

## Chapter 4



USFWS

*Sunset on Umbagog Lake*

# Environmental Consequences

## Introduction

This chapter describes the environmental consequences we predict from implementing the management alternatives presented in chapter 2. Where detailed information is available, we present a scientific and analytic comparison between alternatives and their anticipated consequences, which we describe as “impacts” or “effects.” In the absence of detailed information, we make comparisons based on our professional judgment and experience. We specifically predict the effects of implementing the management actions and strategies for each of the three alternatives: alternative A (Current Management), which serves as the baseline for comparing alternative B (Focal Species: the Service-preferred alternative), and alternative C (Natural Processes Management).

We focus our discussion on the impacts associated with the goals and significant 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. At the end of this chapter, table 4.14 summarizes the effects predicted for each alternative and allows for a side-by-side comparison. Finally, this chapter identifies the irreversible and irretrievable commitment of resources from our proposed actions, as well as those actions relationship between short-term uses of the environment and long-term productivity, their cumulative effects, and the relationship to environmental justice.

As required by CEQ and Service regulations implementing NEPA, we assessed the importance of the effects of the CCP alternatives based on their context and intensity. The context of the impacts ranges from local and site-specific to regional and broad-scale, for example, direct impacts to soils at a kiosk construction location would be highly localized. Impacts on common loon reproduction would directly affect the common loon population on Umbagog Lake and indirectly affect common loon populations in the larger context of New Hampshire and Maine. Improvements in breeding habitat for Canada warbler would benefit this species of conservation concern in the context of BCR 14 and throughout its range. Although refuge lands comprise a small percentage of these larger ecosystem or regional contexts, all alternatives were developed to contribute towards conservation goals in these larger geographic landscapes. Table 4.1 provides some context for our discussion.

**Table 4.1. Impact contexts for Service actions under CCP at Lake Umbagog Refuge**

Kiosk Footprint	0.005 acre
Vernal Pool	0.001 to 0.5 acre
Deer wintering areas	9,221 acres (including proposed expansion lands)
Woodcock Focus Areas	6,664 acres (including proposed expansion lands)
Refuge Habitat Management Units	722 to 4,173 acres (1.1 to 6.5 mi <sup>2</sup> )
Umbagog Lake	>8,500 acres (13.3 mi <sup>2</sup> )
Refuge lands	> 20,500 acres (25.4 mi <sup>2</sup> )
Coos County, NH	1.15 million acres (1,801 mi <sup>2</sup> )
Oxford County, ME	1.33 million acres (2,078 mi <sup>2</sup> )
Upper Androscoggin Watershed	1.47 million acres (2,300 mi <sup>2</sup> )
Atlantic Northern Forest – Bird Conservation Region 14	87.3 million acres (137,500 mi <sup>2</sup> in U.S. & CAN)
Eastern Spruce-Hardwood Forest (Partners-in-Flight Area 28)	90 million acres (140,685 mi <sup>2</sup> in U.S. & CAN)

Ian Drew/USFWS



*Mixed woods on the refuge*

The proposed species and habitat actions are consistent with the states of New Hampshire and Maine comprehensive wildlife conservation strategies, and national and regional conservation plans identified in chapter 1. At varying levels, they would each make positive contributions to these larger landscape-scale conservation endeavors.

We evaluated the intensity of impacts based on the expected degree or percentage of resource change from current conditions, the frequency and duration of the effect, the sensitivity of the resource to such an effect or the natural resiliency of the resource to recover from such an effect, and the potential for implementing effective preventative or mitigation measures to reduce the effect. Duration of effects vary from those that would occur only once for a brief period of time during the 15-year planning horizon, for example, the effects of visitor center construction, to those that would occur every day during a given season of the year, for example, impacts from snowmobiling.

There are certain types of actions identified in chapter 2 that do not require additional NEPA analysis because they are “categorically excluded” from further

analysis or review and, as such, their consequences are not further described in this chapter. These categorically excluded actions include, but are not limited to, the following:

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

In chapter 2, under the section “Actions Common to All Alternatives; Additional NEPA Analysis” we acknowledge that, in order to implement the additions to the hunt program proposed under alternatives B and C, we would need to conduct additional environmental and impacts analysis and public involvement to comply with NEPA. While we describe some of the anticipated impacts in this chapter, we would plan to fully evaluate those program additions in a separate NEPA analysis to be initiated within one year of CCP approval.

## Effects on Socioeconomic Resources

We have organized this chapter by major resource heading. Under each heading, we discuss the resource context and the types of benefits and adverse impacts of management actions that we evaluated. We then discuss the benefits and adverse effects that would occur regardless of which alternative is selected and finally the benefits and adverse effects of each of the alternatives.

In support of analyzing the socio-economic consequences of the actions proposed in the three draft CCP/EIS alternatives, we enlisted the assistance of economists at the USGS - Fort Collins Science Center. Their full report, a regional economic impact analysis, is included as appendix G. It provides detailed information on the current economic setting, and provides a means of estimating and comparing how current management under alternative A, and proposed management under alternatives B and C, could effect the local and regional socio-economic environment. The economic impacts were estimated using the “Impacts Analysis for Planning” (IMPLAN) regional input-output modeling system developed by the U.S. Forest Service.

For each alternative, regional economic effects from the IMPLAN model are reported for the following categories:

- **Local output** represents the change in local sales or revenue
- **Personal Income** represents the change in employee income in the region that is generated from a change in regional output.
- **Employment** represents the change in number of jobs generated in the region from a change in regional output. IMPLAN estimates for employment include both full time and part time workers, which are measured in total jobs.

This type of analysis provides two critical pieces of information: 1) it illustrates a refuge’s current and potential future economic contribution to the local community; and, 2) it can help in determining whether local economic effects are, or are not, a real concern in choosing among management alternatives. Below we provide a summary of the USGS report’s conclusions by alternative.

### Socio-Economic Effects of Alternative A (Current Management)

#### Refuge Revenue Sharing

Under provisions of the Refuge Revenue Sharing (RRS) Act, local towns receive an annual payment for lands that have been purchased in full fee simple acquisition by the Service. Payments are based on the greater of 75 cents per acre or 0.75% of the market value of lands acquired by the Service. The exact amount of the annual payment depends on Congressional appropriations, which in recent years have tended to be less than the amount to fully fund the authorized level of payments. In the most recent fiscal year (FY05), actual RRS payments were 41% of authorized levels.

In 2005, payments to local townships were \$5,049 to Magalloway, ME, \$6,018 to Upton, ME, \$603 to Cambridge, NH, \$19,509 to Errol, NH, and \$6,467 to Wentworth Location, NH for a total payment of \$37,646. Accounting for both the direct and secondary effects, RRS payments for alternative A generate total annual economic impacts of \$ 51,700 in local output, \$30,700 in personal income, and 1 job in Coos and Oxford counties.

#### Refuge Visitor Expenditures in Local Economy

Table 4.2 summarizes estimated refuge visitation by type of visitor activity for alternative A. The visitation estimates for alternative A assume a ten percent increase over the previous five year average annual refuge visitation estimate of 49,500 to reflect the increasing trend in regional visitation.

Table 4.2. Estimated annual refuge visitation by visitor activity for alternative A

Visitor Activity	Total # of visits	Percentage (%) of non-local visits	Total # of non-local visits	Number of hours spent at refuge	Number of non-local visitor days <sup>1</sup>
<b>Consumptive Use</b>					
Fishing	11,000	70%	7,700	8	7,700
Big Game hunting	2,500	67%	1,675	8	1,675
Upland game hunting	3,000	67%	2,010	8	2,010
Waterfowl and migratory bird hunting	150	60%	90	8	90
<b>Non-Consumptive Use</b>					
Wildlife viewing: boating/water use	14,000	60%	8,400	8	8,400
Wildlife viewing: nature trails and other wildlife observation	4,500	85%	3,825	2	956
Other recreation (snowmobiling)	20,000	60%	12,000	1	1,500
<b>Total</b>	<b>55,150</b>		<b>35,700</b>		<b>22,331</b>

<sup>1</sup>One visitor day = 8 hours.

To determine the local economic impacts of visitor spending, only spending by persons living outside the local area of Coos and Oxford counties are included in the analysis. The rationale for excluding local visitor spending is two-fold. First, money flowing into Coos and Oxford counties from visitors living outside the local area (hereafter referred to as non-local visitors) is considered new money injected into the local economy. Second, if residents of Coos and Oxford counties visit Lake Umbagog Refuge more or less due to the management changes, they will correspondingly change their spending of their money elsewhere in those counties, resulting in no net change to the local economy. These are standard assumptions made in most regional economic analyses at the local level. Accounting for both the direct and secondary effects, spending by non-local refuge visitors for alternative A generates total annual economic impacts of \$1.05 million in local output, \$365,400 in personal income, and 15.6 jobs.

#### Impacts from Refuge Administration

Employees of Lake Umbagog Refuge reside and spend their salaries on daily living expenses in communities near the refuge thereby generating impacts within the local economy. Household consumption expenditures consist of payments by individuals/households to industries for goods and services used for personal consumption. The IMPLAN modeling system contains household consumption spending profiles that account for average household spending patterns by income level. The current approved refuge staff consists of ten permanent and nine seasonal employees for alternative A. Five of the permanent positions are currently vacant but are anticipated to be filled under alternative A.

For alternative A, salary spending by refuge personnel would directly account for \$541,300 in local output (sales or revenue), 3.8 jobs, and \$89,000 in personal income in the local economy. The secondary or multiplier effects would generate an additional \$91,800 in local output, 1.2 jobs, and \$30,300 in personal income. Accounting for both the direct and secondary effects, salary spending by refuge personnel for alternative A would generate total economic impacts of \$633,100 in local output, 5 jobs and \$119,300 in personal income.

A wide variety of supplies and services are purchased for refuge operations and maintenance activities. Refuge purchases made in Coos and Oxford counties, contribute to the local economic impacts associated with the refuge. For alternative A, work related expenditures would directly account for \$92,900 in local output, 1.1 jobs, and \$32,300 in personal income in the local economy. Accounting for both the direct and secondary effects, work related purchases for alternative A would generate total economic impacts of \$126,500 in local output, 1.5 jobs and \$43,500 in personal income.

#### Impacts from Habitat Management

No timber harvesting or other commercial or economic management activities would occur under alternative A.

#### Summary of Economic Impacts for Alternative A

Table 4.3 summarizes the direct and total economic impacts of all refuge management activities for alternative A in Coos and Oxford counties. Under alternative A, refuge management activities directly related to all refuge operations generate an estimated \$1.45 million in local output, 17.7 jobs and \$425,300 in personal income in the local economy. Including direct, indirect, and induced effects, all refuge activities would generate total economic impacts of \$1.86 million in local output, 23.1 jobs and \$558,900 in personal income. In 2000, total personal income was estimated at \$2.16 billion and total employment was estimated at 36,874 jobs for Coos and Oxford counties (U.S. Department of Commerce 2002). Total economic impacts associated with refuge operations under alternative A represent well less than one percent of total income (0.03%) and total employment (0.1%) in the overall Coos County and Oxford County economy. Total economic effects of refuge operations play a much larger role in the smaller communities near the refuge such as Errol, NH and Upton ME where most of the refuge related economic activity occurs as compared to the overall, combined economies of the two counties.

**Table 4.3. Economic impacts of all refuge management activities for alternative A (2005, \$,000)**

	Local Output	Personal Income	Employment (# jobs)
Refuge Revenue Sharing			
Direct Effects	\$37.6	\$26.1	0.8
Total Effects	\$51.7	\$30.8	1.0
Refuge Administration (staff salary spending and work related purchases)			
Direct Effects	\$634.2	\$121.3	4.9
Total Effects	\$759.7	\$162.8	6.5
Public Use Activities			
Direct Effects	\$776.9	\$277.9	12.0
Total Effects	\$1,049.4	\$365.4	15.6
Habitat Management (timber harvesting)			
Direct Effects	<i>No timber harvesting occurs under Alternative A</i>		
Total Effects			
<b>Aggregate Impacts</b>			
<b>Direct Effects</b>	\$1,448.7	\$425.3	17.7
<b>Total Effects</b>	\$1,860.8	\$558.9	23.1

**Socio-Economic Effects of Alternative B (Focal Species Management)**

**Property Tax Impacts and Refuge Revenue Sharing**

The proposed Service acquisition of 32,159 acres in fee simple will have an effect on the amount of local property taxes collected as land is transferred from private taxable ownership to public nontaxable ownership. As we described under alternative A, although lands acquired by means of fee simple acquisition by the Service are removed from the tax rolls, the local taxing entities will receive an annual payment, under provisions of the RRS Act.

Accounting for the current RRS payments of \$37,646 (alternative A) and the \$49,444 increase for new land acquisition, RRS payments would total \$87,090 under alternative B. Accounting for both the direct and secondary effects, RRS payments for alternative B would generate total annual economic impacts of \$119,700 in local output, \$71,200 in personal income, and 2.3 jobs in Coos and Oxford counties. A portion (\$30,511) of the increase in RRS payments under alternative B offsets the loss in private property tax collections which does not represent a real increase economic activity to the area. Accounting for the loss in property tax collections, RRS payments under alternative B would generate new total economic impacts of \$77,800 in local output, 1.5 jobs, and \$46,200 in personal income.

**Refuge Visitor Expenditures in Local Economy**

Changes in refuge management activities can affect recreational opportunities offered and visitation levels. Table 4.4 shows the estimated visitation levels associated with each visitor activity for alternative B. Under alternative B, visitation is anticipated to increase for all activities compared to alternative A. The increases in visitation levels are due to refuge land acquisition, additional public use infrastructure, and regional visitation trends. Specific details for each activity are explained below.

Table 4.4. Estimated annual refuge visitation by visitor activity for alternative B.

Visitor Activity	Total # of visits	Percentage (%) of non-local visits	Total # of non-local visits	Number of hours spent at refuge	Number of non-local visitor days <sup>1</sup>
<b>Consumptive Use</b>					
Fishing	14,000	70%	9,800	8	9,800
Big Game hunting	6,250	67%	4,188	8	4,188
Upland game hunting	7,500	67%	5,025	8	5,025
Waterfowl and migratory bird hunting	200	60%	120	8	120
<b>Non-Consumptive Use</b>					
Wildlife viewing: boating/water use	18,000	60%	10,800	8	10,800
Wildlife viewing: nature trails and other wildlife observation	10,000	85%	8,500	2	2,125
Other recreation (snowmobiling)	35,000	60%	21,000	4	10,500
<b>Total</b>	<b>90,950</b>		<b>59,433</b>		<b>42,558</b>

<sup>1</sup>One visitor day = 8 hours.

Accounting for both the direct and secondary effects, spending by non-local refuge visitors for alternative B would generate total economic impacts of \$2.31 million in local output, \$794,600 in personal income, and 34.1 jobs. Most of the increase in visitation is based on the number of people that currently recreate on lands that will be acquired by the refuge. Therefore, it is not a real increase in visitation or economic activity to the area. However, the refuge land acquisition maintains recreation access that is not guaranteed under alternative A. Of the increase in visitation under alternative B, 2,985 out of the 3,569 wildlife viewing related visitor days would be an actual increase in visitation and economic activity to the area that would generate total economic impacts of \$150,900 in local output, 2.4 jobs and \$53,000 in personal income.

#### **Impacts from Refuge Administration**

Proposed staff for alternative B includes all approved staff positions under alternative A, plus an additional three permanent and four seasonal positions. For alternative B, salary spending by refuge personnel would directly account for \$777,800 in local output, 5.4 jobs, and \$127,900 in personal income in the local economy. The secondary or multiplier effects would generate an additional \$131,900 in local output, 1.8 jobs, and \$43,500 in personal income. Accounting for both the direct and secondary effects, salary spending by refuge personnel for alternative B would generate total economic impacts of over \$909,700 in local output, 7.2 jobs and \$171,400 in personal income. Due to the increased staffing levels for alternative B, the associated economic effects of staff salary spending would generate \$276,500 more in local output, 2.2 more jobs, and \$52,100 more in personal income than alternative A.

Work related expenditures under alternative B would directly account for \$141,700 in local output, 1.6 jobs, and \$49,300 in personal income in the local economy. Accounting for both the direct and secondary effects, work related purchases for alternative B would generate a total economic impact of \$193,000 in local output, 2.3 jobs and \$66,300 in personal income. Due to the increased non-salary expenditures for alternative B, the associated economic effects of work related purchases would generate \$66,500 more in local output, 0.8 more of a job, and \$22,900 more in personal income than alternative A.

#### **Impacts from Forest Habitat Management**

Timber harvesting in support of focal species habitat management is an economic activity proposed under alternative B on refuge lands. Refuge timber harvest quantities under alternative B are based on a 15% management unit harvest in 15 year intervals, which is described in more detail in the draft CCP/EIS appendix K. Average annual sawtimber, pulp, and fuelwood harvest quantities were determined by refuge personnel and based on two major assumptions: 1) harvest numbers were based on current refuge lands at current stocking volumes; and, 2) as land is acquired (over the next 15 year period) those lands would have been harvested by the private owner prior to sale. Stocking volumes on lands proposed for acquisition are anticipated to be low and would not allow for additional commercial harvest within the 15 year planning horizon of this draft CCP/EIS. All economic gains would be realized by the private owner prior to Service ownership.

Estimated revenues were based on stumpage value estimates for northern New Hampshire (New Hampshire Department of Revenue 2005). The revenue estimates account for the stumpage values of the different species types (by percent of composition) within the refuge harvest. Over the 15 year refuge harvest cycle, an annual average of 135 MBF of softwood sawtimber, 27 MBF of hardwood sawtimber, 125.3 cords of softwood pulp, 371.3 cords of hardwood pulp, and 88.4 cords of fuelwood would be harvested with stumpage valued at \$27,700.

Total sawtimber, pulp and fuelwood product resulting from timber activities in Coos and Oxford counties was estimated to be 657,000 CCF in 2002 (US Forest Service Timber Products Output Data 2002). The total annual harvest quantity under alternative B represents 0.1% of this total.

Accounting for both the direct and secondary effects, timber production related to refuge harvests for alternative B would generate a total economic impact of \$24,500 in local output, one-tenth of job and \$4,000 in personal income. Forest-based industries in Coos and Oxford counties generated over \$1.16 billion in local output and 4,148 jobs in 2002. Therefore, timber production related to refuge harvests for alternative B would have a very insignificant role in the Coos and Oxford counties forest related industries, accounting for less than 0.003% of local output and employment.

**Summary of Economic Impacts from Alternative B**

Table 4.5 summarizes the direct and total economic impacts of all refuge management activities for alternative B in Coos and Oxford counties. Under alternative B, refuge management activities directly related to all refuge operations generate an estimated \$2.73 million in local output, 35.1 jobs and \$842,400 in personal income in the local economy. Including direct, indirect, and induced effects, all refuge activities would generate total economic impacts of \$3.56 million in local output, 46 jobs and \$1.11 million in personal income. Total economic impacts associated with refuge operations under alternative B represent less than one percent of total income (0.05%) and total employment (0.11%) in the combined economies of the two counties. Total economic effects of refuge operations play a much larger role in the smaller communities near the refuge such as Errol, NH and Upton ME where most of the refuge related economic activity occurs as compared to the overall, combined economies of the two counties.

**Table 4.5. Summary of economic impact from all refuge management activities for alternative B (2005, \$,000).**

	<b>Local Output</b>	<b>Personal Income</b>	<b>Employment (# jobs)</b>
Refuge Revenue Sharing			
Direct Effects	\$87.1	\$60.5	1.9
Total Effects	\$119.7	\$71.2	2.3
Refuge Administration (staff salary spending and work related purchases)			
Direct Effects	\$919.5	\$177.2	7.0
Total Effects	\$1,102.7	\$237.7	9.5
Public Use Activities			
Direct Effects	\$1,706.8	\$602.3	26.1
Total Effects	\$2,307.7	\$794.6	34.1
Habitat Management (timber harvesting)			
Direct Effects	\$18.6	\$2.4	0.1
Total Effects	\$24.5	\$4.0	0.1
<b>Aggregate Impacts</b>			
<b>Direct Effects</b>	<b>\$2,732.1</b>	<b>\$842.4</b>	<b>35.1</b>
<b>Total Effects</b>	<b>\$3,554.6</b>	<b>\$1,107.4</b>	<b>46.0</b>

### Socio-Economic Effects of Alternative C (Natural Processes Management)

#### Property Tax Impacts and Refuge Revenue Sharing

As explained for alternative B, the loss in local property tax revenue was estimated by using the 2005 current value assessments for each land type to be acquired by fee simple acquisition and the 2005 tax rates for each potentially affected community. All 76,304 acres to be acquired under alternative C would be full fee simple acquisition and would result in an annual loss of \$51,628 in property tax collections in Coos and Oxford counties. RRS payments at the current authorized funding level of 41% would result in an annual payment of \$117,317 which would offset the loss in property tax collections and result in an annual net increase of \$65,689. No town would experience an actual net loss in collections. Cambridge, NH does not assess property taxes and would benefit the most from the RRS payments under alternative C.

Accounting for the current RRS payments of \$37,646 (alternative A) and the \$117,317 increase for new land acquisition, RRS payments would total \$154,963 under alternative C. Accounting for both the direct and secondary effects, RRS payments for alternative C would generate total annual economic impacts of \$212,900 in local output, 4.2 jobs, and \$126,600 in personal income in Coos and Oxford counties. A portion (\$51,628) of the increase in RRS payments under alternative C offsets the loss in private property tax collections which does not represent a real increase economic activity to the area. Accounting for the loss in property tax collections, RRS payments under alternative C would generate new total economic impacts of \$103,300 in local output, 2.8 jobs, and \$84,400 in personal income.

*Preparing to snowmobile in the Errol area*



Marvin Moriarty/USFWS

#### Refuge Visitor Expenditures in the Local Economy

Table 4.6 shows the estimated visitation levels associated with each visitor activity for alternative C. Under alternative C, visitation is anticipated to increase for all activities as compared to alternative A. The increase in visitation is due to refuge land acquisition, additional public use infrastructure, and regional visitation trends. Specific details for each activity are explained below.

**Table 4.6. Estimated annual refuge visitation by visitor activity for alternative C.**

Visitor Activity	Total # of visits	Percentage (%) of non-local visits	Total # of non-local visits	Number of hours spent at refuge	Number of non-local visitor days <sup>1</sup>
<b>Consumptive Use</b>					
Fishing	14,000	70%	9,800	8	9,800
Big Game hunting	7,500	67%	5,025	8	5,025
Upland game hunting	9,000	67%	6,030	8	6,030
Waterfowl and migratory bird hunting	200	60%	120	8	120
<b>Non-Consumptive Use</b>					
Wildlife viewing: boating/water use	18,000	60%	10,800	8	10,800
Wildlife viewing: nature trails and other wildlife observation	10,000	85%	8,500	2	2,125
Other recreation (snowmobiling)	35,000	60%	21,000	4	10,500
<b>Total</b>	<b>93,700</b>		<b>61,275</b>		<b>44,400</b>

<sup>1</sup>One visitor day = 8 hours.

Accounting for both the direct and secondary effects, spending by non-local refuge visitors under alternative C would generate total economic impacts of \$2.39 million in local output, \$821,500 in personal income, and 35.3 jobs. Most of the increase in visitation is based on the number of people that currently recreate on lands that would be acquired by the refuge which is not a real increase in visitation or economic activity to the area. However, the refuge land acquisition maintains recreation access that is not guaranteed under alternative A. Of the increase in visitation under alternatives B and C, 2,985 out of the 3,569 wildlife viewing related visitor days would be an actual increase in visitation and economic activity to the area that would generate total economic impacts of \$150,900 in local output, 2.4 jobs and \$53,000 in personal income.

#### **Impacts from Refuge Administration**

Same as alternative B.

#### **Impacts from Forest Habitat Management**

As noted under alternative B, timber harvest in support of habitat management is an economic activity that would occur on refuge lands. Refuge timber harvest quantities for alternative C are based on a 4% management unit harvest in 15 year intervals. The management unit that would be harvested under alternative C is equivalent to the management unit that would be harvested under alternative B. Therefore the only change in refuge timber harvesting between alternatives B and C is the quantity harvested (the same composition of tree species would be harvested). Under alternative B, 15% of the management unit would be harvested in 15 year intervals as compared to only 4% under alternative C. Over the 15 year harvest cycle, the refuge harvest would produce approximately 25% of the quantity harvested for alternative B resulting in an annual harvest average of 33.8 MBF of softwood sawtimber, 6.8 MBF of hardwood sawtimber, 31.3 cords of softwood pulp, 92.8 cords of hardwood pulp, and 22.1 cords of fuelwood with stumpage valued \$6,900.

Timber production in Coos and Oxford counties related to refuge harvests would directly account for \$4,700 in local output and \$600 in personal income in the local economy. The level of refuge timber production for alternative C is not large enough to generate any employment impacts. Accounting for both the direct and secondary effects, timber production related to refuge harvests for alternative C would generate a total economic impact of \$6,100 in local output and \$1,000 in personal income.

