Finding of No Significant Impact

Environmental Assessment and Comprehensive Conservation Plan for the Seney National Wildlife Refuge, Michigan

An Environmental Assessment (EA) has been prepared to identify management strategies to meet the conservation goals of the Seney National Wildlife Refuge. The EA examined the environmental consequences that each management alternative could have on the quality of the physical, biological, and human environment, as required by the National Environmental Policy Act of 1969 (NEPA). The EA evaluated three alternatives for the future management of Seney NWR.

The alternative selected for implementation on the refuge is *Alternative 2*. The preferred alternative would encourage a future trend toward wildlife habitats that are native to the area and maintained, where feasible, by natural processes. The preferred alternative also includes increased opportunities for hunting, fishing, wildlife observation and photography, environmental education and interpretation. Alternative 2 would segment the Refuge into four general units and apply a management strategy to each unit. The units would follow a general gradient of management from low intensity (wilderness) to higher manipulation (managed impoundments and visitor use). Some high and low intensity management actions would occur in all units. Wildlife needs always receive priority when in conflict with visitor services.

For reasons presented above and below, and based on an evaluation of the information contained in the Environmental Assessment, we have determined that the action of adopting Alternative 2 as the management alternative for Seney NWR is not a major federal action which would significantly affect the quality of the human environment, within the meaning of Section 102 (2)(c) of the National Environmental Policy Act of 1969.

Additional Reasons:

1. Future management actions will have a neutral or positive impact on the local economy.
2. This action will not have an adverse impact on threatened or endangered species.

Supporting References:

Environmental Assessment
Comprehensive Conservation Plan

ACTING Regional Director — Date 2/12/09

Seney

National Wildlife Refuge

Environmental Assessment

ENVIRONMENTAL ASSESSMENT FOR IMPLEMENTATION OF COMPREHENSIVE CONSERVATION PLAN FOR SENEY NATIONAL WILDLIFE REFUGE

Abstract: The U.S. Fish and Wildlife Service is proposing to implement a Comprehensive Conservation Plan (CCP) for Seney National Wildlife Refuge (NWR) located in the Eastern Upper Peninsula of Michigan. This Environmental Assessment (EA) considers the biological, environmental and socioeconomic effects that implementing the CCP (which is the preferred alternative in this EA), or one of two alternatives, would have on the issues and concerns identified during the planning process. The purpose of the proposed action is to establish the management direction for the Refuge for the next 15 years. The management action will be achieved by implementing a detailed set of goals, objectives, and strategies described in the CCP.

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Chapter 1: Purpose and Need

1.1. Background

The purpose of the proposed action is to specify a management direction for Seney National Wildlife Refuge (NWR) for the next 15 years. This management direction will be described in detail through a set of goals, objectives, and strategies in a Comprehensive Conservation Plan (CCP).

Seney NWR was established in 1935 by Executive Order under the Migratory Bird Conservation Act for the protection and production of migratory birds and other wildlife. The Refuge encompasses approximately 95,238 acres; 25,150 acres comprise the Seney Wilderness Area in which is contained the Strangmoor Bog National Natural Landmark. While management for migratory birds is paramount, the Refuge provides habitat for a diversity of wildlife species, both migratory and non-migratory.

We prepared this Environmental Assessment (EA) using guidelines established under the National Environmental Policy Act (NEPA) of 1969. NEPA requires us to examine the effects of proposed actions on the natural and human environment. In the following sections we describe three alternatives for future Refuge management, the environmental consequences of each alternative, and our preferred management direction. We designed each alternative as a reasonable mix of fish and wildlife habitat prescriptions and wildlife-dependent recreational opportunities, and then we selected our preferred alternative based on their environmental consequences and their ability to achieve the Refuge purposes.

1.2. Purpose

The purpose of the proposed action is to specify management directions for Seney NWR over the coming 15 years. These management directions will be described in detail through a Comprehensive Conservation Plan (CCP).

1.3. Need for Action

The CCP ultimately derived from this EA will establish the overall management directions for Seney NWR over the next 15 years. The Refuge currently lacks long-term management plans. Instead, management is broadly guided at present by general Service policies, by interpreting the official purposes for which the Refuge was created, and by short-term, step-down management plans.

