive programs. Even under a carefully designed program, increased visitation would cause higher levels of disturbance to wildlife, although most of those in localized areas. We intend to manage our visitor use programs to minimize those effects. Because the impacts from prescribed burning would impact visual quality for a short time each year, and will be implemented under conditions that comply

with the state Clean Air Act and federal EPA standards, we predict their effects would not be significant.

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

Potential Irreversible and Irretrievable Commitment of Resources

Except perhaps in the extreme long term or under unpredictable circumstances, irreversible commitments of resources cannot be reversed. One example is an action that contributes to the extinction of a species. Once extinct, it can never be replaced.

By comparison, irretrievable commitments of resources can be reversed, given sufficient time and resources; but, they represent a loss in production or use for a period of time. One example is the maintenance of forest and shrubland as open field and grasslands. If for some reason grasslands no longer were an objective, they would gradually revert to shrub land and forest, or plantings could expedite that process.

The alternatives propose only a few actions that would irreversibly commit resources. One is committing land to the construction of the proposed new refuge headquarters and visitor contact station. All of the alternatives propose that action. Once we have selected a construction site, a separate environmental assessment will evaluate its site-specific impacts.

Another example is Service land acquisition. Alternatives A, B, and C all propose increasing levels of refuge expansion. Once those lands become part of the refuge, their reversion to private ownership is unlikely. However, once placed in public ownership in the Refuge System, they will provide a new set of benefits to a much broader group of people. Those benefits include watershed protection, wildlife conservation, the preservation of rural character and the expansion of wildlife-dependent recreational uses. Our proposed management of the refuge will result in irretrievable and irreversible commitments of staffing and funding for the acquisition and stewardship of refuge lands.