#### **Summary of Economic Impacts for Alternative C**

Table 4.7 summarizes the direct and total economic impacts of all refuge management activities for alternative C in Coos and Oxford counties. Under alternative C, refuge management activities directly related to all refuge operations generate an estimated \$2.84 million in local output, 37.4 jobs and \$908,000 in personal income in the local economy. Including direct, indirect, and induced effects, all refuge activities would generate total economic impacts of \$3.71 million in local output, 49 jobs and \$1.19 million in personal income. Total economic impacts associated with refuge operations under alternative C represent less than one percent of total income (0.05%) and total employment (0.11%) in the overall Coos and Oxford counties' economy. Total economic effects of refuge operations play a much larger role in the smaller communities near the refuge such as Errol, NH and Upton, ME where most of the refuge related economic activity occurs as compared to the overall, combined economies of the two counties.

Table 4.7. Summary of economic impact from all refuge management activities for alternative C (2005, \$,000).

	Local Output	Personal Income	Employment (# jobs)
Refuge Revenue Sharing			
Direct Effects	\$155.0	\$107.6	3.4
Total Effects	\$212.9	\$126.6	4.2
Refuge Administration (staff salary spending and work related purchases)			
Direct Effects	\$919.5	\$177.2	7.0
Total Effects	\$1,102.7	\$237.7	9.5
Public Use Activities			
Direct Effects	\$1,764.2	\$622.4	27.0
Total Effects	\$2,386.1	\$821.5	35.3
Habitat Management (timber harvesting)			
Direct Effects	\$4.7	\$0.6	0
Total Effects	\$6.1	\$1.0	0
<b>Aggregate Impacts</b>			
<b>Direct Effects</b>	<b>\$2,843.3</b>	<b>\$907.8</b>	<b>37.4</b>
<b>Total Effects</b>	<b>\$3,707.9</b>	<b>\$1,186.8</b>	<b>49.0</b>

## Effects on Air Quality

Chapter 3 - Affected Environment presents the status of air quality in the surrounding refuge landscape. Air quality is good, with no current criteria pollutant exceedances, but of recent concern are ground level ozone and particulate matter that in 2004 exceeded safe health levels.

We evaluated the management actions proposed in each alternative for their potential to help improve air quality, locally, in the region, and globally. The benefits we considered included:

- Potential to adopt energy efficient practices to reduce the refuge's contribution to emissions
- Potential of refuge land conservation to limit the growth of development thereby limiting emission sources and reducing losses of forest vegetation
- Potential of refuge forest management activities to contribute to carbon sequestration and reduce greenhouse gases

The potential adverse effects of the management alternatives that were evaluated included increases in:

- particulates from using burning as a management tool
- vehicle and equipment emissions
- air emissions from new or upgraded building facilities,

### Air Quality Impacts that would not vary by alternative

Overall air quality in the refuge landscape is currently good, with the exception of moderate levels of ozone and particulates that have exceeded safe health levels in the recent past and that contribute to transient visibility problems. Air quality monitoring records for Coos County, NH and Oxford County, ME (EPA 2005)

indicate that ozone and PM2.5 have recently exceeded levels considered safe for sensitive subgroups. Air quality index measures show that in 2004, O3 exceeded safe levels on 3 days and PM2.5 exceeded safe levels on 2 days in Coos County. Oxford County had a single day in 2004 with unhealthy PM2.5 levels. Monitoring in 2005 through September indicates O3 and PM2.5 levels in the moderate range just below unhealthy levels.

Regional air quality should not be adversely affected by refuge management activities regardless of which management alternative is selected. None of the alternatives would violate EPA standards; all three would be in compliance with the Clean Air Act.

There are no major stationary or mobile sources of air pollutants at the refuge or in the local vicinity and none would be created under any of the refuge management alternatives. On the contrary, the Service limits human uses of the refuge to compatible wildlife-oriented consumptive and non-consumptive uses and thus curtails anthropogenic sources of emissions by maintaining wetlands and all but a few acres of floodplain and uplands in natural vegetative cover. So the analysis of air quality impacts considered only how the Service's actions at the refuge might affect criteria air pollutants, visibility, and global warming to a minimal degree, focusing on the potential for localized air quality impacts or improvement.

Visibility concerns due to emission-caused haze, at the nearest Class I airshed, the Great Gulf Wilderness Area, would not be affected by any of the proposed management alternatives.

There would be some minor improvements by way of reduced local emission sources and thus benefits to air quality from actions common to all the alternatives. Removing dwellings, such as cabins or other developed sites or structures, on property acquired from willing sellers and restoring developed areas that are no longer needed for refuge administration or programs to natural conditions would eliminate these locations as potential air emission sources.

Reducing road use would reduce on-refuge vehicular emissions. Although we would keep main access roads open to provide motorized and non-motorized access for approved activities, we would retire and restore unnecessary forest interior and secondary roads to promote watershed and resource conservation. All ATV trails and all unauthorized snowmobile trails would be restored to natural vegetation to eliminate their use.

None of the alternatives include an expanded snowmobile trail system than what currently exists. The increases in snowmobiling attributed to the refuge are due to each alternative's respective refuge expansion proposals,

In his review studies on the ecology of fire, D'Avanzo (2004) describes the findings of a number of scientists concerning fire's role in the northern parts of the Northeast:

- According to Niering (1992) mature stands in many areas originated after extensive fires that were fueled by logging debris in the late 19th century. This led to fire-protection policies and the decline of many fire-dependent ecosystems, for example jack pine (*Pinus banksiana*).
- Bormann and Likens (1979) show that human-induced fires are much more common than fires caused by lightning in northern forests. In addition, fires in Vermont and New Hampshire (Green and White Mountains) are quite rare compared to those in national forests in Pennsylvania, Wisconsin, Minnesota, and Michigan. Northern New England forests have been called "asbestos forests" because fires are so relatively uncommon.
- Foster et al. (1997) argue that hurricanes and other wind events are much more important vectors of disturbance here. Factors limiting fire in northern New England include: precipitation throughout the year, resistance of dominant trees to fire, limited litter accumulation, and many sites (e.g. valleys) protected from high winds.

including land with established regional snowmobile trails. In other words, the current capacity on those lands would not change from current levels. Studies in Yellowstone National Park by Bishop et al (2001) found that snowmobiling accounted for 27% of the park's annual emissions of carbon monoxide, and up to 77% of annual hydrocarbons. No studies have been conducted in the Umbagog area, so the percent contribution by snowmobiling to those local emissions levels is not known. However, current levels do not cause the area to exceed federal or state air quality standards. See the compatibility determination for snowmobiling in Appendix C, "Appropriateness and Compatibility Determinations," for additional information.

Similar to snowmobiling, we are not increasing the current capacity for motorized boating on refuge lands. The predicted increases in motorized boating on the refuge are due to each alternative's respective expansion proposal. Motor boats contribute carbon monoxide and hydrocarbons to the air, but the extent of their contribution is not known for the Umbagog area. As with snowmobiling, current levels do not cause the area to exceed federal or state air quality standards. An outreach program is planned under all alternatives to promote the use of 4-stroke engines to mitigate air quality impacts.

Table 4.8 describes the number of visitors anticipated annually under each alternative.

**Table 4.8. Annual refuge visits by alternative**

Activity	Alternative		
	A	B	C
<b>Consumptive Use</b>			
Fishing	11,000	14,000	14,000
Hunting: Big Game	2,500	6,250	7,500
Hunting: Migratory Birds	150	200	200
Hunting: Upland Game	3,000	7,500	9,000
<b>Non-Consumptive Uses</b>			
Boating/Water Use	14,000	18,000	18,000
Nature trails/other wildlife observation/office visits	4,500	10,000	10,000
Other recreation (snowmobile)	20,000	35,000	35,000
<b>Total annual refuge visits</b>	<b>55,150</b>	<b>90,950</b>	<b>93,700</b>

To limit smoke and other particulate sources under all alternatives, we would conduct no burning on the refuge, except for burning of demolished cabins.

Wildfire is not a substantive concern on the refuge because of the fire characteristics of the Northern Forest. Termed the "asbestos forest" by some scientists (text box next page) the Northern Forest has a history of very few fires and those of only limited extent. Most fires that do occur are human-caused both historically and at present. Nevertheless, we would seek to minimize the possibility of serious fires and their associated health and safety concerns. We

would conduct a wildland urban interface hazard assessment along common boundaries of adjacent private landowners to insure forest management practices are not creating excessive fuel loading that would lead to severe fires.

Construction and operation of a new visitor contact station and headquarters building at the Potter Farm location would be done under all alternatives and cause some local air quality impacts. The size of the facility would vary by alternative as discussed below.

We would introduce energy efficiency measures in our operations that would also reduce emissions. All motorized equipment would be upgraded to 4-stroke equipment whenever a current piece of equipment is retired. We would improve insulation in buildings, use radiant heat where feasible, and fluorescent lights where ever possible.

**Refuge Fire Management Plan:**

Although the Refuge is not within a Federal Class I Air shed under the Clean Air Act Amendments of 1977, visibility and clean air are valued natural resources and their protection would be given full consideration in fire management planning and operations. The Refuge will comply with all applicable federal, state, and local air pollution control requirements, as specified within Section 118 of the Clean Air Act, as amended (42 USO 7418). Further guidance is found within the Service's Fire Management Handbook.

At issue with wildland fire is public and fire fighter safety and health. The Refuge is to take aggressive action to manage smoke to prevent reduced visibility hazards, public safety, fire fighter exposure, and overall air quality (reduce particulate emissions). By minimizing the acreage burned, notifying the public, and restricting access these issues can be mitigated.

**Air Quality Effects of Alternative A (Current Management)**

**Air Quality Benefits**

Proposed refuge management activities would neither substantively benefit nor adversely affect currently good local and regional air quality, with no violations of Federal or State Clean Air Act standards, no impacts to nearby Class I areas, and no cumulative effects on regional ozone or particulate matter pollutant levels.

There would be minor air quality benefits from the air pollutant filtering effects of 14,435 current and up to 5,024 newly acquired acres of upland, floodplain, lake shore, riparian and wetlands vegetation and from adopting energy efficient practices. There would be a negligible reduction in atmospheric carbon due to the sequestering effects of 9,913 current and up to 3,967 newly acquired forested acres. Benefits would be limited to land purchases within the current refuge acquisition boundary in contrast to alternatives B and C that substantially expand the conserved lands base.

Forest management under alternative A would be limited to passive management of existing forest cover. No other forest management activities would be conducted. This would further limit the potential for the beneficial effects of carbon sequestration compared to alternatives B and C.

**Adverse Air Quality Impacts**

Alternative A would include few ground disturbing activities and introduce few additional emission sources. The new Potter Farm visitor facility would be a Service Region 5 standard design small office building. Construction activities would cause short-term, localized effects from construction vehicle and equipment exhausts. Operation of the facility would slightly increase stationary source emissions at the site.

An increase of about 5,000 annual refuge visits by motor vehicle, and little to no predicted increase in current snowmobile and motor boat use on refuge lands, would cause a minor increase in air emissions in the long term and contribute minimally to potential cumulative effects.

## Air Quality Effects of Alternative B (Focal Species Management)

### *Air Quality Benefits*

The effects of alternative B would be similar to alternative A. There would be no substantive change in air quality; no violation of air quality standards, no impacts to Class I areas, and no cumulative effects on ozone and particulate matter. Locally there would be more minor benefits than alternative A but also more potential adverse effects.

Air quality benefits would increase from maintaining up to 76,623 acres (existing and expanded refuge lands) of natural vegetation to filter air and from more energy efficient refuge operations. Acquiring up to 48,760 forested acres on expansion lands would stem nearby development growth and reduce potential air emissions from homes, businesses, camps, vehicles, off-road vehicles and equipment.

We would institute longer rotations in forest management on these lands than have been used by commercial timber managers so that carbon sequestration benefits would increase. Longer forest rotations would improve the health, diversity, and resilience of the forest to disturbance, disease and insect outbreaks, thus maintaining an important carbon “sink.” Similar, though more limited benefits would also accrue from acquisition of forested lands within the current acquisition boundary.

### Adverse Air Quality Impacts

The new Potter Farm visitor facility would be a standard design small office building. Construction of the visitor facility and construction, renovation, or demolition activities associated with other refuge improvements (text box) would cause short-term, localized effects from construction vehicle and equipment exhausts. Operation of the facility would slightly increase stationary source emissions at the site.

Projected annual refuge use levels of 90,950 visits would increase vehicle emissions on and near the refuge in the longer term. The contribution to cumulative local and regional air quality effects would likely be compensated for to a large degree by precluding development in the expansion area.

#### Restoration or New Construction Activities Under Alternatives B&C

##### BUILDINGS/STRUCTURES – Changes proposed under Alts B/C

- 2 buildings would remain intact to serve their current function
- Carmen House (quarters)
- Stranger House (quarters)
- 2 buildings would be converted or expanded
- Office – converted to a research facility
- Shop – add a 30 x 100 storage building
- 1 building would be constructed – Potter Farm – would be converted to offices under all three alternatives
- Alt A&B small office standard design
- Alt C medium office standard design
- 1 building would be demolished
- Cabin at Office – demolish

##### CABINS

- 13 cabins would be demolished and disposed

##### RECREATION/INFORMATION FACILITIES with Kiosks

- Magalloway River Canoe trail/launch (w/kiosk) – will be completed no later than next spring
- Magalloway River Trail extension – 1/4 mile through woods, stone dust trail
- Trail at Potter Farm – 1.8 miles long, 3 feet wide, dirt/wood chip trail (see Oak Point report)
- Trail in expansion – approximately 1 mile long on old logging road
- 2 pullouts - 1/2 acre gravel with wooden guard rails
- Overlook at 26 NH/ME line – 1 acre parking lot 24X24 deck

Air emissions from snowmobiles and motor boats would not significantly increase even though the projected estimate of those activities increases. The predicted increase in visitors engaged in those activities is due to Service acquisition of lands in private ownership currently used by snowmobilers and boaters,

rather than any true increase in numbers or capacity for those activities in the Umbagog area.

**Air Quality Effects of Alternative C (Natural Processes Management)**

**Air Quality Benefits**

Under alternative C we would expand the refuge land base outside the current acquisition boundary. The expansion area would include 71,416 acres of upland forested lands that would be managed in 25,000-acre or larger contiguous, unfragmented blocks, to create a mosaic of conifer and hardwood stands. Management actions would be designed to simulate a mix of stand age and structure that would occur under natural environmental influences. Similar to alternative B, this expanded land acquisition would stem nearby increases in development of second homes and seasonal use homes, thereby substantially reducing the long term potential for air emissions from homes, businesses, camps, vehicles and equipment.

We would utilize accepted forest management practices on these lands with longer rotation ages than commercial timber operations use, which would result in increased carbon sequestration. The predominance of more mature stands would improve the health, diversity, and resilience of the forest to disturbance, disease and insect outbreaks, thus maintaining an important carbon “sink.” Similar, though more limited benefits would also accrue from acquisition of forested lands within the current acquisition boundary.

**Adverse Air Quality Impacts**

The new Potter Farm visitor facility would be a standard design medium office building. Construction of the visitor facility and construction, renovation, or demolition activities associated with other refuge improvements (see text box above) would cause short-term, localized effects from construction vehicle and equipment exhausts. Operation of the facility would slightly increase stationary source emissions at the site.

We would upgrade our refuge maintenance operations to include energy efficient vehicles and equipment.

Projected annual refuge use levels of 93,700 visits would increase vehicle emissions on and near the refuge in the longer term. The contribution to cumulative local and regional air quality effects would likely be compensated for to a large degree by precluding development in the expansion area. Similar to alternative B, although the refuge land base supporting snowmobiling and motor boating would increase, snowmobiling and boater numbers would simply be transferred to our counts and air emissions would not significantly increase over current levels.

**Effects on Soils**

Soils are the structural matrix and nutrient source for plant productivity at the refuge and must be protected to sustain the variety of wetland, riparian, and upland habitats that would meet our habitat and species management goals. Overall, the soils of the refuge are productive and in good condition, with no substantive erosion, compaction, or contamination problems. In certain areas such as cliffs, soils are absent or patchy, thin, and susceptible to disturbance so we would manage these areas to limit any human disturbance.

We evaluated and compared the management actions proposed for each of the refuge CCP alternatives on the basis of their potential to benefit or adversely affect upland soils and soils of the refuge’s floodplains, lake shore, and riparian areas. Impacts of the alternatives to wetland soils are discussed in the wetlands section.

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

- Extent to which refuge land acquisition and conservation under the alternative would limit the growth of nearby development or recreational use thereby reducing loss of forest vegetation and human disturbance and their potential soil impacts
- Extent to which the alternative would replace private forest management on acquired expansion lands with Service management that would improve soil protection
- Potential for camp site acquisition and closure and restoration of access roads and trails to provide opportunities to restore soils

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

- construction of buildings, parking facilities, access roads, and interpretive trails
- forest management activities, including tree-cutting, and use of roads and skid trails
- site clearing for focal species management
- hiking, camping, or other refuge visitor activities
- wildland fire suppression policies and methods

#### **Soil Impacts that would not vary by Alternative**

Regardless of which alternative is selected, we would continue to use best management practices in all management activities that might affect refuge soils to ensure that we maintain refuge soil productivity. Forest management activities would be strictly constrained by resource sensitivity which limits management on 4,478 acres of industry inoperable lands and 2,663 acres of high resource sensitivity areas to individual tree treatments for the benefit of wildlife.

We would restore developed sites with buildings or other infrastructure that have been acquired or that are no longer needed for refuge purposes to natural topography and hydrologic conditions and return to native vegetation as quickly as feasible. In general, existing main access roads would remain open to provide motorized and non-motorized access for approved activities. Other designated motorized access may be developed in the expansion area once a minimum manageable unit is acquired.

Because wildfires can lead to substantive erosion and sedimentation when followed by precipitation, we would take steps to insure that our forest management practices are not creating major fuel loads that would lead to soil-damaging fires. These high temperature and sometimes extensive fires are unlikely to occur at the refuge because of the fire-resistant nature of the Northern Forest (see Air Quality section). Nevertheless, any areas that are burned would be stabilized with erosion control measures and re-vegetated to minimize the potential for damaging erosion.

Under all alternatives, 12 existing remote lake campsites on refuge lands would be maintained. No increased capacity is planned. These sites have been established for years. Regularly used campsites result in soil compaction and reduction in soil moisture. Camping may reduce or remove the organic litter and soil layer, and run-off, and soil erosion may increase. Those changes affect soil invertebrates and microbial processes, and inhibit plant growth. Campsites accessed from the water may also undergo shoreline erosion from the effects of repeated boat landings compacting and removing vegetation. Camp fires create additional impacts. Camp fires destroy organic matter in the soil chemistry to a point that could effectively “sterilize” the soil, making re-vegetation difficult.

Studies indicate that camping impacts may be locally quite severe, but are usually restricted to a relatively small area, i.e. the campsite itself. Significant impacts on vegetation and soil generally occur quickly, even with light use. Much of the impact occurs when the campsite is first opened and during the first year of use. See the compatibility determination for camping in appendix C, “Appropriateness and Compatibility Determinations,” for additional details on those studies. Under all alternatives we plan an outreach program to promote “Leave No Trace” principles.

Off-road vehicles, such as motorbikes and ATVs, are not allowed on the refuge, but violations do occur occasionally. These vehicles can cause serious soil disturbance, compaction, and erosion, especially when they are not on hardened roads. Deteriorating forest roads can also be a locus for such soil impacts. To minimize these impacts, we would inventory and assess all access roads within the refuge within 5 years of CCP completion, and on any newly acquired lands, and implement procedures to retire and restore unnecessary forest interior and secondary roads to promote watershed and resource conservation. We would also restore any off-road vehicle or unauthorized snowmobile trails to eliminate their use. Increased law enforcement would also help reduce those violations contributing to soil impacts.

All designated snowmobile trails on the refuge would be through trails only; we would not provide parking, warming huts, or other infrastructure on refuge lands. No new snowmobile trails are planned under any alternative. Published studies have resulted in differing conclusions as to whether snowmobiling necessarily causes soil compaction. The only common determination is that snowmobile trails on steep, south facing slopes (e.g. > 30 degrees) have a higher likelihood of impact. Damage primarily resulted from decreased snow depths, due to greater solar radiation on south slopes, together with increased pressure of snowmobile treads on steeper slopes. This situation occurs rarely, if at all, on refuge trails. However, we plan to evaluate all trails each 5 years to ensure no site-specific impacts are occurring. Some of these trails may be re-routed or closed, if it is determined that they have a significant negative impact on soils, wildlife or habitat.

Regardless of alternative, site conditions including soil condition, elevation, slope, aspect, and hydrology would be the ultimate determinant of the habitat management potential for any particular site on the refuge. No site would be managed in a manner inconsistent with its recognized potential.

**Soil Impacts of  
Alternative A (Current  
Management)**

**Soil Benefits**

Alternative A is the least desirable alternative in terms of potential benefits from acquisition and conservation of additional lands and the potential for site restoration. We would be limited to purchase of 4,877 acres of forested and recently harvested upland, lakeshore, and floodplain lands within the current refuge acquisition boundary in contrast to alternatives B and C that would allow us to substantially expand the conserved land base (see text box). There would be

no opportunity to protect or restore roads, trails, or sites outside the current refuge boundary so soil impacts from management or development of those lands would continue and likely would increase over the long term.

**Forested and Recently Harvested Uplands, Lakeshore, and Floodplain Lands Protected by CCP Alternatives**

Alternative A – 17,100 acres within current refuge acquisition boundary

Alternative B – 62,891 acres in fee lands and easements including expansion area

Alternative C – 88,656 acres in fee lands including expansion area

Our forest management under alternative A would be limited to a custodial role in conserving existing forest cover. Other than fire protection, we would not actively manage the refuge forested uplands.

**Adverse Soil Impacts**

Alternative A would include few ground disturbing activities that might adversely affect refuge soils. We would not conduct forest management activities, virtually eliminating any minimal potential for localized soil damage from tree-cutting, skid roads, or trails. Best management practices would be employed in construction of the new Potter Farm visitor facility to minimize short-term, localized soil impacts. This should eliminate any potential for significant cumulative effects. Visitation under alternative A would not appreciably change over current levels and is expected to be lower than under either of the other alternatives. As such, visitor activities that might impact soils, such as hiking off designated trails, camping, snowmobiling, and boat launching would pose the lowest concern.

**Soil Impacts of Alternative B (Focal Species Management)**

**Soil Benefits**

Alternative B would provide increased benefits over alternative A and also increased localized adverse effects to refuge soils. Expanding the refuge land base under alternative B by nearly 50,000 acres would eliminate the potential for large-scale development on these lands and reduce the long term potential for the resulting soil impacts.

It is unlikely that any significant forest management operations would occur on expansion lands within the first 15 years or longer after the CCP is implemented, except for pre-commercial thinning or similar non-commercial operations. However, restoration of roads and trails and fire suppression practices on the expansion lands would help reduce soil erosion from such disturbed sites. When the expansion area forests have reached manageable age classes, we would use improved forest management practices in terms of measures to protect the soil. Longer forest rotations would improve the health, diversity, and resilience of the forest to disturbance, disease and insect outbreaks and thereby help maintain protective vegetative cover. New roads or trails needed for forest management would be limited to those necessary to access the stands, would be used less often because of the longer rotations, and would be restored to vegetation after use.

*Wetlands soils impacts.*—Under alternative B we may conduct a hydro-geologic study of groundwater and nutrient flow that are maintaining peatlands and we would address issues or threats as necessary.

**Adverse Soil Impacts**

*Impacts from construction of buildings, kiosks, boat launch, parking facilities, roads and trails.*—Under the expanded construction program noted in the section on Air Quality, there would be localized soil compaction and loss of soil productivity where soils are removed or surfaced for new structures, kiosks, boat launch, parking facilities, roads, and trails and in immediately adjacent areas where vehicles and heavy equipment are used for site access and preparation

work. These impacts would constitute an unavoidable adverse impact of these refuge infrastructure improvements but would comprise, in total, no more than 50 acres of the nearly 50,000 acres of alternative B refuge expansion lands. Offsetting these soil impacts would be reclamation of natural soil productivity on restored cabin sites, campsites, trails, and roads.

Boardwalks would be constructed over saturated areas to protect sensitive wetland vegetation. No construction other than placement of boardwalk pilings would be done in wetlands so there should be negligible localized effects to wetland soils.

*Impacts from increased visitation.* — As we discuss under “Soil impacts that would not vary by alternative” above, the projected increases in annual refuge use levels for those activities likely to impact soils is a primarily a result of increased land acquisition. The capacity for snowmobiling and remote lake camping on refuge lands, for example, would not increase as we do not plan to expand the existing snowmobile trail system or number of campsites. Any contribution to cumulative local and regional soil quality and productivity effects would likely be compensated for to a large degree by precluding development in the expansion area.