The action is needed because adequate, long-term management direction does not currently exist for the Refuge. Management is now guided by a dated Master Plan that was published in 1978 and by various general policies and short-term plans. Also, the action is needed to address current management issues and to satisfy the legislative mandates of the National Wildlife Refuge System Improvement Act of 1997, which requires the preparation of a CCP for all national wildlife refuges in the United States.

This EA will present three management alternatives for the future of Seney NWR. The preferred alternative will be selected based on its ability to meet identified goals. These goals may also be considered as the primary need for action. Goals for the Refuge were developed by the planning team and encompass all aspects of Refuge management, including wildlife management, habitat management, and public use. Each of the management alternatives described in this EA will be able to at least minimally achieve these goals.

1.3.1. Seney National Wildlife Refuge Goals

Goal 1: Wildlife – Protect, restore and maintain the diversity of wildlife native to the Eastern Upper Peninsula of Michigan with an emphasis on Service Resource Conservation Priority Species.

Goal 2: Habitat – Restore and enhance a natural landscape within the Refuge to emulate naturally functioning ecosystems within the Eastern Upper Peninsula of Michigan.

Goal 3: People – Provide visitors and the community with opportunities to experience quality, wildlife-dependent activities and to understand and appreciate the rich mosaic of wildlife and habitats found within the Eastern Upper Peninsula of Michigan.

1.4. Decision Framework

The Regional Director for the Midwest Region (Region 3 of the U.S Fish and Wildlife Service) will need to make two decisions based on this EA: (1) select an alternative for the Refuge, and (2) determine if the selected alternative is a major Federal action significantly affecting the quality of the human environment, thus requiring preparation of an Environmental Impact Statement (EIS). The planning team has recommended Alternative 2 ("Habitat Management Gradient") to the Regional Director. The CCP was developed for implementation based on this recommendation.

1.5. Authority, Legal Compliance, and Compatibility

The National Wildlife Refuge System includes federal lands managed primarily to provide habitat for a diversity of fish, wildlife and plant species. National wildlife refuges are established under many different authorities and funding sources for a variety of purposes. The purposes for Seney NWR were derived from the Migratory Bird Conservation Act of 1929. The appendices of the CCP contain a list of the key laws, orders and regulations that provide a framework for the proposed action.

1.6. Scoping of the Issues

The CCP planning process began in March 2006 with a meeting between Refuge staff and planners from the Service's regional office. The participants in this "internal scoping" exercise reviewed the Seney NWR vision statements and goals, existing baseline resource data, planning documents and other Refuge information. In addition, the group identified a preliminary list of issues, concerns and opportunities facing the Refuges that would need to be addressed in the CCP.

A list of required CCP elements such as maps, photos, and GIS data layers was also developed at this meeting and during subsequent e-mail and telephone communications. Concurrently, the group studied federal and state mandates plus applicable local ordinances, regulations, and plans for their relevance to this planning effort. Finally, the group agreed to a process and sequence for obtaining public input and a tentative schedule for completion of the CCP. A Public Involvement Plan was drafted and distributed to participants immediately after the meeting.

Initial public scoping for the Seney NWR CCP began in August 2006 with an open house event held at the Refuge Visitor Center. Turn-out was light, with approximately 15 people attending despite widespread notification in area newspapers and local television. Comment forms were available at the event and made available at the headquarters and visitor center during the following weeks.

Those interested in making written comments had until October 2006 to submit them. Comments could be sent by U.S. mail, e-mail, or via the Seney planning website on the Internet. Approximately 30 comment forms and other written comments were submitted to the Refuge during the scoping process.

On August 28-30, 2006, a Biology Program Review was held to obtain detailed input on the issues and opportunities concerning the habitat and biological monitoring program at the Refuge. Thirty people, representing Michigan DNR, U.S. Geological Survey biologists, Refuge staff, conservation organizations, and university researchers working on the Refuge attended these discussions.

During July 2006, two agency Visitor Service Specialists met with Refuge staff to review the Visitor Service program. The review team toured the Refuge facilities and made a number of recommendations for improving the quality of visitor experiences, environmental education and outreach.

Both of these program reviews were scheduled to coincide with the CCP scoping process and to help formulate objectives and strategies in the plan.

1.6.1. Seney NWR Issues, Concerns and Opportunities

The following list of issue topics was generated by internal Refuge scoping, the public open house sessions and program reviews.

Habitat Management:

- Upland forest habitat restoration
- Invasive plant species management
- Prescribed burning
- Stream restoration
- Wilderness management
- Role of the Refuge in the landscape

Aquatic Resources:

- Protection of waterbodies from invasive species
- Predator and native fish populations

Wildlife Management:

- Wildlife research
- Carrying capacity for Trust species

Visitor Services:

- White-tailed deer hunting
- Upland game hunting
- Fishing
- Visitor capacity
- Outreach
- Access
- A developed picnic area
- Horseback riding and a snowmobile route

Public Comments on the Draft CCP

This EA was prepared by a team consisting of Refuge and Regional Office staff and was published as Appendix A of the the Seney NWR Draft CCP. The CCP was published in two phases and in accordance with the National Environmental Policy Act (NEPA). The Environmental Assessment presented a range of alternatives for future management and identified the preferred alternative. The alternative that was selected has become the basis of the Final CCP. That document will guide management on the Refuge over the coming 15-year period, and it will guide the development of more detailed step-down management plans for specific resource areas. The CCP will also underpin the annual budgeting process through competitive submissions for funding at the national level. Most importantly, it lays out the general approach to managing habitat, wildlife, and people at Seney Refuge that will direct day-to-day decision-making and actions.

The Draft CCP/EA was released for public review on September 3, 2008; the comment period lasted 35 days and ended October 8, 2008. During the comment period the Refuge hosted an open house event to obtain comments. By the conclusion of the comment period we received 14 written responses by organizations and individuals. In response to these comments we made a number of minor edits to the final document.

All respondents who expressed an opinion endorsed the selection of Alternative 2 and the general approach of the proposed future management of the Refuge. In fact, many comments emphasized the shortcomings of the Alternative 3, the alternate "action" scenario that was not selected for implementation, in favor of the preferred alternative. We were able to incorporate all of the specific technical and grammatical changes suggested in the written comments.

Chapter 2: Description of the Alternatives

2.1. Formulation of Alternatives

Based on the issues, concerns and opportunities we heard during the scoping process, the Planning Team developed three alternative management scenarios that could be used at Seney NWR. These alternatives and the consequences of adopting each are presented in the Environmental Assessment. Each of the alternatives is designed to fit within the scope of operations of similar-sized refuges in the Midwest. The alternatives were formulated under the assumption that staffing and budgets would remain constant or grow slowly throughout the life of the Plan.

The three management alternatives were developed to address most of the issues, concerns, and opportunities identified during the CCP planning process. Specific impacts of implementing each alternative will be examined in five broad issue categories:

Habitat Management: What is an appropriate mix of habitats within this region in the 21st century, and what level of habitat restoration and maintenance is feasible given the constraints of funding and ecological succession? What is the role of the Refuge in the surrounding landscape? Do we need to adjust habitat restoration measures such as prescribed burning and management of invasive plant species?

Aquatic Resources: How can the Refuge best protect rivers, streams and impoundments from invasive aquatic species? Do Refuge waters support an appropriate number of predator and native fish populations?

Wildlife Management: Should the Refuge adjust the quantity or quality of on-site wildlife research projects? What is the carrying capacity for trust species such as Trumpeter Swans and Common Loons?

Water Management: Landscape and Watershed: What changes in the surrounding landscape threaten Refuge resources and how can we mitigate the impacts?

Visitor Services: Should additional wildlife-dependent recreation opportunities be made available or are the existing opportunities for wildlife observation and photography, hunting, environmental education and interpretation adequate?