*Compaction and erosion from forest management activities.*—There would be short-term, localized soils impacts from forest management practices including stand cutting, and clearing for access roads and skid trails. We would minimize these impacts by adhering strictly to best management practices for our forest management operations.

**Table 4.9. Manageable forest habitat on the Lake Umbagog Refuge in next 15 years under the CCP**

<b>Forest Type</b>	<b>Acres</b>
<b>Hardwood</b>	804
<b>Softwood</b>	1,032
<b>Mixed Woods</b>	2,205
<b>TOTAL</b>	<b>4,041</b>

In the next 15 years, we would limit forest management to approximately 4,000 acres (see table 4.9) of current refuge fee-owned lands in a mature age class and stand condition, which occur in the Low or Moderate Resource Sensitivity Zones. We would manage forest lands in the Low Resource Sensitivity Zone within the current refuge acquisition boundary as well as those in the expansion area according to best management practices recommended for New Hampshire and Maine and to meet or exceed New Hampshire and Maine forest certification standards.

We would manage forests in the Moderate Sensitivity Zone only to the extent necessary to achieve specific wildlife or plant community objectives. We would severely limit forest management within High Resource Sensitivity Zone to single tree techniques such as single tree felling or girdling or small group selection to benefit wildlife.

*Damage from fire.*—Soil damage from fires or from erosion on fire-damaged sites is unlikely to occur on the refuge. Nevertheless, all wildland fires would be suppressed with fire fighter and public safety as the highest priority.

Although wildland fires rarely occur in the Lake Umbagog lake area, we would protect against wildland fire whenever it threatens human life, property, and natural or cultural resources. Fires would be suppressed in a prompt, safe, aggressive, and cost-effective manner to minimize adverse impacts to resources and acreage.

## Soil Impacts of Alternative C

### Soil Benefits

From a watershed perspective, alternative C would be the most beneficial in terms of the total land area conserved and resulting reduced potential for soils impacts. We would expand the refuge land base under alternative C by more than 76,000 acres, eliminating to a greater extent than alternative B the potential for development of second homes and seasonal use homes or off-road vehicle use on these lands. This should substantially reduce the long term potential for soil impacts from construction and from off-road vehicles.

Once these expansion land forests have recovered from their last cut and reached manageable status, we would manage forests on expansion lands in contiguous 25,000 acre blocks to create a mix of age and structure to simulate what would occur under natural environmental conditions without human intervention. Longer forest rotations, which would improve the health, diversity, and resilience of the forest to disturbance, disease and insect outbreaks, would help maintain protective vegetative cover. Existing unnecessary roads and trails would be restored. New roads or trails needed for forest management would be limited to those necessary to access the stands, would be used less often because of the longer rotations, and would be restored to vegetation after use.

### Adverse Soil Impacts

*Impacts from construction of buildings, parking facilities roads and trails.*— Impacts here would be the same as those discussed under alternative B.

*Impacts from increased visitation.*— Impacts here would be the same as those discussed under alternative B.

*Impacts from forest management activities.*—There would be short-term, localized soils impacts from forest management practices including stand cutting, and clearing for access roads and skid trails. As in alternative B, we would minimize these impacts by adhering strictly to best management practices for forest management operations on approximately 4,000 acres of current refuge upland forest in the Low and Moderate Resource Sensitivity Zones. We would severely limit forest management within the High Resource Sensitivity Zone to single tree techniques such as single tree felling or girdling or small group selection to benefit wildlife.

*Impacts from fire.*—Soil damage from fires or erosion on fire-damaged sites is unlikely to occur on the refuge. Although wildland fires rarely occur in the Lake Umbagog refuge area, under alternative C we would allow naturally ignited fires to burn until a human resource is threatened. We would protect against wildland fire only when it threatens human life or property. We would conduct no salvage harvest after fire or windthrow event and would not allow collection or removal of dead and down wood except in WUI areas.

## Effects on Hydrology and Water Quality

Management actions proposed for the refuge's CCP alternatives were evaluated and compared based on their potential to help maintain and improve the hydrology and water quality of Umbagog Lake, and the wetlands, rivers, ponds, and vernal pools in the Upper Androskoggin River watershed. We evaluated the benefits of actions that would protect or restore the hydrology or maintain or improve water quality:

- Land acquisition and conservation that would provide watershed benefits by limiting land clearing and changes in local hydrology
- Camp site restoration that would reduce erosion and restore site hydrology
- Improvements in local hydrology through road reconstruction or removal and culvert removal
- Work in partnership with FERC licensee to manage lake water levels at all seasons to benefit wetlands and focal species
- Improved water quality monitoring for early problem identification
- Improved cooperation of other landowners in watershed to influence water quality

We evaluated and compared the impacts of refuge management actions with the potential to cause adverse effects to hydrology and water quality including:

- Creation of wetland openings (e.g. in cattails) to benefit waterfowl
- Changes in recreational boating activities that might lead to lake and river contamination with petroleum products

**Hydrology and Water Quality Impacts That Would Not Vary by Alternative**



Paul Casey/USFWS

*Conducting water studies on the refuge*

**Hydrology and Water Quality Benefits**

*Decision making based on comprehensive scientific data.*—Regardless of which alternative we select, we would take a number of steps to insure that we have sufficient scientific data to support management decisions regarding refuge hydrology and water quality. We would conduct a systems analysis to determine the lake bathymetry and annual hydrology. We may also conduct a sediment analysis, identify wetland functions and measures of integrity, and evaluate water quality and the effect on Federal trust species. We would use this information to evaluate wetland habitat availability and quality from different water level regimes on Federal trust resources. Finally, we would work with State agencies and other conservation partners to identify sources of point and non-point sediment and nutrient loading (e.g. septic systems, erosion, etc) impacting refuge wetlands, and associated lakes and rivers, and address these sources where possible.

*Benefit to the FINNL wetland.*—The Floating Island National Natural Landmark would benefit by more ecologically based management. We would propose to the Park Service an expanded boundary that is more ecologically based, using recent vegetation surveys (see map 2-1).

**Adverse Hydrology and Water Quality Impacts**

In managing the refuge, we would closely monitor and mitigate all of our routine activities that have some potential to result in chemical contamination of water directly through leakage or spills or indirectly through soil runoff. These include use of motorized watercraft, control of weeds and insects around structures, use of chemicals for de-icing roads and walkways, and use of soaps and detergents for cleaning vehicles and equipment. Personnel would take the following precautions to minimize the potential for the chemicals and petroleum products becoming a water quality problem:

- Pouring or mixing of chemicals or petroleum products would be conducted no closer than 25 feet from surface water and over a non-porous surface material

- All staff would be trained in spill prevention and spill response

*Invasive plant control with herbicides.*—Regardless of the alternative selected, the herbicide active ingredient glyphosate, formulated as Rodeo<sup>®</sup>, would be used as one method to prevent establishment and spread of invasive wetland plants, in particular, purple loosestrife, Japanese knotweed, and *Phragmites*. The Regional Contaminants Specialist, who is responsible for upholding Federal standards for water quality and soil protection, has reviewed our proposals and approves our chemical herbicide use.

There would be a potential for herbicide concentrations in lakes and ponds to build up to chronic levels over time. The potential depends on the balance of pesticide input and removal from the lake or pond system. Herbicide inputs may occur either through direct application, water inflow, or through resuspension and diffusion from the sediment layer. Herbicide removal from the system may occur through outflow, degradation, volatilization, and settling or diffusion into the underlying sediment (Neitsch et al. 2001).

The rate of herbicide degradation is an important consideration for assessing the effects of a given herbicide on ponds and lakes. Glyphosate degrades in water with a reported half-life in water that ranges from 3.5 to 70 days depending on the rate of transfer to the sediment layer and testing source (SERA 1996). Based on the relatively short half-life, the large water volume of the lakes, rivers, and wetlands, and the limited acreage likely to require treatment (currently less than 1 acre) it is not expected that any discernable effects would occur to these water resources as a result of herbicide treatments.

*Impacts from increased visitation.*—All alternatives predict some increase in annual visitor numbers; however, the increase varies due to each alternative's respective refuge expansion proposal. Alternative A predicts the lowest annual increase, since no expansion is proposed, while alternative C predicts the highest increase due to its larger refuge expansion proposal. Camping, boating, and snowmobiling are three visitor activities that have some potential to impact water quality, even at current use levels. We do not plan to increase capacity for these activities on existing refuge lands, or on lands to be acquired, regardless of alternative; rather, we plan to maintain existing use levels.

Camping can compromise water quality through improperly disposed human waste at campsites by introducing pathogens. Human and pet waste, food disposal and dishwashing may increase aquatic nutrient loads. That may result in limited, localized increases in algal growth, facilitating oxygen depletion and altering the composition of aquatic vegetation and invertebrate communities. Runoff from eroded campsites can increase turbidity and sedimentation, which may affect fish and invertebrates. Pit toilets located near water in shallow, permeable soils can sometimes introduce coliform bacteria into the water. However, camping rarely affects water quality to the point it is a public health concern (Cole, 1981), and we do not predict the camping we propose would pose a risk to water quality and public health under any alternative.

Boating can impact water quality from improperly cleaned motor boats, which may introduce invasive aquatic species from other water bodies. Soap from improper dishwashing, trash and fish-cleaning waste may each pollute water.

Snowmobiling is documented to contribute petroleum hydrocarbons after ice-out in small shallow water bodies exposed to snowmobile exhaust. The concentration of hydrocarbons in snow is likely to be particularly high on trails where regular

**Hydrology and Water Quality Impacts of Alternative A**

grooming constantly packs exposed snow. Spring snowmelt may release those hydrocarbons into streams or other bodies of water. To what extent the water bodies on the refuge are at risk of hydrocarbon pollution is unclear given current levels of snowmobile use, recent improvements in snowmobile technologies, and the large volumes of water in these local systems. The compatibility determination for snowmobiling in appendix C, "Appropriateness and Compatibility Determinations," provides additional references on snowmobiling impacts.

**Benefits**

We would expect some increase in hydrology and water quality benefits from acquisition and conservation of more than 5,500 additional acres of upland forest, lakeshore, wetlands and other lands within the acquisition boundary under alternative A because we would prohibit potentially damaging development and otherwise incompatible uses.

We would not make improvements in local hydrology through road reconstruction or removal or culvert removal. However, we would realize water quality benefits from improved monitoring and cooperation of watershed landowners. Loons would continue as indicator of effectiveness of water level management on nesting wildlife.

On a site basis, camp restoration would reduce erosion and restore site hydrology. Stringent precautions in conducting refuge management activities would prevent chemical contamination of water directly through leaks or spills or indirectly through soil runoff.

**Adverse Impacts**

Under alternative A, we would not create wetland openings to manage waterfowl, eliminating their potential short-term impacts.

Fishing and hunting activities in the Upper Androscoggin River watershed are not expected to increase under alternative A, but non-consumptive uses associated with wildlife viewing, such as hiking, wildlife photography, canoeing and kayaking would likely increase based on trends in non-consumptive use in the Region. So there may be an increase in the potential for changes in recreational boating activities that might lead to lake and river contamination with petroleum products. Public outreach on that and other issues such as invasive aquatic weeds, invasive fish, and lead contamination would help mitigate that risk.

**Hydrology and Water Quality Impacts of Alternative B**

**Benefits**

By expanding the refuge by up to 49,718 acres in land acquisition and easements under alternative B we would provide substantial additional watershed benefits by limiting land clearing and changes in local hydrology that might otherwise affect those areas from development.

We would increase camp site restoration that would reduce erosion and restore site hydrology and we would improve local hydrology through road reconstruction or removal. Under alternative B we would also restore the hydrology of areas such as the Day Flats area by plugging ditches and re-contouring the disturbed areas.

Water quality benefits would improve from a strengthened partnership with the FERC licensee in determining lake water levels at all seasons, upgraded monitoring, and greater efforts in seeking cooperation of watershed landowners. We would work with the States of New Hampshire and Maine to establish an Umbagog Lake Working Group to develop regulations and best management

practices for activities on the lake and rivers, that would help maintain good water quality, such as a boater ethics program that would include proper waste disposal protocol, elimination of lead fishing tackle, and use of wake zones and appropriate locations for access.

#### **Adverse Impacts**

Fishing and hunting activities in the Upper Androscoggin River watershed are not expected to increase under alternative B, but non-consumptive uses associated with wildlife viewing, such as hiking, wildlife photography, canoeing and kayaking would likely increase based on trends in non-consumptive use in the Region and the improved visitor facilities proposed under this alternative. Impacts predicted for camping, boating, and snowmobiling are noted above under “Hydrology and Water Quality Impacts that would not vary by Alternative.”

### **Hydrology and Water Quality Impacts of Alternative C**

#### **Benefits**

Similar to alternative B, by expanding the refuge by up to 76,305 acres in land acquisition under alternative C we would provide substantial additional watershed benefits by limiting land clearing and changes in local hydrology that might otherwise affect those areas from development.

We would increase camp site restoration, reduce erosion and restore site hydrology and we would improve local hydrology through road reconstruction or removal and culvert removal. We would also restore the hydrology of the Day Flats area by plugging ditches and re-contouring the disturbed areas.

We would promote a more natural hydrologic regime, would monitor to determine if this causes adverse water quality effects, and would alter management accordingly.

We would work with the States of New Hampshire and Maine to establish an Umbagog Working Group to develop voluntary best management practices for activities on the lake and rivers, that would help maintain good water quality, such as boater ethics program that would include proper waste disposal protocol, elimination of lead fishing tackle, and use of wake zones and appropriate locations for access.

#### **Adverse Impacts**

Under alternative C, we would increase staffing and engage in a higher level of routine refuge management activities that may result in a somewhat higher potential for incidence of chemical contamination of water directly through leakage or spills or indirectly through soil runoff than alternative A. We would follow the same measures outline under alternative A to minimize these effects.

We would not create wetland openings to manage for waterfowl thereby avoiding any adverse impact to water quality during the installation phase.

Under alternative C non-consumptive visitor uses associated with wildlife viewing, such as hiking, wildlife photography, canoeing and kayaking would likely increase based on trends in non-consumptive use in the Region in general, and the improved visitor facilities proposed under this alternative. Impacts predicted for camping, boating, and snowmobiling are noted above under “Hydrology and Water Quality Impacts that would not vary by Alternative.”

### **Effects on Open Water and Wetland Habitats and Species**

Wetlands management and conservation is our highest priority for the refuge, consistent with the original refuge establishment purpose, and our first and foremost CCP goal. We evaluated the management actions proposed for each of the refuge CCP alternatives for their potential to benefit or adversely affect open

water and wetland habitats—including fen and flooded meadow, boreal fen and bog, northern white cedar forest, and scrub-shrub wetland—and associated focal species.

**Benefits**

We evaluated the benefits of our actions that would conserve or restore the open water and wetlands habitats or conserve and enhance breeding or migrating focal species, including:

- Acquisition and conservation of additional wetlands
- Conversion of certain areas to more productive or unique wetlands
- Management to prevent the growth of invasive species
- Control of Umbagog Lake water levels to maintain or expand wetlands and to seasonally benefit focal species
- Implementation of beaver management to enhance habitat for waterfowl and other species
- Control of predators that affect nesting or migratory species

**Adverse Impacts**

We evaluated the potential for the actions proposed under the Lake Umbagog refuge management alternatives to cause adverse effects to open water and wetlands habitats, including:

- actions causing soil, hydrology, and water quality impacts that might adversely affect open water biota and wetlands maintenance and productivity
- actions such as vegetation management and promotion or creation of ponds, that might adversely affect open water biota and wetlands maintenance and productivity
- activities of refuge visitors and lake users that might directly impact wetlands habitats or disturb nesting or migratory species

<p><b>Focal Bird Species of Refuge Wetlands and Open Water Habitats</b></p> <ul style="list-style-type: none"><li>— Common Loon</li><li>— American black duck</li><li>— Ring-necked duck</li><li>— Wood duck</li><li>— Common goldeneye</li><li>— Black-backed woodpecker</li><li>— Rusty blackbird</li></ul>
---

**Open Water and Wetland Habitat and Species Impacts That Would Not Vary by Alternative**

**Wetlands Conservation.**—Regardless of which CCP alternative we select, we would continue to conserve the refuge wetlands as the highest priority for refuge management. Because the extent of the unique wetlands complex at the refuge is largely a function of the impounding of Umbagog Lake, we expect that Umbagog Lake water levels would continue to fluctuate, but only within the current bounds of 1,247 ft above mean sea level (MSL) high and 1,238 ft MSL low, regardless of any future changes in management arrangements concerning control of Errol Dam. We also expect that the dam system upriver from the refuge would continue to function within the current system bounds.

We expect that the forested Upper Androscoggin River watershed would remain largely forested with no extensive development for the foreseeable future and that only excessively prolonged periods of heavy rainfall or prolonged extensive drought, neither of which has been known to occur in this region, would alter the hydrologic regime.

Other than very gradual losses of acreage in particular wetland types resulting from natural succession, we anticipate that any adverse impacts to the refuge wetlands complex would likely be a result of changes in local hydrology or water quality originating within the Upper Androscoggin River watershed or from direct human disturbance or the influx of invasive species. Regardless of which CCP alternative we select, we would develop a HMP and HSIMP for wetland habitats, and would mitigate any potential for major unplanned changes in vegetation by continuously monitoring our vegetation types and updating our GIS database at least every 5 years.

**Water Level Effects on Loon and Other Species.**—Under all alternatives we will continue to cooperate with the FERC licensee and other regulatory agencies under the existing license for Errol Dam, to develop a yearly water level management plan “to benefit nesting wildlife.” We will continue to promote stable water levels during the nesting season to the extent possible under the current agreement. We will also collect detailed information on the impacts of fluctuating water levels, which may lead us to request a modification of the license agreement. We will also continue to recommend that water levels be managed at other critical times of the year (e.g. during fall migration) to benefit wildlife.

**Rare Communities.**—Regardless of alternative, we would take all measures necessary to conserve the rare wetland communities on the refuge. We would survey the FINNL and other unique or rare plant communities as a priority and in cooperation with the NPS, would expand the boundary of the FINNL to one that is more ecologically based using the 2002-2003 vegetation surveys (see map 2-1). Within 2 years of CCP completion, we would conduct all administrative procedures to expand the boundary. Also, within 3 years of CCP completion, we would convene a workshop with wetlands ecologists to determine what information should be collected and what monitoring should occur to document any potential loss or degradation of the area. We would also establish a baseline from which to compare subsequent information.

**Rare & Uncommon Plants in Refuge Fens**

- Narrow-leaved cotton grass
- Heart-leaved twayblade
- Creeping sedge
- Meager sedge
- Livid sedge
- Thin-flowered sedge
- Moor rush
- Dragon’s mouth
- Pursh’s goldenrod
- Cotton bulrush
- Orchid’s rose pogonia
- Grass pink

Purple loosestrife



USFWS

**Invasive Plants.**—Invasive plants can cause major damage to native plant assemblages and the wildlife they support if invasive populations are allowed to become established and spread. We would take steps to insure that invasive species do not become established to degrade the wetlands by conducting a systematic survey for invasive species and removing them where they occur. Key among these invasive plants are purple loosestrife, Japanese knotweed, and *Phragmites*. We would take proper care of all refuge equipment to avoid introduction or transport of invasive plants, implement outreach and education programs, and actively support State initiatives and continue to work with States to prevent introduction of invasive species to all water bodies on the refuge.

**Umbagog Lake “Working Group.”**—As described in chapter 2, we propose creating an Umbagog Lake Working Group under all alternatives that would coordinate voluntary efforts to reduce resource threats and resolve user conflicts on the lake. Priority projects for the working group would include working with the States and others to help:

- reduce wildlife exposure to lead
- reduce boating conflicts and user and landowner impacts at access sites and on the lake

- establish refuge and lake user “carrying capacities” and “thresholds of acceptable change” to minimize user conflicts and impacts on wildlife and habitats;
- reduce boat wake impacts on the Magalloway and Androscoggin rivers
- determine if changes to current area closure protection measures are warranted
- identify and address point and non-point sediment and nutrient loading sources where possible

**Impacts from furbearer management.**—Under all alternatives, our furbearer management program may include trapping as a management tool. The furbearer management program would not be designed to eliminate targeted furbearer species, but rather, remove individuals in those areas where a surplus exists. 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.

This program could result in both direct and indirect effects on open water and wetlands habitats and species. Indirect impacts could result from the activity of placing traps as it could displace migratory birds during pair bonding/nesting season, or could destroy nests by trampling. Direct impacts would include the harvest of targeted species, and the potential to harvest non-targeted species. Some of those species could be predators on migratory birds or nests, or could be species that induce beneficial habitat changes (e.g. beavers).

Because of the temporal separation of trapping activities and breeding wildlife using the refuge, indirect impacts on those resources by trappers would be negligible. Trappers using the refuge in early March may disturb individual early nesting waterfowl on occasion, and cause their temporary displacement from specific, limited areas. Those impacts are occasional, temporary, and isolated to small geographic areas. Bald eagles initiate nesting activities on the refuge in February, but not evidence suggest trapping has affected bald eagle nesting success.

Harvest of populations of nest predators such as raccoons, fox, skunk, and mink could have positive impacts on nesting birds, although this benefit could be only temporary and depends on timing, and extent of animals removed. Harvest of beaver and muskrat can be both positive and negative. Muskrats dig bank dens into embankments, causing considerable damage and adding costs to the operations of the refuge. Beaver will sometimes plug water control structures, causing damage, limiting access, and compromising the capability of refuge staff to manage habitat. On the other hand, muskrat and beaver can both enhance aquatic and wetlands habitats by creating openings and ponding water. Many species in this forested region favor beaver ponds and wetlands. Beaver are a keystone species for cycling small wetlands systems from pond to meadow to scrub-shrub to forest, and back to pond.

Harvest of non-targeted species is possible, but requirements for trap setting, requirements for a state license, outreach and education, and requiring adherence to best management practices for reducing incidental take of non-target animals developed by the states, would help minimize this impact.

**Impacts from increased visitation.**—All alternatives predict some increase in annual visitor numbers; however, the increase varies due to each alternative’s respective refuge expansion proposal. Alternative A predicts the lowest annual increase, since no expansion is proposed, while alternative C predicts the highest

increase due to its larger refuge expansion proposal. We do not plan to increase capacity for these activities on existing refuge lands, or on lands to be acquired, regardless of alternative; rather, we plan to maintain existing use levels.

Direct impacts on wildlife can be expected wherever humans have access to an area. In general, human presence disturbs most wildlife, which typically results in a temporary displacement without long-term effects on individuals or populations. Some species will avoid areas frequented by people, such as developed trails and buildings, while other species seem unaffected or even drawn to a human presence. When visitors approach too closely to nests, they may cause the adult bird to flush exposing the eggs to weather events or predators. Overall, direct effects should be insignificant from non-consumptive visitor activities because use of refuge lands is fairly dispersed, and large areas are not accessible.

Hunting and fishing are two priority, wildlife-dependent consumptive activities with additional direct effects on open water wildlife and habitats. Hunting of waterfowl has been ongoing on refuge lands 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 within 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 moderate and occurs outside the breeding season. Our April 2007 amended EA for the refuge's current hunt program (alternative 2 in that EA), which we incorporate by reference herein, provides additional impacts analysis (USFWS, 2007).

The refuge's fishing program follows both states of New Hampshire and Maine regulations, including harvest limits for certain species. These limits are set to ensure that harvest levels do not cumulatively impact native fish resources to the point they are no longer self-sustainable. Other potential impacts of fishing on open water and wetlands wildlife and habitats are detailed in the compatibility determination for public fishing found in appendix C, "Appropriateness and Compatibility Determinations." A summary follows:

- **Accidental or deliberate introductions of non-native fish by anglers.** We plan to continue to work with both states in implementing a public education and outreach program; increased law enforcement is also planned under all alternatives.
- **Accidental introduction of invasive plants, pathogens, or exotic invertebrates attached to fishing boats.** Similar to non-native fish, we will continue to work with both states in implementing a public education and outreach program under all alternatives.
- **Negative effects on loons, eagles, osprey, waterfowl, and other wildlife from lost fishing gear;** namely, the concern with these species ingesting lead sinkers, hooks, lures, and litter, or becoming entangled in fishing line or hooks. Similar to non-native fish, we will continue to work with both states in implementing a public education and outreach program under all alternatives.
- **Disturbance to wildlife; namely to breeding and brood-rearing loons, waterfowl, bald eagles, osprey, and wading birds.** Similar to other visitors, anglers can approach too closely to nests, and may cause the adult birds to flush exposing the eggs to weather events or predators. Under all alternatives, in cooperation with both states, we will continue to close areas seasonally around active nesting sites to minimize human disturbance.