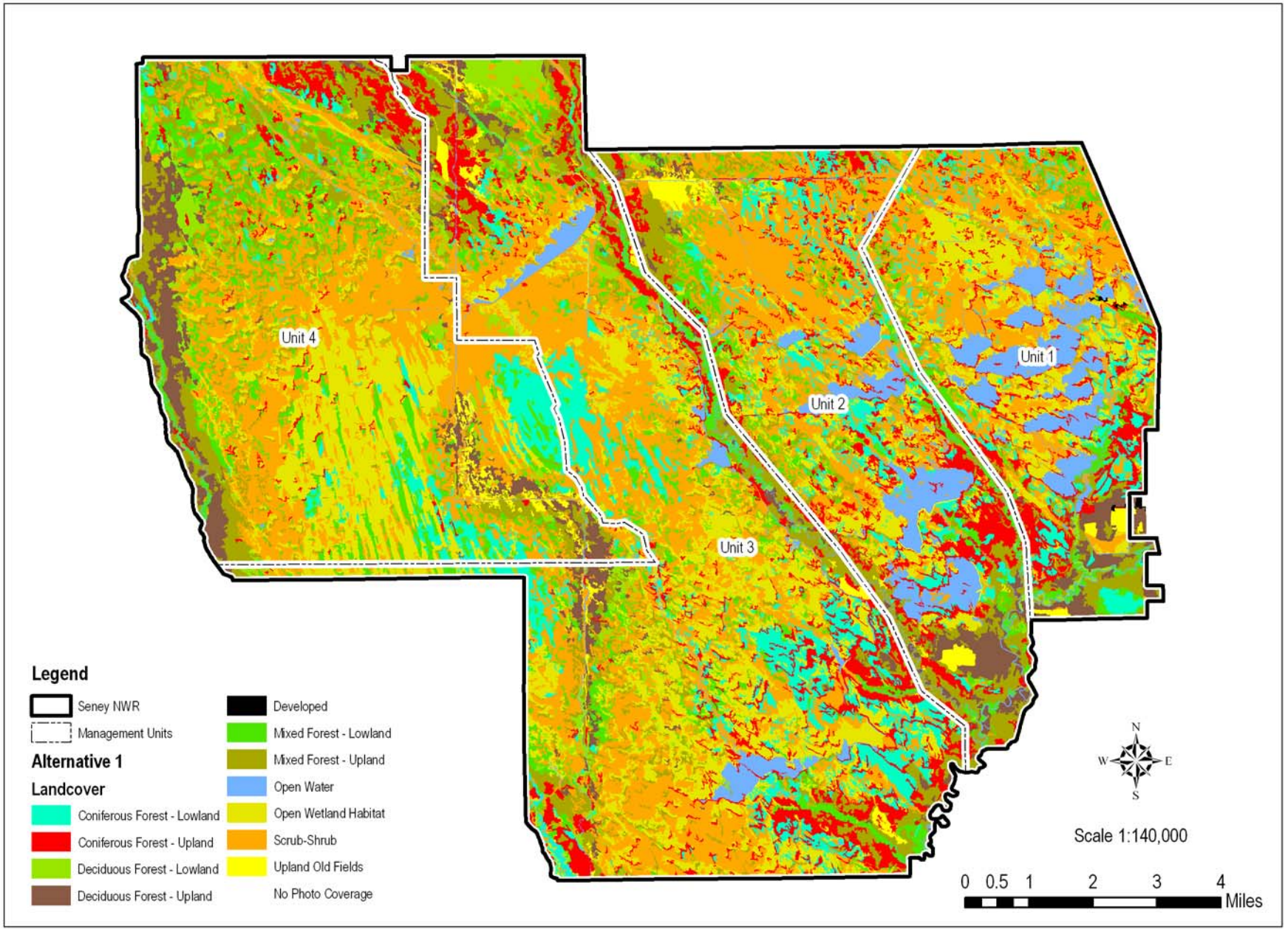
Access: Should the Refuge provide addition access opportunities such as a developed picnic area, horseback riding or a managed snowmobile route?

2.2. Management Alternatives

2.2.1. Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)

The current management direction of Seney NWR would be maintained under this alternative. For NEPA purposes, this is referred to as the "No Action" alternative, a misnomer as some changes will occur over the next 15 years. Management includes conservation, restoration and preservation but occurs opportunistically as budgets allow. Some programs, especially environmental education and outreach, would see improvements only if budgets increase in the future. Figure 1 illustrates the current habitat and landcover of Seney NWR.

Figure 1: Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration and Preservation (No Action), Seney NWR



2.2.2. Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation-Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3 and Wilderness Preservation (Unit 4))

Alternative 2 would segment the Refuge into four general units and apply a management strategy to each unit. The units would follow a general gradient of management from low intensity (wilderness) to higher manipulation (managed impoundments and visitor use). Some high and low intensity management actions would occur in all units except the designated Wilderness (Unit 4). Wildlife needs always receive priority when in conflict with visitor services.

Unit 1: Conservation – This unit contains 14 managed pools, the Visitor Center/Headquarters compound, the Marshland Wildlife Drive and the Fishing Loop. Habitat management would maintain areas for species that the visiting public enjoys, including Trumpeter Swans, Common Loons, wading birds and game fish. Upland habitats would be managed to provide for a diversity of native cover types.

Unit 2: Conservation and Restoration – This unit contains four managed pools, significant mixed pine uplands, and two large old field openings (Diversion Farm and Chicago Farm). The focus of management on this unit would include maintaining seasonal rotation of water levels in the managed pools, natural regeneration of upland forests, and the gradual restoration of the Chicago Farm field to a forested habitat.

Unit 3: Restoration and Preservation – Unit 3 is the largest of the three non-wilderness units. It contains natural and forested wetlands but only three managed pools. A large opening, the Walsh Farms old field, is found on the north end of this unit. Management efforts on this unit would include allowing a greater percentage of natural processes, such as beaver-constructed wetlands, wildfires, and seasonal floods to shape the landscape.

Unit 4: Wilderness: The Federally-designated wilderness would be managed to maintain natural habitats and processes according to the existing Wilderness Management Plan. Visitor and Refuge staff entry would be limited to foot traffic only. Active habitat manipulation would only occur in emergency situations and the minimum tools necessary would used to complete tasks.

Habitat management emphasis for each unit would be defined by specific strategies in Chapter 4 and are illustrated in Figure 2.

2.2.3. Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3), and Wilderness Preservation (Unit 4)

Alternative 3 would include the Refuge striving to manage its forests and water to allow unfettered succession to take place. Dynamic events such as windstorms, insect and tree disease outbreaks, flooding and wildfire would play a more substantial role in shaping habitats. Natural events may lead to limitation or closure of some exiting visitor use areas or services. However, crucial Refuge infrastructure such as roads and dikes would be protected from or repaired after destructive circumstances.

Under this alternative, it would be difficult to set specific acreage goals for some habitat types as natural forces would guide coverage. Refuge staff would consult soil and historic landcover maps and use them as a guide to evaluate results.

The main differences between Alternative 3 and the other alternatives is that ditches and dikes and water control structures would be filled in or removed in Management Units 2 and 3 and prescribed fire would not be used. This would result in an increase of acres of scrub-shrub. Deciduous forest would also increase in both Units 2 and 3 by eliminating all old fields on hardwood-favorable soils (Figure 3).

2.2.4. Alternative(s) Considered But Not Developed

The CCP planning team also considered the alternative of returning the Refuge to its original, presettlement condition everywhere. Attempting to restore Seney NWR's pre-settlement condition would mean restoring it to the state it was in prior to large-scale logging, settlement and draining by Euro-American homesteaders beginning in the late

Figure 2: Alternative 2: Habitat Management Gradient of Conservation Emphasis (Unit 1), to Conservation-Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3), Seney NWR