- **Reduction or alteration of prey base important to fish-eating wildlife.** The extent to which this has occurred over the years, and the impact its had on those wildlife, is unknown.
- **Negative impacts on water quality.** These were described in the section titled “Effects on Hydrology and Water Quality” above.
- **Negative impacts on sensitive wetlands from boat access sites and associated foot traffic.** Direct impacts on vegetation can result as boats physically traverse through wetlands vegetation. Other ground disturbing impacts can occur in wetlands from anglers getting their boats in water, or from shoreline fishing. Portions of, or whole plants, can be torn, sometimes by the roots. Refuge boat access sites and trails will be located away from sensitive wetlands, peat lands, and rare plants under all alternatives. Habitat features important for trout, such as overhanging banks, will also be protected from disturbance

In summary, our observations and knowledge of the area provide no evidence that cumulatively, the visitor activities we propose to continue to allow will have an unacceptable effect on wildlife resources or their habitats. Prior landowners have allowed the public to engage in these activities for many years without discernable negative effects. We do not expect a substantial increase in the cumulative effects of visitor use over the 15 year timeframe of this plan. Refuge staff will monitor and evaluate the effects of visitor use, in collaboration with state agencies and partners, to discern and respond to unacceptable impacts on wildlife or habitats.

**Open Water and Wetland Habitat and Species Impacts of Alternative A**

We would continue to conserve the refuge’s current 3,150 acres of wetlands and 5,033 acres of open water habitat (see table 4.10) under alternative A. Acquisition and conservation of additional wetlands under alternative A would be limited to 616 acres that would be acquired from willing sellers within the current refuge boundary. This increase would be minor compared with adding as much as 4,617 wetland acres and 872 open water acres under alternative B or 5,244 wetland acres and 901 open water acres under alternative C. The additional acreage to be acquired in the respective expansion areas would more than double the refuge’s wetlands base.

Table 4.10. Wetland acquisition by alternative (acres)

Wetland Type	current refuge acres	A		B				C	
		still to be acquired	total in acquisition boundary	Fee Acres	Easement Acres	Fee + Easement	Alt B Totals	Fee Only	Alt C Totals
Fen and Flooded Meadow	482	73	555	115	17	132	687	217	772
Boreal Fen and Bog	1,184	97	1,281	2,458	341	2,799	4,080	3,334	4,615
Northern White Cedar	829	202	1,031	0+	0+	0+	1,031	0+	1,647
Scrub-Shrub Wetlands	655	244	899	842	64	906	1,805	1,077	1,976
<b>Total All Wetland Types</b>	<b>3,150</b>	<b>616</b>	<b>3,766</b>	<b>3,415</b>	<b>422</b>	<b>3,837</b>	<b>7,603</b>	<b>4,628</b>	<b>9,010</b>
Open Water***	5,033	801	5,834	46	23	69	5,906	100	5,934

Of the three refuge management alternatives, we would be most constrained under alternative A in terms of how we would improve conservation of wetlands and open water habitats and enhance management of focal species. Our management efforts would be limited to habitat inventory, mapping, and monitoring; bird surveys and surveys of other vertebrates, invertebrates, and plants; support of research on water level effects and loon populations, protection of nesting loons, and limited acquisition of additional wetlands and open water habitat. We would implement no active habitat management such as beaver management or waterfowl food plantings to improve wetlands and manage habitat productivity for breeding or migratory waterfowl.

Water level fluctuations, water quality problems and human disturbance of wildlife would continue to pose some risk of adversely affecting wetland habitat; breeding, brood rearing, and migrating waterfowl; marsh birds, shorebirds, and wading birds; and other wildlife species of concern at the refuge under alternative A.

We would monitor habitat conditions and continue to work closely with the FERC licensee to ensure that water levels do not affect any wetland habitat type.

Water quality may become an increasingly important issue at the refuge as lands adjacent to the refuge are developed and the user population increases over the years, although the refuge should experience the lowest increase in users under alternative A.

Over the long term, the risk of erosion and water quality problems that might affect these habitats would be highest under this alternative because watershed land conservation would be limited to acquisition within the current refuge boundary.

There would be no wetland impacts from construction and operation of the Potter Farm visitor center because the location is not adjacent to wetland habitat nor does the site drain to any wetlands.

#### **Fen and Flooded Meadow**

Acquisition of up to 73 additional acres and conservation of a resulting total 555 acres of fen and flooded meadow habitat under alternative A would provide minimally increased benefits to breeding and migrating waterfowl and other species using this habitat type. We would monitor wetland conditions but we would not actively manage the habitat for waterfowl or other species.

We would plan to identify impacts to fen and flooded meadow habitat from changes or fluctuations in water levels as the water levels and their effects are monitored and evaluated.

Visitors fishing or boating in or near fen and flooded meadow habitat may disturb nesting or foraging birds, except where we implement areas closures around bald eagle and loon nests. Because of staffing and management constraints, alternative A would offer little opportunity to further limit visitor impacts. However, impacts should be minor because this type of disturbance would occur infrequently and would not likely adversely affect waterfowl productivity.

#### **Boreal Fen and Bog**

We would continue to conserve the refuge's 1,184 acres of boreal fen and bog habitat under alternative A and would seek to acquire 97 additional acres of the habitat. Purchase of these additional acres would minimally increase conservation of the refuge peatland complex.

None of our passive management actions under alternative A would adversely affect boreal fen and bog habitats. The refuge peatland habitats generally are not used by visitors so disturbance of wildlife or damage to rare plants would be unlikely to occur. Of course care would be taken in our own projects and in monitoring by researchers to avoid any effects to these habitats.

#### **Northern White Cedar**

We may acquire as much as 202 acres of northern white cedar habitat under alternative A. Purchase of these additional acres, which includes the largest Northern white cedar swamp in New Hampshire, would substantially benefit conservation of this type in the region as well as benefiting focal species such as the black-backed woodpecker. However, no active management techniques would be employed.

None of our passive management actions under alternative A would adversely affect northern white cedar habitat. Northern white cedar habitats generally are not used by visitors so disturbance of wildlife or direct damage to the habitat would be extremely unlikely to occur. Care would be taken in our own projects and in monitoring of researchers to avoid any effects to these habitats.

#### **Scrub-Shrub Wetland**

We may acquire as much as 244 acres of scrub-shrub wetland habitat under alternative A. Purchase of these additional acres would increase conservation of this habitat as well benefits to woodcock because they would constitute an increase of 37 percent in Service ownership.

No active management techniques would be employed and none of our passive management actions under alternative A would adversely affect scrub-shrub habitat.

#### **Open Water**

We would acquire 801 acres of open water habitat thereby conserving 5,834 acres of open water habitat under alternative A. No active management techniques would be employed.

As noted, water quality effects on aquatic species may become an increasingly important issue at the refuge as lands adjacent to the refuge are developed. Over the long term, the risk of erosion and water quality problems that might affect these habitats would be highest under this alternative because watershed land conservation would be limited to land acquisition within the current refuge boundary.

Refuge visitors who boat and fish may cause localized, transient impacts by disturbing the bottom substrate in shallow areas or causing minor spills or leaks of petroleum products. Brochures and signage would notify these users of proper precautions. We would work with the State of New Hampshire to evaluate the no-wake exemption on Magalloway and Androscoggin rivers which allows high speed boat operation within 150 feet of shoreline. These impacts would be more limited when compared to alternatives B and C, because the estimated refuge user population increases over the years would be lowest under alternative A.

#### **Common Loon**

We would continue to protect loons as we have in the past under alternative A. We would continue to support research on the apparent decline in Umbagog Lake loons, to advise the FERC licensee on water levels to benefit loons, and to protect active loon nests in spring and summer from predators and human disturbance using outreach and visitor contact, floating rafts, buoy lines, restricted access, and other tools as warranted.

**Open Water and Wetland  
Habitat and Species  
Impacts of Alternative B**

No additional active management techniques would be employed to increase loon productivity and none of our passive management actions under alternative A would adversely affect loons.

We propose to substantially expand conservation of the refuge wetlands and markedly upgrade how we manage for waterfowl and other focal species under alternative B. We would continue to conserve the refuge's current 3,150 acres of wetlands and 5,033 acres of open water habitat (see table 4.10) under alternative B. In addition to acquiring the remaining 616 wetland acres and 801 open water acres within the current refuge boundary, we would seek to acquire 3,837 wetland acres and 69 acres of open water habitat in the alternative B expansion area (see map). The additional acreage to be acquired would more than double the refuge's conserved wetland and open water habitat acreage.

Among the alternatives, we would be best able to achieve our wetlands conservation and focal species management goals under alternative B. Our management efforts would be expanded well beyond our current passive management to include specific habitat manipulation and species conservation measures including broadening our techniques for beaver management, providing waterfowl food plantings, and management of habitat productivity for breeding and migratory waterfowl.

We would take additional steps to ensure that water level fluctuations and water quality problems are addressed, and to further limit human disturbance and thereby reduce the risk of adverse effects to wetland habitats and focal species. We would monitor habitat condition and continue to work closely with the FERC licensee to ensure that water levels do not affect any wetland habitat type. Further, under alternative B we propose several future studies, and inventory and monitoring projects that would assist in evaluating the impacts from water level fluctuations. As such, when the Errol Dam license expires in August 29, 2023, the Service would be able to utilize the new information obtained from these studies to affect future water level management under a new license and/or to promote a conservation owner for the dam.

Through acquisition of lands adjacent to the refuge we would expand conservation of the watershed and reduce the adverse effects of development and population increases over the years.

There would be no impacts from construction and operation of the Potter Farm visitor facility because the proposed location is not immediately adjacent to wetlands habitat. However, construction of the interpretive loop trail near the new headquarters, under this alternative poses some risk of affecting wetlands. A conceptual design and tentative location for a trail (see map 2-8) are identified in the Roadway/Trail Evaluations and Headquarters Assessments (Oak Point Associates 2004). The trail would be approximately 2 miles long, designed to allow travel by people with disabilities, and route visitors to wetland and meadow habitat adjacent to the Lake and then north through forested areas before looping back to the headquarters. The eastern portion of the trail would parallel a large wetland. No construction would be done that would directly affect the wetland other than setting of pilings for boardwalks, which would be constructed over saturated areas to protect sensitive vegetation.

**Fen and Flooded Meadow**

Under alternative B, we would improve our management of fen and flooded meadow habitat by acquiring and conserving as much as 132 additional acres of the habitat and actively managing it for breeding and migrating waterfowl,



Paul Casey/USFWS

*Observation platform on  
the Magalloway River*

marshbirds, shorebirds, and wading birds. Fee purchase and easements on these additional acres would increase this habitat by 43 percent.

We would take specific steps to upgrade fen and flooded meadow habitat management for breeding, brood rearing, and migrating waterfowl; marsh birds, shorebirds, and wading birds; and other wildlife species of concern at the refuge under alternative B. An improved partnership with the FERC licensee to address water level control, expanded bird and aquatic invertebrate surveys, and promotion of wild rice and other food plants would substantially upgrade our ability to support breeding and migratory birds.

We plan to identify impacts to fen and flooded meadow habitat from changes or fluctuations in water levels as the water levels and their effects are monitored and evaluated so that we can assure that any effects of fluctuating levels would be minor and short-term

Refuge visitors fishing or boating in or near fen and flooded meadow habitat may disturb nesting or foraging birds. These effects would likely increase with the increased visitation expected under this alternative. We plan to increase staffing and enhance management under alternative B to ensure this type of disturbance would occur infrequently, impacts would continue to be minor and not adversely affect waterfowl productivity.

#### **Boreal Fen and Bog**

Conservation and management of boreal fen and bog habitats would greatly improve under alternative B. We would acquire as much as 2,799 additional acres under this alternative more than tripling the refuge's conserved boreal fen and bog acreage. Purchase of these additional acres would greatly increase conservation of the refuge peatland complex. The Floating Island National Natural Landmark (FINNL) would expand from 860 to 2181 acres. Monitoring and research efforts would identify threats to this habitat.

#### **Northern White Cedar**

We may acquire an additional 202+ acres of northern white cedar habitat within the acquisition boundary and in the expansion area under alternative B. Purchase of the 202 additional acres in the current acquisition boundary, which includes the largest northern white cedar swamp in New Hampshire, would substantially benefit conservation of this type in the region as well as benefiting focal species such as the black-backed woodpecker. The acreage in the expansion area cannot be estimated at this time from available mapped data however, we expect it to be no more than 50 acres. Purchase of these small scattered stands would provide some minimal additional benefit to black-backed woodpecker because they would constitute an increase of less than 5 percent in Service ownership.

There would be no adverse effects from limited habitat management actions under this alternative. Although not likely to be a priority in 15 year life of CCP, there is a potential for restoring about 150 acres of northern white cedar over that time.

#### **Scrub-Shrub Wetland**

Acquiring as much as 913 acres to conserve a total 1,812 acres of scrub-shrub habitat would double the refuge's conserved acreage and substantially increase benefits to scrub-shrub wetland habitat, Canada warbler and woodcock, and scrub-shrub wetland dependant species under alternative B.

Manual or portable power tools would be used in vegetation management to manipulate or maintain habitat such as alder. Cutting would be done to minimize disturbance to nesting or foraging wildlife.

### **Open Water**

Benefits would be greater under alternative B with addition of up to 873 open water acres and an expanded program of management activities to conserve and enhance the biota of open water habitats.

With added watershed land conservation of more than 45,000 acres under this alternative, risks to aquatic species from water quality problems would diminish in Umbagog Lake and in the river tributaries. Some of this benefit may be offset by increased visitation.

Refuge visitors who boat and fish may disturb the bottom substrate in shallow areas or cause minor spills or leaks of petroleum products. Outreach including brochures and signage will notify these users of proper precautions.

### **Common Loon**

While we would continue to protect loons as we have in the past under alternative B in cooperation with the LPC and FERC licensee, we would take a number of additional steps including monitoring angler use and fishing pressure in relation to loon territories, validating loon nesting and territorial carrying capacities, and further determine whether 18 nesting pairs on Umbagog Lake and 4 nesting pairs in the expansion area remain appropriate targets for these areas, evaluating interactions of loons with waterfowl during the breeding season; and specifically evaluate how these wildlife interact at high loon densities. The major proposed expansion in watershed land base would increase indirect benefits to loons by protecting water quality and their aquatic prey base.

We would evaluate the need for predator control around loon sites and where necessary would use lethal and non-lethal predator control measures targeted at individual animals. Continuous monitoring of methods would ensure control would not adversely affect any sensitive predator species populations.

The near doubling of refuge visitation under alternative B would likely increase pressure to view loons and increase the potential for nesting loon disturbance. We would upgrade signage and informative materials to educate visitors to this problem, expend greater staff effort in monitoring visitor presence near loon nest sites, and continue to exclude visitors from these areas as necessary.

## **Open Water and Wetland Habitat and Species Impacts of Alternative C**

We would substantially expand conservation of the refuge's wetlands under alternative C but we would not manage the refuge wetlands for production of waterfowl or other focal species but rather would manage them to promote a diverse and sustainable wetlands complex with a natural regime of disturbance and recovery and a natural sustainable complement of native wildlife species.

We would continue to conserve the refuge's current 3,150 acres of wetlands and 5,033 acres of open water habitat (see table 4.10) under alternative C. We would seek to acquire the remaining 616 wetland acres and 801 open water acres within the current refuge boundary as well as 4,628 wetland acres and 100 acres of open water habitat in the alternative C expansion area (see map 2-10). Similar to alternative B, the additional acreage to be acquired would more than double the refuge's conserved wetland and open water habitat acreage.

Compared to the other alternatives, we would achieve a greater degree of wetlands conservation under alternative C in terms of acreage under Service management but we would not likely achieve the highest level of productivity or sustainability in terms of the range of focal wildlife species that we would manage for under alternative B. Our management efforts would be expanded beyond our current custodial management to include specific habitat manipulation measures to simulate as closely as possible the biotic community conditions that would otherwise exist under natural disturbance patterns in the Northern Forest in the absence of 200 years of human resource use and industrial, commercial, agricultural, residential, and recreational development.

We would address water quality problems to eliminate to the degree possible the effects of human pollution. Through acquisition of lands adjacent to the refuge we would expand conservation of the watershed and reduce the adverse effects of development. We would work towards a water level agreement that simulates as near as possible, the natural hydrologic regime of the Upper Androscoggin River watershed. We would limit human access to simulate a back country wilderness-type experience with no facilities development and no motorized access.

We would not take any specific steps to enhance habitat for breeding, brood rearing, and migrating waterfowl; marsh birds, shorebirds, and wading birds; and other wildlife species of concern at the refuge under alternative C. However, we would continue to protect common loons in cooperation with the FERC licensee and the Loon Preservation Committee. We would monitor habitat condition and continue to work closely with the FERC licensee to ensure that water levels do not affect any wetland habitat type. Limiting human access to simulate a back country wilderness-type experience with no facilities development and no motorized access would benefit wildlife by reducing disturbance and localized habitat losses.

We would continue to promote stable water levels during the nesting season to the extent possible under the current agreement, using loons as the indicator species to evaluate the effectiveness of water level management on nesting wildlife. We would continue to recommend that water levels be managed at other critical times of the year (e.g. during fall migration) to benefit wildlife.

Construction of the loop trail near the new Potter Farm facility would have the same impacts and mitigation as described for alternative B.

#### **Fen and Flooded Meadow**

The benefits to fen and flooded meadow habitat would be minimally higher with 217 acres of habitat acquired and conserved under alternative C. There would be no refuge focal species management so benefits to refuge focal species would be indirect from the increase in habitat conservation.

Water level fluctuations, water quality problems and human disturbance would continue to pose some risk of adversely affecting fen and flooded meadow habitat, waterfowl, and other wildlife at the refuge under alternative C.

We would monitor habitat condition and continue to work closely with the FERC licensee to ensure that water levels do not affect this habitat. Water quality may become an increasingly important issue at the refuge as lands adjacent to the refuge are developed and the user population increases over the years.

There would be no impacts from construction and operation of the Potter Farm facility because the location is not adjacent to this habitat. Impacts should be minimal from Lake users fishing or boating who may disturb nesting birds, but this would occur infrequently and not likely adversely affect waterfowl productivity.

#### **Boreal Fen and Bog**

The benefits of conservation and management of boreal fen and bog habitats would be similar to alternative B with up to 3,334 fee acquired acres. This alternative too would greatly increase conserve the refuge's peatland complex and substantially benefit peatland dependent species.

Peat coring of the FINNL and other peatlands on Lake Umbagog Refuge under this alternative would not adversely affect these wetlands.

#### **Northern White Cedar**

We may acquire as much as 202+ acres of northern white cedar habitat under alternative C. As in alternative B, purchase of these additional acres would minimally benefit black-backed woodpecker.

#### *Scrub-Shrub Wetland*

We may acquire as much as 1,321 acres of scrub-shrub wetland habitat under alternative C. Purchase of these additional acres would benefit woodcock, Canada warbler and other species.

#### **Open Water**

We would acquire 801 within the boundary and 100 additional open water acres under alternative C. We expect that acquisition and conservation of an additional major portion of the Upper Androscoggin River watershed under alternative C would benefit aquatic biota, including SAV and fish, by reducing the potential for development and off-refuge recreational use that may adversely affect refuge water quality.

#### *Common Loon*

We would continue to protect loons as we have in the past under alternative C. We would continue to support research on the decline in Umbagog Lake loons, to advise the FERC licensee on water levels to benefit loons, and to protect active loon nests in spring and summer from predators and human disturbance using outreach and visitor contact, buoy lines, restricted access, and other tools as warranted.

No additional active management techniques would be employed to increase loon productivity under alternative C. We do not expect that any of our management actions, including forest management actions, would adversely affect loons. We expect that acquisition and conservation of an additional major portion of the Upper Androscoggin River watershed under alternative C would indirectly benefit loons by reducing the potential for development that may adversely affect refuge water quality.

## **Effects on Floodplain, Lake Shore, and Riparian Habitats and Species**

Floodplain, lake shore, and riparian habitats serve as protective buffers and wildlife travel corridors between the refuge wetlands and the watershed upland areas, as important forest components of the refuge, and as valued productive breeding habitat for focal vertebrate species, including cavity nesting waterfowl, bald eagle, osprey, and regional priority bird species including the northern parula and rusty blackbird. A major priority of the refuge is to sustain high quality woodcock habitat in the areas identified as woodcock focus areas.

Management actions proposed for each of the refuge CCP alternatives were evaluated for their potential to help conserve and expand floodplain, lakeshore,

and riparian habitats and to maintain and improve the productivity of focal wildlife species. The evaluated benefits include:

- Potential for acquisition of floodplain, lake shore, and riparian areas that would expand conservation of these habitats
- Potential for habitats to benefit locally with restoration of camp sites
- Potential for protection of vernal pools through improved inventory and management measures that would enhance these uniquely important productive habitats
- Potential to implement specific management measures to protect and enhance eagle and osprey nest sites would benefit these focal raptors
- Potential for improved woodcock management

The adverse effects of the Lake Umbagog refuge management alternatives that were evaluated include:

- The potential for increased refuge visitation to adversely affect these habitats
- The potential for human disturbance of bald eagle and osprey nest sites
- The potential for alterations in hydrology or other land management actions to adversely affect vernal pools

**Floodplain, Lakeshore, and Riparian Habitat Impacts That Would Not Vary by Alternative**

**Resource Conservation.** — Regardless of which CCP alternative we select, we would develop a HMP and HSIMP for floodplain, lakeshore, and riparian habitats, we would mitigate any potential for major unplanned changes in floodplain, lakeshore, and riparian habitat vegetation by continuously monitoring our vegetation types and updating our GIS database at least every 5 years.

We would conserve and maintain natural vernal pools, and other small-scale unique or rare communities on existing refuge lands and within the expansion areas. We would implement a comprehensive program (text box) to conserve vernal pools that would include inventory, monitoring, research, ranking, and management protocols to minimize any impacts to these uniquely important habitats.

<p><b>Vernal Pool Conservation</b></p> <ul style="list-style-type: none"><li>• complete inventory of vernal pools in 5 years</li><li>• develop and implement management standards and guidelines to conserve vernal pool habitat in 7 years</li><li>• rank vernal pools as to their conservation concern and need for management based on size, location, threats, productivity, seasonality, species diversity, and other parameters</li><li>• promote vernal pool conservation in Refuge outreach programs</li><li>• survey to identify all potentially affected vernal pools before any active forest management occurs</li><li>• follow best management practices to protect all vernal pools</li></ul>
---

We would continue to protect bald eagles and ospreys from human disturbance during the nesting season, evaluating closure areas on a case-by-case basis. Legal hunting is not considered a threat to these species because no hunting is occurring during spring and summer when these birds are nesting. Also, no mortality of these birds has been attributed to accidental shooting in the Umbagog Lake Area. We have also submitted this document for an intra-agency Section 7 consultation on ESA compliance.

We would manage furbearers through state-licensed trappers under state and refuge regulations to provide a natural resource-based activity that achieves refuge resource objectives.

**Facilities Upgrade and Protection.**— The majority of our current refuge facilities are located in the riparian zone of the Magalloway River. A number of new facilities and visitor amenities are proposed for the lakeshore areas at the refuge.

**New Headquarters and Visitor Contact Facility**

We propose to construct a new refuge headquarters and visitor contact facility at the Potter Farm tract on the south shore of Umbagog Lake. The Potter Farm site is common to all alternatives, but the size of the facility differs depending on the alternative. Alternatives A and B propose a small office, as defined by the new Service facility standards, while alternative C proposes a medium office facility.

The Potter Farm site is an abandoned farm site with a house and barn immediately surrounded by fields and adjacent to wooded areas and the Lake. The site does not currently support important lakeshore vegetation such as mature white pine stands, so construction of the new headquarters and visitor contact facility would not directly adversely impact vegetation although construction would preclude restoration of the Potter Farm site to lakeshore forest in the future.

Visitor access to the new facility would be provided by new surfacing of the section of Mountain Pond Road from U.S. Highway 26 to Potter Farm Road and new surfacing of Potter Farm road. Surfacing would be upgraded from the current single lane gravel surfacing to a 24-foot 2-lane paved surface which would require construction of a full depth gravel section for the entire width of the roadway and reconstruction of all roadside swales and culverts. Surfacing impacts would be localized with effects to the road shoulder areas and the environment immediately downgradient of the swales and culverts. Best management practices for road construction would be employed in upgrading the road, including review of culvert designs and use of silt fences and debris catchments to minimize the potential for erosion and sedimentation impacts to the Thurston Cove and Big Island portions of the Lake. Best Management Practices (BMPs) and ancillary precautions would be defined in an *Erosion and Sedimentation Control Plan* to be approved by the Service before the reconstruction contract is approved.

**Visitor Infrastructure**

In conjunction with the proposal to develop a new administrative and visitor contact facility, alternatives B and C propose to construct an interpretive trail at the Potter Farm site. A conceptual design and tentative location for a trail were identified by Oak Point Associates in their report. The trail was approximately 2 miles long, and would be designed to allow travel by people with disabilities.

Alternatives B and C also propose additional visitor facilities along major travel routes, including 2 roadside pullouts, and an overlook platform on Route 26. Each of these sites would have an information kiosk, and provide parking for several vehicles. Both alternatives propose a ¼ mile loop extension to the Magalloway River accessible to people with disabilities (ADA compliant).

All snowmobile trails on the refuge would be through trails only; we would not provide parking, warming huts, or other infrastructure on refuge lands. No expansion of the existing trail system would occur.

**Site, Road, and Trail Restoration**

We would restore developed areas that are no longer needed for refuge administration or programs to natural conditions. As we acquire lands, we would remove cabins or other developed sites or structures if they are surplus to refuge needs, re-grade to natural topography and hydrology and re-vegetate to establish desirable conditions.

We would inventory and assess all access roads within the refuge, and on any newly acquired lands, and implement procedures to retire and restore



USFWS

Youth program on the refuge

unnecessary forest interior and secondary roads to promote watershed and resource conservation. All ATV trails and all unauthorized snowmobile trails would be restored to eliminate their use. Existing main access roads would remain open to provide motorized and non-motorized access for approved activities.

### **Facility Maintenance**

Under all alternatives, the existing headquarters building on the Magalloway River would be maintained as a research or auxiliary field office. In addition, all alternatives would remove the adjacent small cabin.

All of the alternatives include the periodic maintenance and renovation of existing facilities to ensure the safety and accessibility for staff and visitors. Our current facilities are described in chapter 3. They include administrative facilities such as refuge quarters at two former residences and the maintenance shop off Mountain Pond road. Visitor facilities to be maintained under all alternatives include: the Magalloway River trail and new extension, sign, and viewing platform; and, 2 roofed, wooden information kiosks. A Magalloway River Canoe Trail and launch site would be implemented in 2006 and would also require periodic maintenance.

### **Fire Protection**

We would conduct a wildland-urban interface hazard assessment along common boundaries of adjacent private landowners within 2 years of CCP approval and every 10 years thereafter, to ensure forest management practices are not creating excessive fuel loading. Details are incorporated in the refuge FMP.

**Impacts from furbearer management.**—The impacts are the same as those described for open water and wetlands habitats and species in the discussion under “Open Water and Wetland Habitat and Species Impacts that would not vary by Alternative.”

**Impacts from increased visitation.**—The impacts are the same as those described for wetlands habitats in the discussion under “Open Water and Wetland Habitat and Species Impacts that would not vary by Alternative.” In addition to those, these habitat types could be impacted by hunting for additional species and from the camping program. Hunting in these habitat types on refuge lands extends to migratory game birds and upland game hunting. White-tailed deer, moose, snowshoe hare, ruffed grouse and woodcock are the principal species hunted. As described in the discussion on waterfowl hunting, this use has been established in the area on refuge lands for decades. All hunting seasons and limits adhere to respective federal and state regulations. Those regulations are set within each state based on what harvest levels can be sustained for a species without jeopardizing state populations, or in the case of woodcock, the Atlantic 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 moderate and occurs outside the breeding season. Our April 2007 amended EA for the refuge’s current hunt program (alternative 2 in that EA), which we incorporate by reference herein, provides additional impacts analysis (USFWS, 2007).

Similar to other visitor activities, human disturbance on wildlife can result from camping. Larger groups, and those campers with pets, are more likely to disturb wildlife. Generally, these disturbances result in a temporary displacement without long-term effects on individuals or populations. Some species may avoid areas frequented by people, such as campsites, while other species seem unaffected or even drawn to the human presence. Humans may intentionally supply foods to wildlife, or unintentionally supply foods through littering, accidental spillage, or improper food storage. Human foods are generally unhealthy for wildlife, and may also promote scavenging behavior, which could

increase wildlife vulnerability to predators. Rodent populations often increase at campsites in response to the increased availability of human food, and may negatively affect nesting songbirds since they also predate on eggs. Bears and other scavengers may also be attracted to improperly stored food, and may damage property or threaten visitor safety. We have recorded on instance of a bear looking for food damaged a kayak at an Umbagog Lake campsite.

Campers can directly and indirectly effect vegetation in these habitat types as well. Impacts can be locally severe, even with low to moderate use. There is typically a loss of ground vegetation cover, reduced vegetation height and vigor, loss of rare or fragile species, and changes in plant community and composition. Vegetation may be removed or trampled, especially shrubs and trees that could be used for firewood. Axes and fire scars can damage trees, and branches may be broken, bark removed or damaged, or nails placed in trees. Tree regeneration is typically lost and the disturbed site will often convert to trampling-resistant grasses and forbs. Some rocky and gravelly lakeshore areas are more resistant to disturbance, including many along Umbagog Lake.

When people come from out of the area, they can be vectors for seeds and propagules of invasive plants. Once established, invasive plants can outcompete native vegetation, thereby altering habitats and indirectly affecting wildlife. The threat of invasive plants is an issue we are vigilant about; annual monitoring, immediate treatment, and a public outreach and education program would occur under all alternatives.

No expansion of camping sites is planned under any alternative, and all camping allowed is permitted only at designated sites. We intend to continue to evaluate campsites annually. Regarding human disturbance, we would continue to minimize this impact by seasonally closing campsites that are located close to active loon territories or nesting bald eagles. Visitors are now required to bring their own firewood to reduce impacts to vegetation. Overall, under current and planned management, and based on our observations at campsites, we predict the effects from camping would not be significant under any alternative.

**Impacts to Floodplain, Lake Shore, and Riparian Habitats and Species from Alternative A**

We would continue to conserve the refuge’s current 1,372 acres of floodplain, lakeshore, and riparian habitat (see table 4.11) under alternative A. An additional 153 acres of wooded floodplain and 288 acres of lakeshore pine-hemlock habitat under alternative A—a 32 percent increase—would be acquired from willing sellers within the current refuge boundary. This minor increase would be lower but of the same order of magnitude as the acquisition increases proposed under the refuge expansion alternatives B and C.

**Table 4.11. Floodplain, lakeshore, and riparian habitat acquisition proposed by alternative**

Habitat Type	current refuge acres	A		B				C	
		still to be acquired	total in acquisition boundary	Fee Acres	Easement Acres	Fee + Easement	Alt B Totals	Fee Only	Alt C Totals
Wooded Floodplain	1140	153	1,293	123	13	136	1429	140	1433
Lakeshore Pine-Hemlock	232	288	520	0+	0+	0+	520+	0+	520+
<b>Total Both Types</b>	<b>1372</b>	<b>441</b>	<b>1813</b>	<b>123+</b>	<b>13+</b>	<b>136+</b>	<b>1949+</b>	<b>140+</b>	<b>1953+</b>

Adding up to 441 acres of these habitats would increase conservation of floodplain, lakeshore, and riparian acres to over 1,800 acres but we would be more constrained under alternative A than under the other alternatives in terms of how much we could improve conservation of floodplain, lakeshore, and riparian habitats and enhance management of focal species. Our management efforts would be limited to habitat inventory, mapping, and monitoring; bird surveys and surveys of other vertebrates, invertebrates, and plants; support of related research, protection of nesting eagles and ospreys, and limited acquisition of additional habitat. We would implement no active habitat management such as early successional management.

The Magalloway River trail project would cause short term construction impacts and long-term loss of a minor amount of habitat. Construction of the Potter Farm headquarters and visitor contact facility would cause minor localized impacts along the lakeshore. There would be no other construction projects that would affect these habitats.

Of the twelve campsites that the refuge intends to keep open, 5 are located in lakeshore pine-hemlock habitat, 5 are in mixed conifer-hardwoods, and 2 are in balsam fir-floodplain forest, all accessible only by boat. Remote camping would continue to have localized, long term impacts to lakeshore and floodplain habitats as described above. Illegal camping at non-designated sites also occurs regularly along the Magalloway River, Harper's Meadow, in the Leonard Pond area, and elsewhere. Monitoring and outreach would help mitigate these latter impacts.

#### **Wooded Floodplain**

We would acquire up to 153 additional acres of wooded floodplain habitat under alternative A within the current refuge boundary. This increase from the current 1,140 acres in Service ownership would minimally increase benefits to cavity nesting waterfowl, northern parula, and rusty blackbird because of the habitat conservation afforded although no active management techniques would be employed.

#### **Lakeshore Pine-Hemlock**

We would acquire as much as 288 additional acres of lakeshore pine-hemlock habitat under alternative A. This added habitat would more than double refuge acreage from the current 232 acres and, thereby, would increase protection benefits to jack pine, bald eagle, osprey, and other raptors at the refuge. There would be no adverse impacts from this land acquisition although there may be localized, short term impacts to soils from camp or other site restoration activities on any of these newly acquired lands.

#### **Bald Eagle and Osprey**

Bald eagle and osprey would benefit from conservation of the lakeshore pine-hemlock habitat described above under alternative A. Our biological program would continue its present priorities such as: cooperating with partners in the monitoring of loon, bald eagle, and osprey populations on the lake; protecting loon, bald eagle, and osprey active nest sites from human disturbance on refuge lands.

Potential adverse impacts to eagles and ospreys under alternative A

#### **Bald Eagle & Osprey Protection Under Alternative A**

- Protect and maintain super-canopy nesting trees on current and future refuge lands.
- Inventory active and historic nesting sites each year
- Continue bald eagle and osprey surveys in conjunction with the States of Maine and New Hampshire, and conservation partners
- Maintain and/or install as warranted, predator guards on all active nesting trees.
- Continue to implement area closures around bald eagle nest trees; place visible floating buoys and signs to alert all boaters to closure area.
- Continue to work cooperatively with State agencies and NGO's on bald eagle and osprey management.

would include a somewhat greater risk of human disturbance of nesting eagles and ospreys and a higher probability of loss or lack of recruitment of nesting trees than are likely to occur under alternatives B and C because we would not be able to invest as much time and the level of resources required for protection and we would not implement super-canopy tree recruitment measures. The eagle and osprey aquatic food base would more likely be adversely affected under alternative A than B or C because watershed conservation would be limited to current lands and lands within the acquisition boundary.

### **Impacts to Floodplain, Lake Shore, and Riparian Habitats and Species from Alternative B**

We propose a modest increase in acquisition and conservation of floodplain, lakeshore, and riparian habitat under alternative B as well as a substantial upgrade in our management actions to conserve and improve this habitat for focal species. We would continue to conserve the refuge's current 1,372 acres of floodplain, lakeshore, and riparian habitat (see table 4.11) under alternative B while seeking to acquire 289 acres of wooded floodplain and 288 acres of lakeshore pine-hemlock habitat—a combined 577 acre increase—from willing sellers within the current refuge boundary and in the expansion area. This increase would be of the same order of magnitude as those proposed under alternatives A and C.

We plan a greater amount of restoration for the alternative B expansion area to benefit primarily riparian habitat. The localized short term impacts and long term benefits of restoration projects would be similar to alternative A. The impacts of construction projects also would be similar to alternative A.

A greater increase in refuge visitation would cause minimally higher risk than alternative A of localized habitat impacts from recreational activities.

Management of remote camping would be upgraded under alternative B to minimize the impacts to floodplain and lakeshore habitats described above. Mitigation would include:

- Establishing a program of increased outreach on-site, and increased enforcement of rules and regulations to minimize illegal camping
- Possibly designating some sites as “one night only” for paddlers moving through the area
- Providing campers with an orientation and overview of rules and regulations and Leave No Trace program
- Restoring sites or seasonally closing sites as needed to conserve resources
- Removing camping at North 1 and North 2 sites along Route 16
- Improving campsites to address safety and long term sustainability without habitat degradation

There would be increased benefits to vernal pools on more than 49,000 acres of expansion lands where vernal pools would be inventoried and protected under alternative B.

#### **Wooded Floodplain**

We would acquire or manage under easement as much as 289 additional acres of wooded floodplain habitat under alternative B both within the current refuge boundary and in the expansion area. This increase in acreage from the current 1,140 acres in Service ownership would increase benefits to cavity nesting waterfowl, northern parula, and rusty blackbird because of the increased land conservation and the active management techniques that would be employed.

Mapping and monitoring of the Magalloway River floodplain would be conducted. We would restore the hydrology of the Day Flats area by plugging ditches and re-contouring the disturbed areas. This action may cause immediate short-term erosion and sedimentation while the project is underway to restore this partially developed site to a wooded wetland. We would employ best management practices to mitigate these effects.

### Lakeshore Pine-Hemlock

The additional acreage of lakeshore pine-hemlock we would acquire under alternative B would be the same 288 as noted above for alternative A plus additional acreage to be identified in the expansion area. This increase in acreage, from the current 232 acres, would provide some minimal benefit to jack pine, bald eagle, osprey, and other raptors because there would be less than 1 square-mile of this type under Service protection.

### Bald Eagle and Osprey

There would be increased bald eagle and osprey benefits from conservation of the lakeshore pine-hemlock habitat and active management to eliminate human disturbance and protect and recruit nesting trees.

We would upgrade our management activities under alternative B to protect bald eagles and osprey (text box) by implementing more stringent measures to protect nesting trees and instituting measures to ensure nesting trees are available within 1 mile of foraging habitat.

The risk of human disturbance would increase slightly from increased visitation which would be mitigated by our upgrade in management.

Water quality would be improved or maintained through monitoring. The eagle and osprey aquatic food base would be better protected by expanded watershed and open water habitat conservation.

Similar to alternative B, we propose a minor increase in acquisition and conservation of floodplain, lakeshore, and riparian habitat under alternative C although we would not implement specific management actions for focal species. Rather we would manage this habitat to reflect what would occur under natural environmental influences. We would continue to conserve the refuge's current 1,372 acres of floodplain, lakeshore, and riparian habitat (see table 4.11) under alternative C and seek to acquire 293 acres of wooded floodplain and 288 acres of lakeshore pine-hemlock habitat—a 581 acre increase—from willing sellers within the current refuge boundary and in the expansion area. This increase would be of the same order of magnitude as those proposed under alternatives B and C.

The localized short term impacts and long term benefits of restoration projects would be similar to alternative B.

### Expanded Bald Eagle & Osprey Protection under Alternative B

All alternative A measures **plus**:

- Protect and maintain super-canopy trees within 1 mile of high quality foraging habitat to support nesting and perching by bald eagles and osprey.
- Protect individual nest trees with at least a 300-foot no-touch buffer area.
- Ensure recruitment of new nest trees; identify stands with potential.
- Manipulate pines in high quality raptor habitat areas to promote new nesting sites
- Control human access with potential to disturb nest sites.
- Protect historic nest sites, nest trees, and trees with partially constructed nests
- Work with States to support efforts to eliminate practices that contribute lead and other contaminants to the lake.
- Ensure recruitment of new nest trees; identify stands with this potential.

### Impacts to Floodplain, Lake Shore, and Riparian Habitats and Species from Alternative C

The greater increase in visitation under this alternative as compared to alternative B would cause a minimally higher risk of localized habitat impacts from recreational activities.

Remote camping would continue to have localized, long term impacts to lakeshore and floodplain habitats. Like alternative B, remote camping on the existing designated sites would continue to be allowed, but we would increase monitoring of individual sites, and rehabilitate, or close permanently or seasonally those in need of restoration. Increased efforts would be made to address these problems under this alternative. Our emphasis on a wilderness-type camping experience would further reduce impacts compared to alternatives A and B.

There would be increased benefits to vernal pools on more than 76,000 acres of expansion lands because those vernal pools would be inventoried and protected under alternative C.

#### **Wooded Floodplain**

We would acquire in fee as much as 293 additional acres of wooded floodplain habitat under alternative C within the current refuge boundary and in the expansion area. Similar to alternative B, this increase in acreage from the current 1,140 acres in Service ownership would increase benefits to cavity nesting waterfowl, northern parula, and rusty blackbird because of the increased land conservation and any active management techniques that would be employed in the near term to promote establishment of a sustainable floodplain community.

We would restore the hydrology of the Day Flats area by plugging ditches and re-contouring the disturbed areas. This action may cause immediate short-term erosion and sedimentation while the project is underway to restore this partially developed site to a wooded wetland. We would employ best management practices to mitigate these effects.

#### **Lakeshore Pine-Hemlock**

Alternative C would have the same habitat conservation and site restoration benefits, and short-term impacts, as alternative B. Additional acreage to be identified in the expansion area would minimally increase benefits to jack pine, bald eagle, osprey, other raptors by providing additional nesting and roosting habitat. We would acquire the same 288 acres of lakeshore pine-hemlock under alternative C as noted earlier under alternatives A and B. This increase in acreage from the current 232 acres would provide minimal benefit to jack pine, bald eagle, osprey, and other raptors because there would be less than 1 square-mile of this type under Service conservation.

#### **Bald Eagle and Osprey**

Under alternative C we would institute the same measures proposed under alternative B to enhance bald eagle and osprey protection and recruitment so the same benefits and impacts would result.

There would be an increased risk of human disturbance from increased refuge visitation under alternative C that would be mitigated by our proposed upgrade in management.

Water quality would be improved or maintained through increased monitoring efforts and the eagle and osprey aquatic food base thereby better protected by expanded watershed and open water conservation.

## Effects on Upland Forest Matrix Habitats and Species

The upland forest matrix in and near the refuge is vital to conserving the refuge watershed while providing habitat and movement corridors for wildlife of the Northern Forest and ensuring long-term recreational opportunities for refuge visitors. Conserving the Lake Umbagog refuge forest matrix to sustain and enhance these values would continue to be a major refuge goal.

Management actions proposed for each of the refuge CCP alternatives were evaluated and compared on the basis of their potential to benefit or adversely affect upland forest habitats and focal species.

We compared the benefits of the alternatives from actions that would conserve or restore upland forests and improve conditions for focal species, including the extent to which we would:

- acquire and conserve upland forest lands
- restore camp sites to promote forest growth
- engage in forest management practices on former privately managed lands that would increase rotations and lead to more mature forest
- improve forest conservation and management to alter forest composition so that it best supports focal bird species
- improve forest conservation and management to create habitat and travel corridors to benefit mammalian focal species

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

- Forest management activities that include tree cutting and construction and use of skid trails and haul roads
- Increased recreational use of current and newly acquired upland forests that could lead to habitat impacts or disturbance of wildlife

## Impacts to Upland Forest Matrix Habitats and Focal Species That Would Not Vary by Alternative

**Forest Management.**—Regardless of the alternative selected, we would use at a minimum all BMPs recommended by the States of New Hampshire and Maine (see appendix K) to conduct forest management activities in the refuge uplands. These BMPs would protect sensitive habitat components such as vernal pools and focal species nesting sites.

**Impacts from furbearer management.**—The impacts are the same as those described for open water and wetlands habitats and species in the discussion under “Open Water and Wetland Habitat and Species Impacts that would not vary by Alternative.”

**Impacts from increased visitation.**—Potential impacts to upland forests and focal species from our priority, wildlife-dependent public use programs and camping, is the same as described under “Floodplain, Lakeshore, and Riparian Habitat Impacts that would not vary by Alternative.”

In addition, there are potential impacts from snowmobiling which would continue at current use levels under all alternatives. Appendix C includes a compatibility determination for snowmobiling which summarizes a literature review of potential impacts. None of those studies were conducted locally, however, and direct extrapolations to the refuge are difficult. In general, the greatest potential impact is with resident winter mammals and raptors, such as the bald eagle. Some of the wildlife and habitat impacts described in the compatibility determination are:

- increased energy expenditure by wildlife in response to the disturbance; increased heart rate, activity, or actual flight could each result in an energetic cost, which is exacerbated in severe winters or in individual animals in poor health or condition
- displacement to suboptimal habitat or areas where forage and cover are a lower quality
- alteration of behavior where disturbed animals may change their foraging times to periods when energy losses or exposure to predators is higher
- changes in community composition and inter-species interactions
- improved predator access to prey wintering areas (a benefit for predators, but a negative impact on prey)
- direct mortality from snowmobile-wildlife collisions.

Two potential positive impacts noted are:

- reduced energy expenditure by wildlife where snow compaction and trail creation reduces energy expenditure in otherwise deep snow
- improved access to resources whereby compacted trails expand access to foraging areas

*Winter on the refuge*



Paul Casey/USFWS

Snowmobile trails on the refuge are located almost entirely on existing hardened roads built to support commercial logging operations. Impacts from snowmobiling on these surfaces relating to soil and vegetation have been effectively mitigated by the use of these roads as the location for the trails. Water courses are crossed with bridges and culverts designed to support trucks and other heavy equipment, therefore additional impacts from snowmobiling is unlikely. Snowmobile trails throughout the area have been established for many years and pre-date refuge ownership. Wildlife impacts are considered minimal since potentially affected wildlife are generally accustomed to this use. Increases in emission regulations by the EPA along with the increase in the number of 4-stroke and new cleaner 2-stroke engines in modern snowmobiles has and will continue to reduce potential impacts to the environment. An increased law enforcement presence from a Refuge Law Enforcement Officer and the Zone Officer will ensure compliance with snowmobile restrictions. Monitoring will identify any actions needed to respond to new information and correct problems that may arise in the future.

Based on available information and at current and anticipated levels and patterns of use, and given our monitoring, outreach and enforcement programs, we predict the effects of snowmobiling on designated refuge trails, considered separately or cumulatively, would not constitute significant short-term or long-term impacts on upland habitats. However, we plan to evaluate all trails on a 5 year basis to ensure no site-specific impacts develop. Some of these trails may be re-routed or closed, if it is determined that they have a significant negative impact on wildlife or habitat.

With regards to hunting, our April 2007 amended EA for the refuge's current hunt program (alternative 2 in that EA), which we incorporate by reference herein, provides an impact analysis on upland forest wildlife species affected by our program. Our proposal under alternative B and C to include a new turkey hunt on refuge lands in both states, and a new bobcat hunt on refuge lands in Maine, consistent with respective states' regulations, would be fully analyzed in a separate environmental analysis. We would plan to initiate that analysis within one year of CCP approval and would include opportunities for public involvement.

**Impacts to Upland Forest Matrix Habitats and Focal Species from Alternative A**

Under alternative A, we would continue to conserve the refuge’s current 9,913 acres of upland spruce-fir, mixed, and northern hardwood forest (see table 4.12). We would also seek to acquire and conserve an additional 3,967 acres of upland forest—a 40 percent increase in acreage—from willing sellers within the current refuge boundary. This increase would be of much more limited benefit to upland habitats and focal species when compared with adding as much as 45,665 upland forest acres under alternative B or 71,416 acres under alternative C. The additional acreage to be acquired in their respective expansion areas would more than double the refuge’s conserved upland forest habitat.

**Table 4.12. Upland mixed forest matrix habitat acquisition proposed by alternative**

Habitat Type	current refuge acres	A		B				C	
		still to be acquired	Refuge Total	Fee Acres	Easement Acres	Fee + Easement	Refuge Total	Fee Only	Refuge Total
Spruce-fir	1,947	618	2,565	17,211	9,503	26,714	29,279	11,841	14,406
Mixed Forest	3,478	2,129	5,607	6,645	4,636	11,281	16,888	28,908	34,515
Northern hardwoods	4,488	1,220	5,708	4,719	2,941	7,660	13,368	30,667	36,375
<b>Forest Matrix</b>	<b>9,913</b>	<b>3,967</b>	<b>13,880</b>	<b>28,575</b>	<b>17,080</b>	<b>45,655</b>	<b>59,535</b>	<b>71,416</b>	<b>85,296</b>

We would not engage in forest management practices on former privately managed lands that would increase rotations and lead to more mature forest under alternative A. We would not actively manage the forest to improve forest structure or alter forest composition so that it best supports focal bird species. Our management role would be passive so we would not engage in harvesting. However, we expect that natural succession and disturbance would eventually lead to mature forests with a larger softwood component. Forest succession alone would be the only means by which habitat to benefit mammalian focal species would be created.

Because we would not actively manage the forests under alternative A, there would be no impacts from tree cutting or construction and use of skid trails and haul roads.

Acquisition of 4,534 upland forest matrix acres and increased visitation under alternative A would minimally increase off-trail disturbance of upland forests with habitat impacts or disturbance of wildlife.

Because natural succession would be the only mechanism through which the upland areas would recover from ice storms, wind throw or other natural disturbances, and there would be a far more limited acreage in refuge uplands (15,000 acres) under alternative A, any significant disturbance event could have serious implications so far as the potential for the natural disturbance to diminish the habitat value of those portions of the refuge for long periods

Snowmobiling would continue to be allowed with use confined to the two state-designated trails. Appendix C includes a compatibility determination for snowmobiling which describes potential impacts from this activity. However, allowing snowmobiling only on established trails means any important habitat and wildlife impacts have already occurred. Some level of winter wildlife disturbance effects would continue.