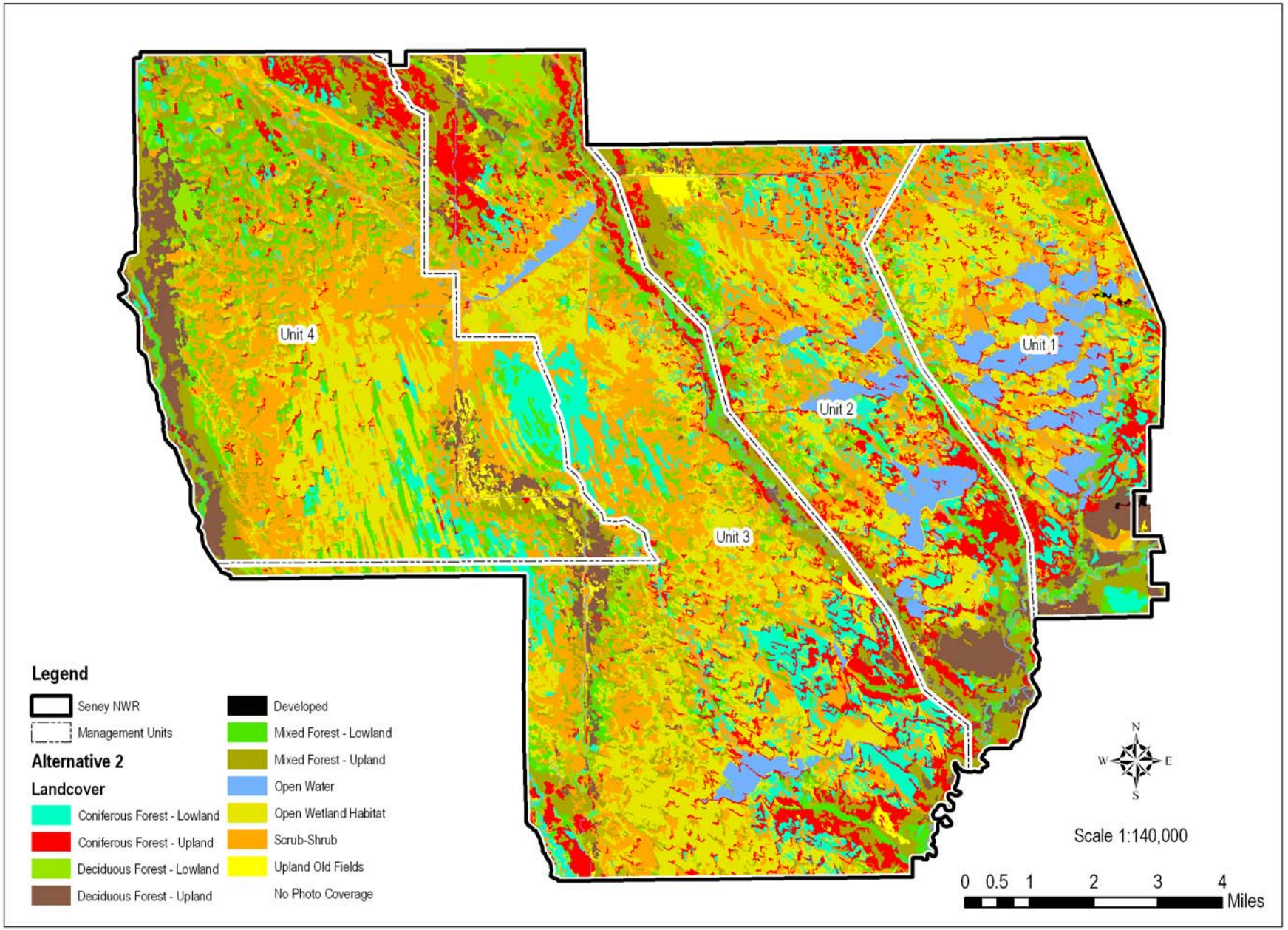
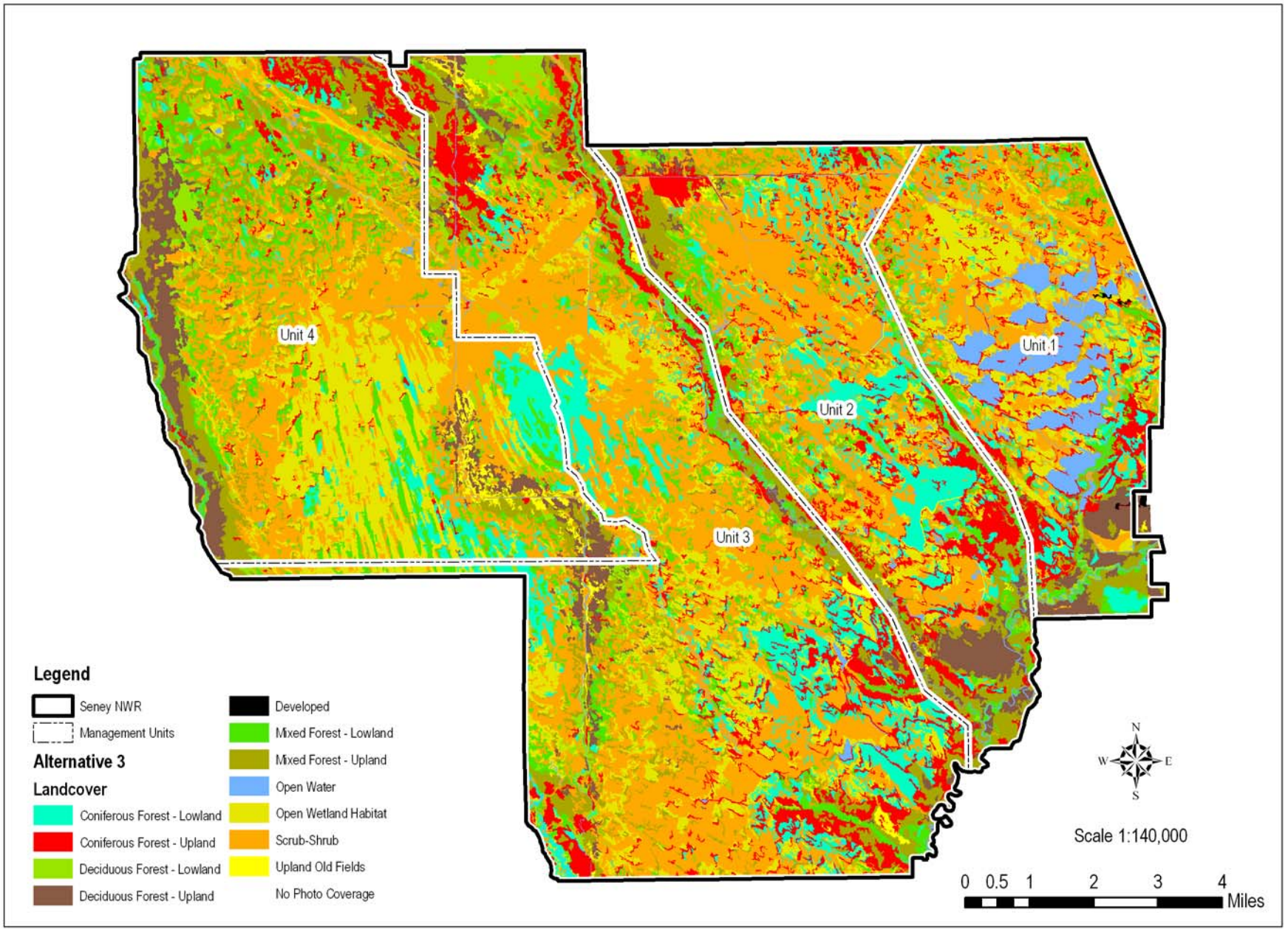