**Spruce-fir Habitat Type**

Under alternative A, acquiring up to 618 acres to total 2,559 refuge acres of spruce-fir conserved would benefit refuge focal species. However, we would not implement any measures to directly enhance mature spruce-fir habitats to benefit blackburnian or black-throated green warblers. We would continue to work with partners to conserve deer winter yards which would maintain some localized mature spruce fir stands preferred by these species. Through natural succession spruce-fir is expected to become a larger component of the upland forests, so this would also tend to benefit the warblers. Deer would benefit from winter yard conservation on current and newly acquired lands.

Under alternative A, there would be no active forest management so there would be no management-related adverse impacts.

**Mixed Woods Habitat Type**

Under alternative A, acquiring up to 2,129 acres to achieve a total of 5,607 refuge acres of mixed woods conserved would benefit refuge focal species. As noted for spruce-fir we would not implement any measures to directly enhance mixed forest to promote the spruce or fir habitat components to benefit Canada, black-throated green, and blackburnian warblers.

Through natural succession spruce and fir are expected to become a larger component of the upland forests, so this would tend to benefit the warblers.

There would be no benefits to woodcock because no active woodcock management would occur. In general, maturing forest with few large disturbed sites would not support woodcock. However, because there would be no active forest management there would be no management related adverse impacts.

**Northern Hardwoods Habitat Type**

Acquiring up to 1,220 acres to total 5,708 refuge acres of Northern hardwoods conserved would benefit refuge focal species. But we would not actively manage northern hardwood stands to promote dense understory to benefit black-throated blue warblers, or intolerant hardwoods to benefit woodcock production, Canada warbler or other early successional species. We would be limited to relying on whatever natural disturbances occur to promote early successional growth. No active management, however, means there would be no management related adverse impacts.

Forest management on the refuge will generally follow recommendations in the following publications:

- Forestry habitat management guidelines for vernal pool wildlife in Maine (Calhoun and deMaynadier 2003).
- Buffers for wetlands and surface waters: a guidebook for New Hampshire municipalities (Chase et al. 1997).
- Best management practices for erosion control on timber harvesting operations in New Hampshire (Cullen 2000).
- Biodiversity in the forests of Maine: guidelines for land management (Flatebo et al. 1999).
- Good forestry in the granite state: recommended voluntary forest management practices for New Hampshire (NHFSSWT 1997).
- Management guide for deer wintering areas in Vermont (Reay et al. 1990).
- Guide to New Hampshire timber harvesting laws (Smith and Whitney 2001).

American woodcock



USFWS

**Impacts to Upland Forest Matrix Habitats and Focal Species from Alternative B**

We propose to greatly expand conservation of upland habitats at the refuge and to institute a wide range of significant upgrades in our management of upland focal species under alternative B. We would continue to conserve the refuge's current 9,913 acres of upland forest (see table 4.12) under alternative B and propose acquiring the remaining 3,967 acres within the current refuge boundary and 45,655 additional forested acres in the alternative B

expansion area (see map 2-7). In all we plan to conserve 59,535 acres of upland forest matrix.

We would not implement forest habitat management on expansion lands within 15 years of CCP approval except for pre-commercial thinnings or other pre-commercial operations, until the forest has recovered from recent harvesting. Silvicultural practices on about 4,000 acres within the refuge acquisition boundary may cause some of the adverse effect described below, but implementation of best forest management practices would minimize effects. We would avoid impacts to all sensitive environments on the refuge by adhering to strict operability standards that prohibit or severely restrict forest management on protected resources and in buffer areas.

There would be the same type of wildlife disturbance impacts from snowmobiling as discussed above, but there would be more trails monitored because of refuge expansion. Precluding installation of additional infrastructure to support snowmobiling would limit such impacts by limiting time spent on the refuge. We would relocate trail portions where needed to meet habitat goals and would close and restore unauthorized trails.

#### **Spruce-fir Habitat Type**

Acquiring up to 26,714 acres to total 29,279 refuge acres of spruce-fir conserved would increase benefits to refuge focal species. We would implement specific measures to enhance spruce-fir habitats on current and expansion area lands under alternative B to benefit blackburnian and black-throated green warblers, and to promote growth of travel corridors for lynx and other larger mammals. Forest management measures are detailed in the habitat management plan that includes using silvicultural methods on spruce-fir management units such as thinnings, small patch cuttings, and overstory removal to enhance regeneration of spruce. Rotations used to favor spruce would be 100 to 120 years; for fir 80 years.

All of these silvicultural techniques pose some risk of causing adverse impacts on, adjacent to, and downgradient of the site as well as on access roads and skid trails. Forest practices could damage the litter layer, coarse woody debris, snags, or cavity trees important for wildlife. They may alter the moisture regimes in soil and on the forest floor in ways that affect plants and animals such as forest floor amphibians and small mammals. Other potential effects include soil disturbance, compaction, and erosion on site and on access roads and skid trails, elimination or displacement of individual animals inhabiting the treated site, loss of nesting, roosting, or raptor perching trees, and increased risk of colonization by invasive plants. Residual stand damage may result in the introduction of insects or disease into an otherwise healthy stand. Harvesting may also leave the remaining trees more susceptible to wind throw. Best forest management practices (see text box) would be followed to ensure that any effects on managed land would be minimized.

We would avoid direct impacts to all sensitive environments on the refuge by adhering to BMPs and restricting management in high sensitivity zones and industry inoperable areas.

We would continue to work with partners to conserve deer wintering areas which would maintain some localized mature spruce fir stands preferred by these species.

#### **Mixed Woods Habitat Type**

Acquiring up to 11,281 acres to total 16,888 refuge acres of mixed woods conserved would substantially increase benefits to refuge focal species. Similar to our proposal for spruce-fir habitat, we would implement measures under

alternative B to enhance mixed woods habitat, focusing principally on the spruce and fir components of these habitats and on patches of early successional habitat. Management would be conducted on current refuge lands and fee acquired expansion lands to benefit blackburnian and Canada warblers and woodcock in woodcock focus areas. We would use the same techniques and rotations described above for spruce and fir. We would create and maintain openings and promote early successional hardwoods for woodcock in woodcock focus areas. These measures are detailed in the habitat management plan.

The potential for adverse impacts would be similar to what we described for spruce-fir above, with a slightly greater degree of risk of soil erosion from openings maintained for woodcock. Potential impacts of human disturbance caused by refuge visitors would be limited by the relative remoteness of the woodcock management sites.

**Northern Hardwoods Habitat Type**

Acquiring up to 7,660 acres to total 13,368 refuge acres of Northern hardwood forest conserved would benefit refuge focal species. Their benefits would increase through active management to promote dense understory to benefit black-throated blue warblers, and intolerant hardwoods to benefit woodcock production, Canada warbler or other early successional species.

There would be adverse impacts from silvicultural operations, including those noted above under spruce-fir. These impacts would generally be short-term, localized at managed sites, and mitigated by best forest management practices.

Similar to alternative B, we propose a major expansion in the total acreage of upland forest matrix we would conserve at the refuge under alternative C. However, our management objectives under alternative C are designed to attain certain forest characteristics rather than to directly optimize focal species conservation and productivity.

Under alternative C we would not employ specific forest management measures targeted at focal species but rather manage the forest in large, contiguous blocks greater than 25,000 acres to provide a mosaic of composition and maturity that would be characteristic of these forests under natural patterns of disturbance and succession. We expect that, in general, focal species would ultimately benefit as these natural characteristics are attained, but we would not alter our management approach even if it is determined that certain focal species do not benefit.

To manage the forest at such a landscape scale requires us to acquire a greater expansion area than proposed under alternative B. While we would continue to conserve the refuge’s current 9,913 acres of upland forest and acquire 3,967 acres within the current refuge boundary, we would seek an additional 71,416 forested acres in the alternative C expansion area (see map 2-10). In all we would conserve 85,296 acres of upland forest.

The silvicultural practices employed under alternative C and their potential impacts, best management practices, and operability restrictions to conserve sensitive environments would be the same as alternative B. The cumulative direct

**Impacts of Forest Roads on Birds**

*“We studied the effect of maintained and unmaintained forest roads on (1) forest bird nest survival, (2) reproductive parameters of ovenbirds (Seiurus aurocapillus) potentially associated with food abundance, and (3) habitat and microclimate at six sites on the White Mountain National Forest, New Hampshire, during two breeding seasons. We conclude that small, unsurfaced forest roads at low road density do not result in decreases in forest passerine bird productivity in extensively forested areas in New England.”*  
(King and DeGraaf 2002)

**Impacts to Upland Forest Matrix Habitats and Focal Species from Alternative C**



USFWS

*Moose are common in the spruce-fir forest*

forest management effects would be similar to but more limited than alternative B because of smaller cuts (4%) to management units.

Snowmobiling impacts would be limited to current trails where any substantive habitat and wildlife impacts have generally already occurred. Winter wildlife disturbance effects would continue

#### **Spruce-fir Habitat Type**

The spruce-fir habitat benefits would be similar to alternative B, with major expansion of 11,841 acres to total 14,406 of spruce-fir forest conserved under alternative C. However, there would be no refuge focal species management measures. Forest management effects would be similar to but more limited than alternative B because of the smaller cuts (4%) to each management unit. There would be lower cumulative effects over the type within the Umbagog Lake watershed. Deer would benefit from conserving mature and maturing stands on expansion lands.

The techniques we would use to manage spruce-fir under alternative C to achieve a pattern characteristic of the diversity of the spruce-fir type under natural disturbance patterns would include small group selection and individual tree removal with longer entry intervals to promote older aged stands of 150 years or greater. These forest management methods would likely have effects similar to those described previously for alternative B with more limited direct effects to management sites and lower cumulative effects over the type within the Upper Androscoggin River watershed.

The exception to this would occur where an insect outbreak affects a major portion of the forest, up to 2,500 acres, or we determine that cutting a large area is necessary to simulate the effects of an insect outbreak or major blowdown event. Should such a requirement be identified in the future, we would conduct a full NEPA analysis of the forest management project.

#### **Mixed Woods Habitat Type**

There would be benefits similar to alternative B, with a major expansion of 28,908 acres to total 34,515 of mixed woods conserved under alternative C. However, we would implement no refuge focal species management measures. We would use small group selection, on up to 1/2-acre sites, to increase the softwood component of the mixed woods stands. This forest landscape mosaic would benefit Canada warblers where there is sufficient dense understory and blackburnian warblers where there are sufficient mature conifers. Impacts on these sites would be more limited than those described for alternative B on similar sites because the cuts would be smaller and entry to stands would be less frequent. In the long term, we would not likely be able to achieve as high a population density of either bird species on refuge lands because we would not be cutting back mature stands as frequently or over as large a portion of this type and therefore not creating as much optimal habitat as we would under alternative B.

We would not specify woodcock management focus areas under alternative C and would not promote woodcock as a major focal species. We would manage for natural clearings and early successional components in mixed stands that would be part of the mosaic of stand composition sought under this alternative. These clearings would benefit woodcock only if singing grounds and large openings for night roosting are sufficient in number and proximity to the woodcock's other necessary habitat components to adequately support the species.

#### **Northern Hardwoods Habitat Type**

There would be benefits similar to alternative B with major expansion of 30,667 acres to total 36,375 of Northern hardwood forest conserved under alternative

C but no refuge focal species management measures. We would use small group and single tree selection cuts of  $\frac{1}{4}$  acre or less to create all-aged stands in this type with a median canopy tree age of 150 years. These openings would be employed to simulate tree fall gaps. Impacts on these sites would be more limited than those described for alternative B on similar sites because the cuts would be smaller and entry to stands would be less frequent. In the long term, we would not likely be able to achieve as high a population density of either bird species on refuge lands because we would not be cutting back mature stands as frequently or over as large a portion of this type and therefore not creating as much optimal habitat as we would under alternative B.

As noted above, these clearings would benefit woodcock only if singing grounds and large openings for night roosting are sufficient in number and proximity to the woodcock's other necessary habitat components to adequately support the species.

## Effects on Public Use and Access



Ian Drew/USFWS

*Fishing on Umbagog Lake*

Since refuge lands are held in the public trust by the Service, access is generally allowed for compatible, priority wildlife-dependent public uses unless Federal trust resource would be impacted, or the activity would detract from achieving refuge purposes or the Refuge System mission, or because administrative resources are not available to ensure a safe, quality experience. Lake Umbagog Refuge is currently open to the following priority wildlife-dependent public uses: hunting, wildlife observation and photography, environmental education and interpretation. Under all alternatives we would officially open the refuge to fishing, which according to Service policy, is another priority, wildlife-dependent public use. Other popular activities allowed on the refuge include, but are not limited to: remote lake camping in designated sites, snowmobiling in designated areas, cross-country skiing and snowshoeing, and motorized and non-motorized boating.

Some regionally popular activities are not allowed on the refuge as described in chapter 2-alternatives. These include: sled dog mushing; mountain biking; trail riding; ATV or other motorized ORV use; personal watercraft; personal motorized equipment such as segways; horseback riding; float plane use; competitions or organized group events (e.g. fishing derbies, dog trials, or mountain bike or cross-country ski or boat races); geocaching, and camping outside of designated sites.

Table 4.8 provides a summary of projected annual visitation by the major activities allowed for each alternative. We evaluated the benefits of the following management actions with the potential to affect the level of opportunity or visitor experience for those major activities listed:

- Service fee simple land acquisition provides permanent access for approved activities
- Improvements and/or new construction of visitor infrastructure, and the increased distribution of refuge information, will improve visitor experiences
- Increased partnerships with local, regional, and state recreational interests will encourage a diversity of sustainable opportunities
- Increased outreach and Service visibility to promote resource stewardship and outdoor ethics

We evaluated and compared the following impacts that refuge management actions could have on the level of opportunity and visitor experiences:

- Refuge acquisition may result in the elimination of non-wildlife dependent, non-priority activities that are presently allowed by the current owner
- Refuge activities may attract an unanticipated increase in visitation, resulting in increased conflicts or negative encounters among users
- Confusion could result over ownership boundaries and which laws, rules, and regulations apply

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

The Magalloway River Trail, its new extension, and the new Potter Farm area trails would be maintained and/or developed regardless of alternative. This infrastructure would be built to comply with the American with Disabilities Act standards, affording the only opportunity we are aware of in the area for an accessible outdoor experience off of a major road. All alternatives would also continue to allow snowmobile use on designated routes and allow remote lake camping in designated sites. These are some of the most popular activities occurring on the refuge. The opportunity provided for these two activities on the refuge is important because eliminating them would have regional implications. For example, the refuge snowmobile trails are important links in a regional interstate network of trails and disrupting that use would diminish a very important social and economic activity for the area. Remote lake camping in the area is very limited and offers a very unique opportunity for a visitor to immerse themselves in nature. It should be noted, however, that none of the alternatives propose to expand these activities on current refuge lands. Nevertheless, we predict we would be able to meet demand for these activities, within the current capacity of the refuge to maintain them and still meet refuge goals and objectives, over the next 15 years.

Our April 2007 amended EA for the refuge's current hunt program (alternative 2 in that EA), which we incorporate by reference herein, provides additional impacts analysis (USFWS, 2007).

As lands are acquired for the refuge, we would plan to continue to allow the six priority, wildlife-dependent activities, except under extenuating circumstances unforeseen at this time. However, there may be activities allowed by the current owner that we would not allow to continue once acquired for the refuge. The list of popular activities not allowed on refuge lands was noted above. We are not sure how much these activities are occurring on lands proposed for acquisition, but suspect activities such as ATV use, motor cross or motor biking, mountain biking, and horseback riding occur. Some people engaged in these activities would shift their use to other ownerships, including the White Mountain National Forest and town lands. Other people, including some that may be local residents in Errol, NH or Upton, ME, may use these lands exclusively, and be forced to quit the activity.

**Public Use and Access Impacts of Alternative A**

Alternative A would result in Service acquisition of 6,392 acres from willing sellers to add to the approved boundary, increasing opportunities for priority public uses commensurately. A 10% increase over current visitation, resulting in an expected 55,150 annual visitors over the next 15 years, is predicted based on regional tourism trends, increased Service land acquisition, and planned visitor services activities. We do not anticipate that this increase would adversely affect resources or the use or enjoyment by visitors because the increases projected for the refuge would be well-distributed. The only potential for increased adverse effects, or increased conflict, between or among users may occur with visitors engaged in boating. While we rarely hear complaints from visitors, those that we do hear are typically about incidents between non-motorized and motorized boaters. Or, we have heard from adjacent private landowners who complain about trash and human waste being left on their lands from lake and river boater trespass. Alternative A does not propose to regulate these activities, but we would continue to respond to complaints on a case-by-case basis.

There is an increasing local demand for interpretive and educational programs as evidenced by the numerous requests we receive. Our current staffing level and management priorities limit our ability to respond to all requests. Two interpretive programs a year, and participation in two local community events, is our current limit. Under alternative A, we would continue not to be able to meet demand for these activities.

Our current hunting program and infrastructure would be maintained, including the six waterfowl hunting blinds. According to state wildlife biologists responsible for the Umbagog area, hunting pressure is considered light for northern New Hampshire and western Maine. We believe we are accommodating all hunters who want to use the area. Hunting appears to be well-distributed and we rarely hear complaints about its administration. Neither our observations of hunters, nor feedback from them, or comments from other refuge visitors, has demonstrated to us that we need to place any additional restrictions on hunting.

We predict that fishing opportunities would not appreciably increase, despite our formally opening up the refuge to fishing, since the vast majority of anglers in the area fish from boats in state waters. Similar to hunting, our observations indicate that fishing is well-distributed, and self-regulated, and we rarely hear complaints.

### Public Use and Access Impacts of Alternative B

Alternative B would result in Service acquisition of 32,159 acres in fee simple from willing sellers to add to the approved boundary, increasing permanent opportunities for priority public uses commensurately. In particular, those engaged in hunting, wildlife observation and nature photography would benefit from the expansion. An increase over current visitation, resulting in an expected 90,950 annual visitors over the next 15 years, is predicted based on regional tourism trends, increased Service land acquisition, and planned visitor services activities.

With the proposed expanded land base, and proposed new trail and wildlife viewing infrastructure, most of the upland activities would continue to be well-distributed and the variety of interpretive and wildlife observation opportunities, in particular, would increase. We would not appreciably expand our environmental education program, and similar to alternative A, would not likely meet demand until we develop partnerships as planned to facilitate the design and implementation of educational programs on refuge lands. Under alternative B, we would also continue to develop a Friends Group, provide volunteer opportunities, and maintain the Youth Conservation Corps; all of which are programs that will increase Service presence and community outreach.

What we predict to increase is conflicts among boaters, as described under alternative A. To combat this concern, alternative B proposes to work within the structure of the Umbagog Working Group to develop strategies to address these conflicts, including the development of thresholds of acceptable change, capacity limits, or controlled access, which would be implemented among the resource agencies with jurisdiction on the lake. Alternative B would also implement: improved outreach programs, increased Service to visitor contacts, improved informational and educational materials, and develop a promotional campaign to improve boater ethics, as strategies to minimize these conflicts.

Under alternative B, the two refuge river campsites would be eliminated and restored to native vegetation. While these sites have been popular, and are occupied most weekends during July and August, their condition is deteriorating, and creating soil and water impacts. These sites will be closed and not be replaced, which we expect will be a concern to some visitors. Our proposed hunt program under alternative B would provide additional hunt opportunities by adding two new seasons, one for turkey hunting on refuge lands in both states, and a bobcat season on refuge lands in Maine, both consistent with respective states'



Ian Drew/USFWS

*The Magalloway River  
Trail*

regulations. We plan to analyze the impacts of those additional seasons on hunters and other refuge visitors in a separate environmental analysis. We would initiate that analysis within one year of CCP approval and would include opportunities for public involvement. Fishing impacts are similar to alternative A.

### **Public Use and Access Impacts of Alternative C**

Alternative C would result in Service acquisition of 76,304 acres in fee simple from willing sellers to add to the approved boundary, increasing permanent opportunities for priority public uses commensurately. As with alternative B, those engaged in hunting, wildlife observation and nature photography would particularly benefit from the expansion. An increase over current visitation, resulting in an expected 93,700 annual visitors over the next 15 years, is predicted based on regional tourism trends, increased Service land acquisition, and planned visitor services activities. With the proposed expanded land base, most of the upland activities would continue to be well-distributed.

Less planned infrastructure for interpretation would be developed under alternative C, otherwise most of the impacts described for alternative B actions apply to alternative C. The only other difference is that in an effort to create a more dispersed, back-country, low density hunting and fishing experience on refuge lands, we may implement a permit program to better disperse users and manage densities. A permit system will not be favored by some people who are opposed to any controls on, or manipulations of, their activity on public lands.

### **Effects on Cultural Resources**

As we described in Chapter 3 – Affected Environment there are several sites on the National Historic Register documented on or near refuge lands. We protect them, and would continue to do so, under state and federal historic preservation act requirements. Our actions with the potential to impact cultural resources are routinely reviewed and assessed under provisions of Section 106 of the National Historic Preservation Act. To date, projects requiring such reviews include an evaluation of whether certain cabins and the Potter Farm complex of buildings qualified as historic structures.

It is possible that unrecorded historic sites occur on lands proposed for acquisition under any alternative. Thus, the potential for permanent protection of presently unknown sites increases with the amount of refuge lands proposed for acquisition.

We expect none of the alternatives to have significant adverse impacts on cultural resources in New Hampshire or Maine. Beneficial impacts would occur at various levels, depending on the alternative, because of proposed environmental education and interpretation programs, and increased field surveys to identify and protect any discovered sites. In alternatives B and C we would identify high probability sites to survey more intensely. Furthermore, we would evaluate the potential to impact archeological and historical resources prior to any ground disturbing actions, and would consult with respective SHPOs. We would especially be thorough in areas along streams and lakes where there is a higher probability of locating a site. This document has been submitted to both states of Maine and New Hampshire SHPOs for their review and concurrence. The Tribal Historic Preservation Officers from the federally-recognized tribes in Maine have also received this document for review.

### **Cumulative Impacts**

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

This cumulative impacts assessment includes other agencies’ or organizations’ actions if they are inter-related and influence the same environment. Thus, this

analysis considers the interaction of activities at the refuge with other actions occurring over a larger spatial and temporal frame of reference.

## **Air Quality**

None of the alternatives are expected to have significant cumulative adverse impacts on air quality locally or regionally in New Hampshire or Maine. Some short-term, local deterioration in air quality would be expected from air emissions of motor vehicles, motorboats, and snowmobiles used by refuge visitors and staff. Visitors would access the refuge primarily by automobile and snowmobile, with approximately 65 percent of the more than 90,000 annual visits expected to originate outside the Coos County – Oxford County area. However, the refuge is not expected to be a New England recreation destination. Most visitors would already be in the area or would be passing through the area on vacation and would seek out the refuge for a day trip. All snowmobile trails on the refuge would be through trails only; we would not provide parking, warming huts, or other infrastructure on refuge lands. Therefore, the presence of the refuge alone would only account for a small percentage of vehicle emissions generated in this area.

We predict no cumulative impacts to Class 1 air sheds from our actions; the closest Class 1 area being the Great Gulf Wilderness Area, approximately 45 miles to the southwest near Gorham, New Hampshire. The air quality and visibility problems that occur there are caused by ozone and particulate emissions from major sources to the west and south. Actions at the refuge would not contribute to that problem.

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

## **Soils**

The greatest past, present, and foreseeable future adverse impacts on the Umbagog Lake and Upper Androscoggin River watershed soils are from timber management and development. We would improve watershed soil conditions and minimize site-level soil impacts through acquisition of commercially managed timber lands and other upland sites; vegetative restoration of developed sites, roads, and trails; employment of best management practices on building, road, and trail construction sites, cooperative land conservation of important habitat; and technical information exchange with landowners throughout these watersheds.

We would accomplish this to some degree under alternative A. Under alternatives B and C we propose a major increase in Service land acquisition and a wide range of restoration and mitigation practices to improve soil conditions on all refuge lands in the watershed.

## **Hydrology and Water Quality**

There would be cumulative benefits to hydrology and water quality from restoration of camp sites, other disturbed sites, and unused roads and trails on acquired lands. There would also be cumulative benefits from more intensive measures to restore natural hydrology through such measures as culvert removal under alternative C.

There would be no significant adverse cumulative impacts to hydrology or water quality under any of the alternatives. BMPs and erosion and sediment control measures would be used on building, road, trail, and other recreation infrastructure construction sites to ensure impacts are minimized. These projects are few in number and located widely dispersed throughout the refuge so their local effects would not be additive.

## **Biological Resources — Conserved Habitats and Focal Species**

All alternatives would maintain or improve biological resources on the refuge, in the Upper Androscoggin watershed, and within the Northern Forest ecosystem. The combination of our management actions with other organizations' actions could result in significant, beneficial cumulative effects by: (1) increasing

conservation and management for Federal and State-listed threatened and endangered species; (2) improving uplands and wetlands habitats that are regionally declining; and (3) preventing spread or reducing invasive plants and animals.

There would be no significant cumulative adverse effects to biological resources under any of the alternatives because the changes in habitat components that we would manage for directly or expect to realize through natural succession would on balance be beneficial. Biological resources that we would manage to prevent their introduction, limit, or eliminate, such as invasive plants or bass, are not natural components of the Lake Umbagog refuge ecosystem. Losses of those biotic components where they occur would not be considered adverse.

## **Cultural Resources**

We expect none of the alternatives to have significant adverse cumulative impact on cultural resources in New Hampshire or Maine. Beneficial impacts would occur at various levels, depending on the alternative, because of proposed environmental education and interpretation programs, increased land protection, and increased field surveys to identify and protect any discovered sites. In alternatives B and C we would identify high probability sites to survey more intensely.

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/EIS.

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

All of the alternatives strive to maintain or enhance the long-term productivity and sustainability of natural resources on the refuge. The alternatives strive to conserve our Federal trust species and the habitats they depend on, as evidenced by the seasonal public use restrictions during focal bird species nesting seasons. Outreach and environmental education are a priority in each alternative to encourage visitors to be better stewards of our environment.

The dedication of certain areas for the new refuge headquarters and for roads, trails, visitor facilities on the refuge represents a loss of long-term productivity on localized areas, but is not considered significant given the comparative refuge land base.

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

## **Unavoidable Adverse Effects**

Unavoidable adverse effects are the effects of those actions that could cause significant harm to the human environment and that cannot be avoided, even with mitigation measures. There would be some minor, localized unavoidable adverse effects under all the alternatives. For example, there would be localized adverse effects of building the new refuge headquarters and upgrading the access road. There would be property tax losses to towns and increased visitation that could have unavoidable effects. However, none of these effects rises to the level of significance. All would be mitigated, so there would in fact be no significant unavoidable adverse impacts under any of the alternatives.

## **Potential Irreversible and Irretrievable Commitments of Resources**

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

In comparison, irretrievable commitments of resources are those which can be reversed, given sufficient time and resources, but represent a loss in production

or use for a period of time. An example of an irretrievable commitment is the maintenance of clearings and early successional forest for woodcock management. If for some reason woodcock management were no longer an objective, these would gradually revert to mature forest, or the process could be expedited with plantings.

Only a few actions proposed in the alternatives would result in an irreversible commitment of resources. One is construction of the proposed new Potter Farm visitor facility and access road. All alternatives propose that we continue to pursue this action.

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

The commitment of resources to maintain the wetlands is small compared to the benefits derived from the increased biodiversity. These wetlands provide nesting, foraging, and migrating habitat for many migratory bird species of conservation concern. They also benefit refuge visitors by providing wildlife observation opportunities.

## Environmental Justice

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” (February 11, 1994), requires that Federal Agencies consider as part of their action, any disproportionately high and adverse human health or environmental effects to minority and low income populations. Agencies are required to ensure that these potential effects are identified and addressed.

## Existing Socioeconomic Conditions

The EPA defines environmental justice as; “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.” In this context, fair treatment means that no group of people should bear a disproportionate share of negative environmental consequences resulting from the action.

Consideration of the potential consequences of the proposed action for environmental justice requires three main components:

- A demographic assessment of the affected communities to determine whether minority or low income populations are present;
- An integrated assessment of all potential impacts identified to determine if any results in a disproportionately high and adverse impact to these groups; and
- Involvement of the affected communities in the decision-making process and in the development and implementation of any mitigation strategies.

Minority populations are not likely to be affected at the refuge. The minority populations of Oxford County, Maine and Coos County, New Hampshire constitute a substantially smaller proportion of the total population, 1.7% and 1.9% respectively, than that for the states of Maine and New Hampshire, 3.1% and 4.0% respectively, and for the Nation as a whole, 24.6%. Minority populations represent a slightly smaller proportion of the communities surrounding the refuge, 0.6% in New Hampshire and 1.2% in Maine.

Socio-economically disadvantaged populations are present and may be affected by actions taken at the refuge. The percent or individuals who are

socioeconomically disadvantage (living in poverty) in Maine is 10.9% and in New Hampshire, 6.5%. Socioeconomically disadvantaged individuals—living at or below the poverty line—constitute 11.8% of the Oxford County, Maine population, and 10.0% of the Coos County, New Hampshire population. The communities comprised of residents surrounding the refuge (see figure 4.1) differ slightly from their respective Counties. The Maine census block group has a slightly smaller proportion of people living below the poverty line than that for Oxford Counties, at 10.3% while the census tract (2 block groups) in Coos County New Hampshire have a slightly higher percentage living below the poverty line at 7.5%. See table 4.13 below for poverty comparisons with state and national figures.

*An aerial view of Harper's Meadow and the diversity of habitats in the area*



Ian Drew/USFWS

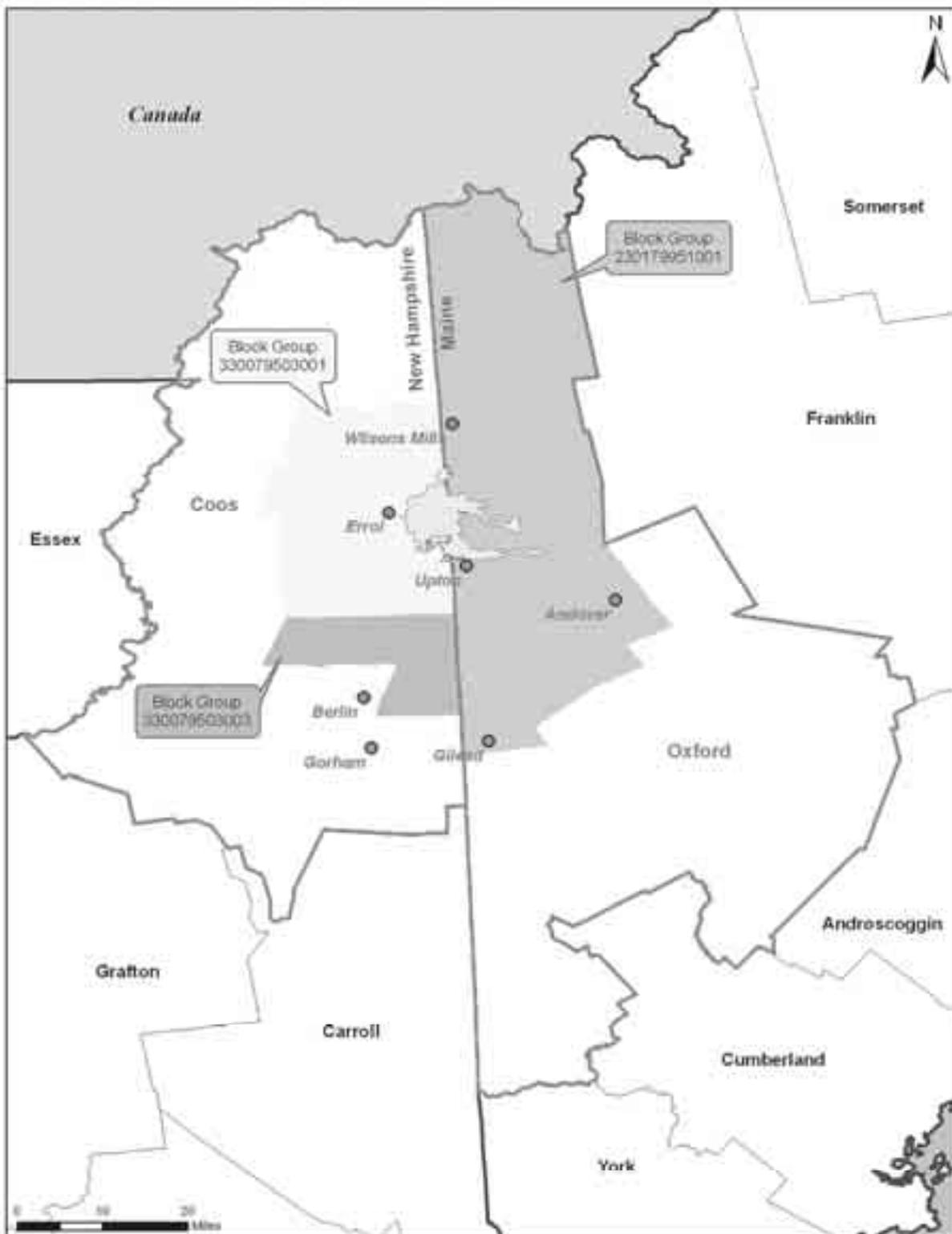


Figure 4.1. U.S. Census blocks surrounding the refuge

**Table 4.13. Socially disadvantaged community indicators for areas surrounding the refuge**

Indicators	Community		County		Community as Percent of County		State	
	ME <sup>1</sup>	NH <sup>2</sup>	Oxford, ME	Coos, NH	Oxford, ME	Coos, NH	ME	NH
<b>Per Capita Income</b>	\$20,113	\$19,720	\$16,945	\$17,218	119%	115%	\$19,533	\$23,844
<b>Median Value of Housing Units</b>	\$85,400	\$81,600	\$82,800	\$70,500	103%	116%	\$98,700	\$133,300
<b>Unemployed</b>	2.6%	3.5%	3.3%	3.3%	79%	106%	3.1%	2.7%
<b>Individuals Below the poverty Level</b>	10.3%	7.0%	11.8%	10.0%	87.3%	70%	10.9%	6.5%

<sup>1</sup>Census Block Group 230179951001

<sup>2</sup>Census Tract of Block Groups 330079503001 and 330079503003

Source: USCB 2000

**Summary of Consequences to Environmental Justice**

The communities surrounding the refuge are relatively homogenous; minority groups do not represent a substantial portion of the affected community. No differential impacts based on minority status would therefore be anticipated under any of the alternatives.

Oxford County, Maine and Coos County, New Hampshire are socially disadvantaged communities with greater percentages of persons living below the respective State poverty levels than in the state overall. The relevant Maine census block that includes the refuge is slightly more affluent than the State of Maine overall and the New Hampshire census tract that include the refuge is less affluent than the State of New Hampshire overall. Therefore, environmental justice considerations do apply to actions taken by the Service at the refuge with respect to the potential to adversely affect socioeconomically disadvantaged communities.

Economically, these communities would benefit under all management alternatives in terms of realizing increased revenues to offset property taxes on acquired lands and in terms of additional jobs and increased personal income. It is not likely that any of these communities would be adversely affected by loss of access to game or fish for those who use them to supplement their annual diet, because both hunting and fishing will remain a part of the compatible activities on the refuge. Although certain areas may be restricted for particular recreational activities, such as snowmobiling, that are an important source of income for nearby communities, it is expected that sufficient access to snowmobiling will be maintained on designated trails and off-refuge to continue to support this revenue base.

Table 4.14. Summary of the effects of management alternatives on Lake Umbagog Refuge resources

Lake Umbagog NWR Resources	Alternative A Continue Current Management	Alternative B Refuge Focal Species Management Service-preferred alternative	Alternative C Natural Processes Management
<p><b>Socio-economic Resources</b></p>	<p>Proposed actions were evaluated for their effect on the economic categories: local output, personal income, and employment. Refuge management or associated activities including refuge revenue sharing (RRS) payments and local property taxes, refuge visitor expenditures, refuge administration, and contributions from management activities that involve economic uses, are all considered.</p> <p>Refuge management activities directly related to all refuge operations generate an estimated \$1.45 million in local output, 177 jobs, and \$425,000 in personal income into the local economy.</p> <p>Including direct, indirect, and induced effects, all refuge activities would generate a total economic impact of \$1.86 million in local output, 23.1 jobs and \$558,900 in personal income. Total economic impacts represent less than 1% (0.03%) of total income and total employment (0.1%) in the overall Coos County, New Hampshire and Oxford County, Maine combined economy.</p>	<p>Using the same analysis as alternative A, alternative B would result in the following:</p> <p>Refuge management activities directly related to all refuge operations generate an estimated \$2.73 million in local output, 35.1 jobs and \$842,400 in personal income in the local economy.</p> <p>Including direct, indirect, and induced effects, all refuge activities would generate total economic impacts of \$3.56 million in local output, 46 jobs, and \$1.11 million in personal income into the local economy. Total economic impacts associated with refuge operations under alternative B represent less than one percent of total income (0.05%) and total employment (0.11%) in the overall Coos County and Oxford County economy.</p> <p>Total economic effects of refuge operations play a much larger role in the smaller communities near the refuge such as Errol, NH and Upton ME where most of the refuge related economic activity occurs as compared to the overall two county economies.</p>	<p>Using the same analysis as alternative A, alternative C would result in the following:</p> <p>Refuge management activities directly related to all refuge operations generate an estimated \$2.84 million in local output, 37.4 jobs and \$908,000 in personal income in the local economy.</p> <p>Including direct, indirect, and induced effects, all refuge activities would generate total economic impacts of \$3.71 million in local output, 49 jobs and \$1.19 million in personal income into the local economy. Total economic impacts associated with refuge operations under alternative C represent less than one percent of total income (0.05%) and total employment (0.11%) in the overall Coos County and Oxford County economy.</p> <p>Total economic effects of refuge operations play a much larger role in the smaller communities near the refuge such as Errol, NH and Upton ME where most of the refuge related economic activity occurs as compared to the overall two county economy.</p>
<p><b>Air Quality</b></p>	<p>Proposed Refuge management activities would neither substantively benefit nor adversely affect currently good local and regional air quality, with no violations of Federal or State Clean Air Act standards, no impacts to nearby Class I areas, and no cumulative effects on regional ozone or particulate matter pollutant levels.</p>	<p>Effects similar to alternative A. No substantive change in air quality; no violation of standards, no impacts to Class I areas, and no cumulative effects. Locally more minor long-term benefits than alternative A but also more potential short-term adverse effects.</p>	<p>No violation of Federal or State Clean Air Act standards; no impacts to nearby Class I areas. Adverse effects same as B but more benefits than alternative A or B because C has largest refuge expansion.</p>

<p><b>Lake Umbagog NWR Resources</b></p>	<p><b>Alternative A Continue Current Management</b></p>	<p><b>Alternative B Refuge Focal Species Management Service-preferred alternative</b></p>	<p><b>Alternative C Natural Processes Management</b></p>
<p><b>Air Quality (cont'd)</b></p>	<p>Minor air quality benefits from air pollutant filtering effects of 14,435 current and up to 5,024 newly acquired acres of natural vegetation and from adopting energy efficient practices. Negligible reduction in atmospheric carbon by sequestering effects of 9,913 current and up to 3,967 newly acquired forested acres.</p> <p>Few ground disturbing activities and few additional emission sources. Construction of Potter Farm headquarters and visitor contact facility would cause short-term, localized effects from construction vehicle and equipment exhausts. Facility operations would slightly increase stationary source emissions.</p> <p>There would be short-term (one-day) minor localized increases in particulate matter from fires used to dispose of demolished cabins, which might be done on average about one a year.</p> <p>An increase of about 5,000 annual Refuge visits by motor vehicle would cause a minor increase in air emissions in the long term and contribute minimally to potential cumulative effects.</p>	<p>Benefits would increase from maintaining up to 69,087 acres of natural vegetation (existing and expanded Refuge lands) to filter air and from more energy efficient Refuge operations. Acquiring up to 45,655 forested acres would stem nearby development growth and reduce potential air emissions. Longer forest rotations minimally increase carbon sequestration.</p> <p>Same impacts of constructing and operating Potter Farm headquarters and visitor contact facility as alternative A. Other construction, renovation, and demolition projects would also cause short-term, minor local effects from vehicle and equipment emissions and dust during construction.</p> <p>Same cabin disposal fire impacts as alternative A.</p> <p>An increase of more than 40,000 annual Refuge visits by motor vehicle would contribute more to local air pollutant emission levels than alternative A over the longer term and increase the potential for cumulative effects. Precluding development in the expansion area would help offset potential cumulative air quality effects.</p>	<p>Greatest potential increase in benefits—up to 96,119 acres (existing and expanded Refuge lands) of natural vegetation and wetlands to filter air and energy efficient Refuge operations. Adding up to 71,416 forested acres would best stem nearby development growth and reduce potential emissions. Longer forest rotations would increase carbon sequestration and maintain forest health and resilience.</p> <p>Impacts of constructing and operating Potter Farm headquarters and visitor contact facility same as alternative A. Other construction, renovation, and demolition projects would also cause short-term, minor local effects from vehicle and equipment emissions and dust during construction.</p> <p>Same cabin disposal fire impacts as alternative A.</p> <p>An increase of more than 43,000 annual Refuge visits by motor vehicle would contribute more to local air pollutant emission levels than alternative A over the longer term and increase the potential for cumulative effects. Precluding development in the expansion area would help offset potential cumulative air quality effects.</p>

Lake Umbagog NWR Resources	Alternative A Continue Current Management	Alternative B Refuge Focal Species Management Service-preferred alternative	Alternative C Natural Processes Management
<p><b>Soils</b></p>	<p>Alternative A would provide benefits and cause localized adverse effects to refuge soils. Acquiring up to 4,877 acres of upland, lakeside and streamside land would increase soil benefits from site restoration within current refuge acquisition boundary.</p> <p>There would be few ground disturbing activities and no active forest management to cause adverse soil effects. BMPs employed in building new Potter Farm headquarters and visitor contact facility would minimize short-term, localized soil impacts and eliminate potential cumulative effects. A 10% increase in visitor activities—hiking off designated trails, camping, boat launching—would minimally increase soil impacts.</p>	<p>Alternative B would increase long term benefits over alternative A in terms of protecting soils and restoring disturbed sites but also increases some short-term localized adverse effects to refuge soils. Expanding the Refuge by fee purchase and easement of up to 49,718 acres, would eliminate the soil impacts of development on these lands. Improved forest management practices on current and expansion lands would enhance vegetation protecting soils.</p> <p>Short-term, localized soils impacts from forest stand cutting, and clearing for access roads and skid trails, would be minimized using BMPs. Forest management in Special Management and Restricted Management zones would be strictly limited to preclude soil impacts</p> <p>Potter Farm facility, trail, boat launch, parking area, and kiosk construction would cause short-term localized soil erosion, compaction, and loss of productivity on no more than 50 acres of Refuge lands. BMPs would minimize soil impacts in all construction projects.</p> <p>No construction except boardwalk pilings for trail access would be done in wetlands; boardwalks over saturated areas would protect wetland soils and sensitive vegetation. Groundwater and nutrient flows maintaining peatlands will be studied and any issues or threats addressed.</p> <p>Restoration of natural soil productivity on reclaimed cabin sites, campsites, skid trails, and unnecessary roads would help offset localized construction effects.</p>	<p>Expanding the Refuge land base under alternative C by up to 76,000 acres would better eliminate the potential for soil impacts associated with development than alternative B.</p> <p>Forest management would be less intensive where 4 % of each management unit is cut on a 15-20 year cycle versus 15% cut under alternative B with correspondingly lower impacts to soils. There may be a similar number of skid trails but they would haul a 75% lower volume than alternative B, so any soil damage should be less severe.</p> <p>Adverse effects from construction of the Potter Farm facility and trail, boat launch, parking area, and kiosk projects would be the same as alternative B. BMP's would be used to minimize adverse effects. Boardwalks would be used in wetlands. Soil productivity would be restored on reclaimed sites.</p>

Lake Umbagog NWR Resources	Alternative A Continue Current Management	Alternative B Refuge Focal Species Management Service-preferred alternative	Alternative C Natural Processes Management
<p><b>Hydrology and Water Quality</b></p>	<p>Alternative A would provide minor watershed benefits and cause minimal adverse effects to Refuge hydrology and water quality. Acquiring 5,500 additional acres of upland forest, lakeshore, and wetlands within the acquisition boundary would prohibit potentially damaging development.</p> <p>Camp restoration would reduce local erosion and restore site hydrology.</p> <p>Loons would continue as indicator of effectiveness of water level management on nesting wildlife.</p> <p>Water quality benefits from improved monitoring and cooperation of watershed landowners.</p> <p>Stringent precautions in conducting Refuge management activities would prevent chemical contamination of water directly through leaks or spills or indirectly through soil runoff.</p> <p>A minor increase in recreational boating activities might cause lake and river contamination with petroleum products. Public outreach on that and other issues such as invasive aquatic weeds, invasive fish, and lead contamination would help mitigate that risk.</p>	<p>Alternative B would substantially increase watershed benefits and cause minimal increased adverse effects to Refuge hydrology and water quality as compared to alternative A. Expanding the refuge by up to 49,718 acres would substantially increase watershed benefits by limiting land clearing and changes in local hydrology from development. Increased site restoration would reduce erosion and restore site hydrology. Local hydrology would improve through road reconstruction and unnecessary road removal, culvert removal, and hydrology restoration of areas such as the Day Flats area.</p> <p>Water quality benefits would improve from a strengthened partnership with the FERC licensee in determining beneficial lake water levels at all seasons, upgraded monitoring, and greater efforts in seeking cooperation of watershed landowners.</p> <p>Creating wetland openings and simulated beaver impoundments might cause turbidity and sedimentation impacts. BMPs for these techniques would limit impacts to short-term and localized.</p> <p>A minor increase in recreational boating activities on the refuge might contribute to lake and river contamination with petroleum products. The Service does not regulate Umbagog Lake boating, but increased public outreach on that and other issues such as invasive aquatic weeds, invasive fish, and lead contamination would help mitigate that risk. Umbagog Lake Working Group BMPs for lake and river activities, addressing proper waste disposal, elimination of lead fishing tackle, and use of wake zones and appropriate access, would help maintain good water quality.</p>	<p>Alternative C would substantially increase watershed benefits over A and B and would limit adverse hydrology and water quality effects compared to B. Expanding the refuge by 76,000 acres would further increase watershed benefits by limiting land clearing and changes in local hydrology from development.</p> <p>Camp site restoration, local hydrology restoration, and lake water quality benefits would be similar to alternative B.</p> <p>We would not create wetland openings or simulated beaver impoundments alternative C.</p> <p>Alternative C would have boating and related impacts from increased visitation and outreach similar to B.</p>

Lake Umbagog NWR Resources	Alternative A Continue Current Management	Alternative B Refuge Focal Species Management Service-preferred alternative	Alternative C Natural Processes Management
<p><b>Wetland &amp; Open Water Habitats</b></p>	<p>Wetlands and open water habitats would benefit from continuing protection of the current 3,150 wetland acres and 5,033 open water acres. Acquisition under alternative A would be limited to 616 wetland acres and 801 open water acres.</p> <p>Water level fluctuations, water quality problems and human disturbance of wildlife would continue to pose risks to wetland habitat; breeding, brood rearing, and migrating waterfowl; marsh birds, shorebirds, and wading birds; and other wildlife species of concern. Management limited to habitat inventory, mapping, and monitoring, wildlife surveys, water level effects and loon population research, and protection of nesting loons with no Refuge focal species management.</p> <p>Future adjacent development and increasing refuge visitation may affect Refuge water quality indirectly through the watershed. Impacts may be direct through increased use of the Lake and other water bodies. Alternative A has the greatest potential for adjacent development with its impacts but also has lowest future visitation that would somewhat offset those effects.</p> <p>No wetland impacts from construction of Potter Farm visitor center because site not adjacent to wetlands and does not drain to any wetlands.</p>	<p>Alternative B substantially expands protection of wetlands and upgrades waterfowl and other Refuge focal species management compared to A. It would increase refuge protected wetlands by 3,837 acres and open water habitat by 3,906 acres and broaden our techniques for beaver management; waterfowl food plantings, and management of habitat productivity for breeding and migratory waterfowl.</p> <p>We will monitor habitat condition and propose to work cooperatively with the FERC licensee, currently FPLE, to promote water levels throughout the year to benefit wildlife and sustain rare wetland habitat types.</p> <p>Future adjacent development and increasing refuge visitation may affect Refuge water quality. Alternative B reduces adjacent development but has increased future visitation.</p> <p>The Potter Farm facility is not adjacent to wetland habitat but part of the new loop trail is through wetlands. No construction would be done that would directly affect the wetland except for boardwalk pilings. Boardwalks would be constructed over saturated areas to protect sensitive vegetation.</p>	<p>Alternative C also substantially expands protection of wetlands but would not include management to directly benefit Refuge focal species as in alternative B. Alternative C would acquire and protect up to 4,628 acres of wetlands and promote a natural regime of disturbance and recovery with a natural complement of native wildlife species that would not necessarily benefit particular Refuge focal species in the long term.</p> <p>Acquisition of expansion lands would increase watershed protection and reduce adverse effects of development. Controlling water level fluctuations to mimic a natural hydrologic regime may benefit some species but not others. Limiting human access to simulate a back country wilderness-type experience with no facilities development and no motorized access would benefit wildlife by reducing disturbance and localized habitat losses.</p> <p>Potter Farm loop trail impacts would be the same as described for alternative B.</p>

Lake Umbagog NWR Resources	Alternative A Continue Current Management	Alternative B Refuge Focal Species Management Service-preferred alternative	Alternative C Natural Processes Management
<b>Fen &amp; Flooded Meadow</b>	<p>Adding 73 acres to protect a total 555 acres of fen and flooded meadow habitat would continue and minimally increase benefits to breeding and migrating waterfowl and other species using this habitat. We would monitor wetland conditions but not actively manage habitat for waterfowl or other species.</p> <p>Visitors fishing or boating in or near fen and flooded meadow habitat may disturb nesting or foraging birds but impacts would be minor because disturbance would be infrequent and would not likely adversely affect waterfowl productivity. Outreach efforts would help address this potential.</p>	<p>Alternative B improves management of fen and flooded meadow habitat with up to 132 added acres and actively managed for breeding and migrating waterfowl, marshbirds, shorebirds, and wading birds.</p> <p>An improved partnership with the FERC licensee to address water level management, expanded bird and aquatic invertebrate surveys, and promotion of wild rice and other food plants would substantially upgrade our ability to support breeding and migratory birds. Any effects of fluctuating levels would be minor and short-term</p> <p>Visitors fishing or boating in or near fen and flooded meadow habitat may disturb nesting or foraging birds but impacts would be minor because disturbance would be infrequent and would not likely adversely affect waterfowl productivity. Increased outreach efforts would better mitigate this potential.</p>	<p>Benefits to fen and flooded meadow habitat minimally higher with 217 acres of habitat acquired and protected under alternative C.</p> <p>No Refuge focal species management so benefits to Refuge focal species would be indirect from increase in habitat protection.</p> <p>Adverse impacts would be the same as described under alternative B.</p>
<b>Boreal Fen &amp; Bog</b>	<p>Purchase of 97 additional acres would minimally increase protection of the peatland complex and benefits to peatland dependent species because the increase is just 8 percent in FWS ownership. No active Refuge focal species management so no further wildlife benefits.</p> <p>No impacts from passive management actions. Disturbance of wildlife or damage to rare plants unlikely because peatland habitats generally not visited.</p>	<p>Protection and management of boreal fen and bog habitats would greatly improve compared to alternative A with up to 2,799 acres acquired in fee or easement. The Floating Islands National Natural Landmark (FINNL) would expand from 860 to 2181 acres. Monitoring and research efforts would identify threats to this habitat.</p>	<p>Benefits of protection and management of boreal fen and bog habitats would be similar to alternative B with up to 3,334 fee acquired acres. This alternative too would greatly increase protection of the refuge peatland complex and substantially benefit peatland dependent species.</p> <p>Peat coring of the FINNL and other peatlands on Lake Umbagog NWR under this alternative would not adversely affect these wetlands.</p>

Lake Umbagog NWR Resources	Alternative A Continue Current Management	Alternative B Refuge Focal Species Management Service-preferred alternative	Alternative C Natural Processes Management
<b>Northern White Cedar</b>	<p>Purchase of 202 additional acres, including the largest Northern white cedar swamp in NH, would substantially benefit protection of this habitat in the region as well as benefit Refuge focal species such as the black-backed woodpecker.</p> <p>No active management techniques would be employed so there is no potential for direct effects. Passive management actions would not adversely affect Northern white cedar habitat which generally is not used by visitors.</p>	<p>Benefits slightly higher than alternative A by adding 202 acres in an acquisition boundary and up to 50 acres in expansion area. Some minimal additional benefit to black-backed woodpecker.</p> <p>No adverse effects from limited management actions. Not likely to be a priority in 15 year life of CCP but potential for restoring about 150 acres over that time.</p>	<p>Benefits and impacts similar to alternative B.</p>
<b>Scrub-Shrub</b>	<p>Purchase of 244 acres would increase protection of this habitat as well benefits to woodcock. No active management techniques would be employed and none of our passive management actions under alternative A would adversely affect scrub-shrub habitat.</p>	<p>Adding 913 acres to protect a total 1,812 acres of scrub-shrub habitat would double protected acreage and substantially increase benefits to scrub-shrub wetland habitat, Canada warbler and woodcock, and scrub-shrub wetland dependant species under alternative B.</p> <p>Manual or portable power tools would be used in vegetation management to manipulate or maintain habitat such as alder. Cutting would be done to minimize disturbance to nesting or foraging wildlife.</p> <p>Creating 1 to 10-acre simulated beaver ponds in seasonal drainages would cause short-term erosion, turbidity and sedimentation from excavation equipment and long-term changes to the habitat that would benefit focal species.</p> <p>Furbearer management would in some cases require killing individual animals to achieve management objectives but furbearer populations would not be adversely affected.</p>	<p>Adding 1,077 acres to protect a total 1,976 acres of scrub-shrub habitat would substantially increase benefits to scrub-shrub wetland habitat and dependent species under alternative C.</p> <p>Impacts similar to B except no construction of simulated beaver impoundments.</p>
<b>Open Water</b>	<p>Acquiring up to 801 acres to protect a total 5,834 acres of open water habitat under alternative A would benefit fish, invertebrates, and aquatic plants but no active management would be done.</p>	<p>Benefits would be greater under alternative B with addition of up to 873 open water acres and an expanded program of management activities to conserve and enhance the biota of open water habitats.</p>	<p>Alternative C would have benefits and minimal adverse impacts similar to alternative B.</p>

Lake Umbagog NWR Resources	Alternative A Continue Current Management	Alternative B Refuge Focal Species Management Service-preferred alternative	Alternative C Natural Processes Management
<b>Open Water (cont'd)</b>	<p>Watershed land protection would be limited to acquisition within the current refuge boundary thus limiting the indirect benefits to water quality and aquatic species.</p> <p>Refuge visitors who boat and fish may cause localized turbidity or minor spills or leaks of petroleum products. Outreach including brochures and signage will notify these users of proper precautions.</p>	<p>With added watershed land protection of more than 45,000 acres, risks to aquatic species from water quality problems would diminish in Umbagog Lake and river tributaries. Some of this benefit may be offset by increased visitation.</p> <p>Refuge visitors who boat and fish may disturb the bottom substrate in shallow areas or cause minor spills or leaks of petroleum products. Outreach including brochures and signage will notify these users of proper precautions.</p>	
<b>Common Loon</b>	<p>Continuing to protect nesting loons through water level management and restricting human activity in their proximity, and efforts to support research on loons and water level effects under alternative A would continue to benefit nesting loons. Protecting more open water habitat should also benefit loons.</p> <p>No additional active management techniques would be employed to increase loon productivity and none of our passive management actions under alternative A would adversely affect loons.</p>	<p>Increased management efforts including more intensive predator control would benefit loons under alternative B with a proposed target of 18 nesting pairs on Umbagog Lake and 4 nesting pairs in the expansion area.</p> <p>Major expansion in watershed land base would increase indirect benefits to loons by protecting water quality and aquatic prey.</p> <p>Some predator control methods would eliminate individual predatory animals but continuous monitoring of methods would ensure control would not adversely affect any sensitive predator species populations.</p> <p>The near doubling of refuge visitation under alternative B will likely increase pressure to view loons and potential nesting loon disturbance. Upgrading signage and educational materials, increasing monitoring of visitors and excluding nesting areas would mitigate these effects.</p>	<p>Similar to alternative A, continuing to protect loons and support research on loons and water level effects under alternative C would continue to benefit loons. Protecting more open water habitat should also benefit loons.</p> <p>No additional active management techniques would be employed specifically to increase loon productivity although none of our management actions under alternative C would adversely affect loons.</p> <p>Major expansion of watershed land base would have benefits similar to alternative B. Major increase in visitation would have potential for adverse effects to be mitigated similar to B.</p>

Lake Umbagog NWR Resources	Alternative A Continue Current Management	Alternative B Refuge Focal Species Management Service-preferred alternative	Alternative C Natural Processes Management
<p><b>Floodplain, Lakeshore, and Riparian Habitats</b></p>	<p>Adding up to 441 acres of these habitats would increase protected floodplain, lakeshore, and riparian acres to over 1,800 acres but management to benefit these habitats would be limited to inventory, mapping, and monitoring; biotic surveys; support of related research, protection of nesting eagles and ospreys.</p> <p>Magalloway trail project would cause short term construction impacts and long-term loss of a minor amount of habitat. Potter Farm facility construction would cause minor localized impacts along lakeshore. No other construction projects would affect these habitats.</p> <p>Remote camping would continue to have localized, long term impacts to lakeshore and floodplain habitats.</p> <p>Increased visitation may cause minimal increased risk of localized habitat impacts off managed trails from hiking, boating, and wildlife viewing activities that concentrate in these areas. Education, signage, and monitoring would mitigate these effects.</p> <p>Vernal pools on existing and acquired Refuge lands inventoried and protected under all alternatives.</p>	<p>Up to 577 acre increase provides protection benefits similar to alternative A. More active management would substantially increase benefits to Refuge focal species.</p> <p>Greater amount of restoration planned for expansion area to benefit primarily riparian habitat. Localized short term impacts and long term benefits of restoration projects would be similar to alternative A. Impacts of construction projects similar to alternative A.</p> <p>Greater increase in visitation would cause minimally higher risk than alternative A of localized habitat impacts from recreational activities.</p> <p>Remote camping would continue to have localized, long term impacts to lakeshore and floodplain habitats. Increased outreach efforts would be made to address these problems under this alternative.</p> <p>Increased benefits to vernal pools on more than 49,000 acres of expansion lands inventoried and protected under alternative B.</p>	<p>Up to 581 acre increase provides protection benefits similar to alternative A. No active management planned so benefits to Refuge focal species would be indirect.</p> <p>Localized short term impacts and long term benefits of restoration projects would be similar to alternative A.</p> <p>Greater increase in visitation would cause minimally higher risk of localized habitat impacts from recreational activities.</p> <p>Remote camping would continue to have localized, long term impacts to lakeshore and floodplain habitats. Like alternative B, remote camping on the existing designated sites would continue to be allowed, but we would increase monitoring of individual sites, and rehabilitate, or close permanently or seasonally those in need of restoration. Increased efforts would be made to address these problems under this alternative. Emphasis on wilderness experience camping would further reduce impacts compared to A and B.</p> <p>Increased benefits to vernal pools on more than 76,000 acres of expansion lands inventoried and protected under alternative C.</p>
<p><b>Wooded Floodplain</b></p>	<p>Minimal increased benefits to cavity nesting waterfowl, northern parula, and rusty blackbird from adding 153 acres of habitat but no active focal species management techniques would be employed.</p>	<p>Increased benefits to Refuge focal bird species from combined increased 289 acres of land protection and implementing active focal species management techniques.</p> <p>Mapping and monitoring of the Magalloway River floodplain would be conducted. Restoring hydrology of Day Flats area may cause minimal short-term erosion and sedimentation. Best management practices would mitigate these effects.</p>	<p>Increased benefits to habitat and indirect benefits to Refuge focal bird species from adding 293 acres to protected habitat base and from near term active management techniques to promote establishment of sustainable floodplain community.</p> <p>Restoring Day Flats area hydrology would have same impacts and BMPs to mitigate as alternative B.</p>

	<b>Alternative A Continue Current Management</b>	<b>Alternative B Refuge Focal Species Management Service-preferred alternative</b>	<b>Alternative C Natural Processes Management</b>
<b>Lake Umbagog NWR Resources</b>	<p>Acquiring 288 additional acres of lakeshore pine-hemlock habitat would more than double refuge acreage from the current 232 acres and increase protection benefits to jack pine, bald eagle, osprey, and other raptors at the refuge.</p> <p>Localized, minimal, short term impacts to soils from camp or other site restoration activities on any of these newly acquired lands but long term benefits from restoration.</p>	<p>Same protection and site restoration benefits, and short-term impacts, as alternative A plus additional acreage to be identified in the expansion area would minimally increase benefits to jack pine, bald eagle, osprey, other raptors by providing additional nesting and roosting habitat.</p>	<p>Same protection and site restoration benefits, and short-term impacts, as alternative B plus additional acreage to be identified in the expansion area would minimally increase benefits to jack pine, bald eagle, osprey, other raptors.</p>
<b>Bald Eagle &amp; Osprey</b>	<p>Bald eagle and osprey would benefit from protection of the lakeshore pine-hemlock habitat.</p> <p>Risk of human disturbance of nesting eagles and ospreys and impacts to nesting trees because of limited management resources and no active super-canopy tree recruitment measures. Effects minimally offset by lowest increase in visitation.</p> <p>Eagle and osprey food base may be adversely affected because watershed and open water protection limited to within acquisition boundary.</p>	<p>Increased bald eagle and osprey benefits from protection of the lakeshore pine-hemlock habitat and active management to eliminate human disturbance and protect and recruit nesting trees.</p> <p>Increased risk of human disturbance from increased visitation mitigated by upgrade in management.</p> <p>Water quality improved or maintained through monitoring. Eagle and osprey food base better protected by expanded watershed and open water protection.</p>	<p>Benefits and impacts similar to alternative B</p>
<b>Upland Forest Matrix</b>	<p>Up to 3,967 acre increase in protected upland forest matrix in the current refuge boundary would increase benefits to upland habitats and Refuge focal species</p> <p>No active management to benefit Refuge focal bird species or promote mammalian travel corridors but natural succession and disturbance would eventually lead to mature forests with a larger softwood component which would benefit mature-forest dependant species but not early succession dependent species such as the woodcock.</p>	<p>Greatly expanded protection to total 59,535 acres of upland forest matrix and many significant upgrades in management activities would markedly increase benefits to Refuge focal species under alternative B.</p> <p>We would not implement management on expansion lands within 15 years of CCP until the forest has recovered from recent harvesting. Silvicultural practices on about 4,000 acres within acquisition boundary would cause some adverse impacts but best forest management practices would minimize effects.</p>	<p>Benefits similar to alternative B, with major expansion in the total acreage of upland forest protected under alternative C but no Refuge focal species management measures. Refuge focal species will ultimately benefit as natural forest characteristics are attained, but no adjustment to otherwise benefit Refuge focal species. Benefits primarily to mature forest dependent species because the acreage of early successional vegetation would be limited to natural or simulated disturbance areas.</p>

	<b>Alternative A Continue Current Management</b>	<b>Alternative B Refuge Focal Species Management Service-preferred alternative</b>	<b>Alternative C Natural Processes Management</b>
<p><b>Lake Umbagog NWR Resources</b></p> <p><b>Upland Forest Matrix (cont'd)</b></p>	<p>No impacts from tree cutting or construction and use of skid trails and haul roads. Magalloway River Trail would be only walking trail maintained on refuge.</p> <p>Acquisition of 4,534 upland forest matrix acres and increased visitation under alternative A would minimally increase off-trail disturbance of upland forests with habitat impacts or disturbance of wildlife.</p> <p>Significant natural forest disturbance events, such as windstorms, could diminish the habitat value of portions of refuge for long periods because recovery only by natural regeneration.</p> <p>Snowmobiling would continue to be allowed with use confined to the two state-designated trails. Refuge compatibility determination describes substantial impacts for snowmobiling however, allowing snowmobiling only on established trails means any important habitat and wildlife impacts have already occurred. Some level of winter wildlife disturbance effects would continue</p>	<p>We would avoid impacts to all sensitive environments on the refuge by adhering to strict operability standards that prohibit or severely restrict forest management on protected resources and in buffer areas.</p> <p>Same snowmobiling impacts as alternative A, but more trails monitored because of expansion. No additional infrastructure installed to support snowmobiling. Relocation of trail portions where needed to meet habitat goals. Unauthorized trails closed and restored.</p>	<p>Silvicultural practices and potential impacts, best management practices, and operability restrictions to protect sensitive environments same as alternative B.</p> <p>Snowmobiling impacts would be limited to current trails where any substantive habitat and wildlife impacts have generally already occurred. Winter wildlife disturbance effects would continue.</p>
<p><b>Spruce-fir Habitat Type</b></p>	<p>Acquiring up to 618 acres to total 2,559 Refuge acres of spruce-fir protected would benefit Refuge focal species. Benefits limited because only through natural succession would spruce-fir become a larger component of the forest to benefit blackburnian and black-throated green warblers. Deer would benefit from winter yard protection on current and newly acquired lands.</p>	<p>Acquiring up to 26,714 acres to total 29,279 Refuge acres of spruce-fir protected would increase benefits to Refuge focal species. Specific measures to enhance spruce-fir habitats on current and expansion area lands under alternative B would benefit blackburnian and black-throated green warblers, and promote growth of travel corridors for lynx and other larger mammals. Deer would benefit from increased winter yard maintenance efforts on expansion lands.</p>	<p>Benefits similar to alternative B, with major expansion of 11,841 acres to total 14,406 of spruce-fir forest protected under alternative C but no Refuge focal species management measures. Direct forest management effects similar to but more limited than alternative B because of smaller cuts (4%) to management units. Lower cumulative effects over the type within the Umbagog Lake watershed. Deer would benefit from protection of mature and maturing stands on expansion lands.</p>

Lake Umbagog NWR Resources	Alternative A Continue Current Management	Alternative B Refuge Focal Species Management Service-preferred alternative	Alternative C Natural Processes Management
<b>Spruce-fir Habitat Type (cont'd)</b>	No active forest management so no related adverse impacts.	Forest management impacts, site and skid trail habitat disturbance and loss, soil compaction, soil erosion would be seen on up to 15% of each managed unit on 15-20 year rotation. BMPs would mitigate those effects. More sensitive sites would be protected by restrictions to single tree or group cuts.	If cutting a large area is necessary to simulate the effects of an insect outbreak or major windthrow event in the future, we would conduct a full NEPA analysis of the forest management project.
<b>Mixed Woods Habitat Type</b>	<p>Acquiring up to 2,129 acres to total 5,607 Refuge acres of mixed woods protected would benefit Refuge focal species. Benefits limited because only through natural succession would spruce and fir become a larger component of the mixed woods type to benefit Canada, black-throated green, and blackburnian warblers.</p> <p>No benefits to woodcock because no active woodcock management. In general, maturing forest with few large disturbed sites would not support woodcock. We would also not create openings to manage for woodcock in mixed forests.</p> <p>No active forest management so no related adverse impacts.</p>	<p>Acquiring up to 11,281 acres to total 16,888 Refuge acres of mixed woods protected would substantially increase benefits to Refuge focal species. We would implement specific measures to enhance spruce and fir habitats on current and expansion area lands under alternative B to benefit Canada, black-throated green and blackburnian warblers and woodcock. Better management of age classes and structural classes would also benefit Canada warblers and woodcock.</p> <p>Substantial increase in woodcock benefits from program of forest management techniques focused to support woodcock.</p> <p>Human disturbance impacts would be limited by relative remoteness of management sites.</p> <p>Potential adverse impacts similar to spruce-fir impacts above, with a slightly greater degree of risk of soil erosion from openings maintained for woodcock.</p>	<p>Benefits similar to alternative B, with major expansion of 28,908 acres to total 34,515 of mixed woods protected under alternative C but no Refuge focal species management measures. Forest landscape mosaic would benefit Canada warblers and blackburnian warblers locally where habitat components are favorable. Impacts on these sites would be more limited than those described for alternative B on similar sites because the cuts would be smaller and entry to stands would be less frequent. Long term benefits to early successional dependent species not as high from landscape management as under alternative B because disturbance regime would tend toward more mature stands.</p> <p>Natural clearings and early successional components in mixed stands would benefit woodcock only if singing grounds and large openings for night roosting are sufficient in number and proximity to the woodcock's other necessary habitat components to adequately support the species.</p>

Lake Umbagog NWR Resources	Alternative A Continue Current Management	Alternative B Refuge Focal Species Management Service-preferred alternative	Alternative C Natural Processes Management
<p><b>Northern Hardwood Habitat Type</b></p>	<p>Acquiring up to 1,220 acres to total 5,708 Refuge acres of Northern hardwoods protected would benefit Refuge focal species. Benefits limited because only natural disturbances would promote dense understory to benefit black-throated blue warblers, or intolerant hardwoods to benefit woodcock production, Canada warbler or other early successional species.</p> <p>No active forest management so no related adverse impacts.</p>	<p>Acquiring up to 7,660 acres to total 13,388 Refuge acres of Northern hardwood forest protected would benefit Refuge focal species. Refuge focal species benefits would increase through active management to promote dense understory to benefit black-throated blue warblers, and intolerant hardwoods to benefit woodcock production, Canada warbler or other early successional species.</p> <p>Adverse silvicultural impacts would be short-term, localized at managed sites and mitigated by best forest management practices.</p>	<p>Benefits similar to alternative B, with major expansion of 30,667 acres to total 36,375 of Northern hardwood forest protected under alternative C but no Refuge focal species management measures. Impacts on silviculture sites would be more limited than for alternative B on similar sites because cuts would be smaller and entry to stands would be less frequent. In the long term, benefits to Refuge focal species lower than alternative B because we would create as much optimal habitat.</p>
<p><b>Public Use &amp; Access</b></p>	<p>Five of the six priority public uses (hunting, wildlife observation and photography, and environmental education and interpretation) are allowed on the refuge, and would be provided on lands to be acquired in the future. Fishing is the only priority public use not formally allowed at present. Popular, non-priority public uses that would be allowed to continue include snowmobiling and camping. We would maintain the current capacity for these activities.</p> <p>Education and interpretive programs are limited and we have very little visitor infrastructure in place to facilitate self-guided opportunities. We do not meet demand for these programs; however, we do meet demands for hunting, and wildlife observation and photography.</p>	<p>We would formally open the refuge to fishing and increase our infrastructure to support all six priority public uses. Visitor experiences would be enhanced as we provide new trails, wildlife viewing areas, and fishing and boating access. Educational programs would be facilitated on the refuge, but we would look to partners to develop and implement them. We may not meet demand for this activity.</p> <p>Impacts for expanding our hunt program to include turkey hunting (both states) and bobcat hunting (Maine only) would be analyzed in a separate EA to initiate within 1 year of CCP approval.</p> <p>We would continue to provide the existing level of opportunity for snowmobiling and lake camping, but no opportunity for expansion, or new infrastructure, is planned for these activities. Two popular river camp sites would be eliminated because of resource degradation. Typically these sites are full every weekend during the summer months. Visitors expecting to use the sites would be impacted.</p>	<p>Similar to alternative B except, less interpretive infrastructure would be provided and fewer trails constructed. The objective under alternative C would be to provide a low density, back country experience. The Potter Farm area would be developed with trails and interpretive infrastructure, but no other new trails would be developed. Thus, visitors that prefer developments to enjoy their visit would be less satisfied under alternative C than under alternative B.</p> <p>Snowmobiling, camping, and boating opportunities and impacts are similar to alternative B.</p>

Lake Umbagog NWR Resources	Alternative A Continue Current Management	Alternative B Refuge Focal Species Management Service-preferred alternative	Alternative C Natural Processes Management
<p><b>Public Use &amp; Access (cont'd)</b></p>	<p>Conflicts among motorized and non-motorized boaters would continue to be the biggest challenge.</p> <p>Some popular activities in the area would continue not to be allowed, but this is not a change of expectation on existing refuge lands as they have never been allowed. However, where they occur on lands to be acquired in fee simple (up to 7,000 acres), some of those user groups would be impacted. Unfortunately, we do not have an estimate of numbers.</p>	<p>Conflicts among motorized and non-motorized boaters are likely to increase; however, strategies would be implemented to try and minimize these concerns. We would work within the structure of the proposed Umbagog Working Group to address these conflicts among the agencies with jurisdiction on the lake.</p> <p>Similar to alternative A, as we acquire lands in fee simple (up to 32,159 acres); we would eliminate certain activities that are not allowed on current refuge lands. As with alternative A, we do not know how many people would be impacted. On the other hand, Service acquisition benefits priority public uses, and those other activities allowed, because it affords permanent public access.</p>	<p>Similar to alternative B, as we acquire lands in fee simple (up to 76,304 acres); we would eliminate certain activities that are not allowed on current refuge lands. As with alternative B, we do not know how many people would be impacted. On the other hand, Service acquisition benefits priority public uses, and those other activities allowed, because it affords permanent public access.</p>
<p><b>Cultural Resources</b></p>	<p>We have not conducted a detailed archeological or history survey of all refuge lands; however some specific project surveys have been done to determine the eligibility of certain sites. We know of one historic and four prehistoric sites on the refuge.</p> <p>We would continue to protect these sites under state and federal historic preservation act requirements. Any future actions with the potential to impact cultural resources will be reviewed and assessed under provisions of Section 106 of the National Historic Preservation Act.</p> <p>This document has been submitted to both state SHPOs for their review and concurrence.</p>	<p>In addition to impacts under alternative A:</p> <p>We would identify high probability sites to survey more intensely prior to refuge activities. Areas along rivers and lakes have particularly high potential and we will be especially vigilant in those areas.</p> <p>We would also increase outreach and education to inform visitors about the refuge's cultural resources.</p>	<p>Same as alternative B.</p>