Figure 3: Alternative 3: Active Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3), Seney NWR



1800's and continuing into the early 20th century. At that time, according to historical accounts, the lands that now comprise the Refuge were covered by sedge meadows, mixed pine stands, and scattered deciduous forests. To implement this alternative and meet its goals, all impoundments and dikes would have to be removed and ditches filled in.

The planning team dismissed this alternative on the grounds that it would be contrary to the established purposes of Seney NWR "…as a refuge and breeding ground for migratory birds and other wildlife" (Executive Order 7246, dated December 10, 1935) and "… for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" (16 U.S.C. 715d, Migratory Bird Conservation Act). While reverting to pre-settlement conditions would undoubtedly benefit some wildlife, probably those species that favor forest and shrub/scrub, it would not allow the Refuge to meet its primary obligation to serve as a breeding ground for migratory birds. This alternative would be very costly, at least at first, and would severely disrupt long-established management institutions and infrastructure in Upper Peninsula Michigan.

Table 1: Comparison of Objectives by Management Alternative

Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	**Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)**	**Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)**
Goal 1: Wildlife – Protect, restore and maintain a natural diversity of wildlife native to the Eastern Upper Peninsula of Michigan with an emphasis on Service Resource Conservation Priority Species.		
Objective 1.1: Trust Resources: Implement a monitoring program to track the presence, abundance, population trends, and/or habitat associations of select Trust Resources, including but not limited to Region 3 Conservation Priority Species, habitats, communities and ecosystems (e.g., patterned fen in Strangmoor Bog National Natural Landmark). As the need arises, implement research to answer questions that have been raised regarding the management of Trust Resources.	**Objective 1.1: Trust Resources:** Implement a monitoring program to track the presence, abundance, population trends, and/or habitat associations of select Trust Resources, including but not limited to Region 3 Conservation Priority Species, habitats, communities and ecosystems (e.g., patterned fen in Strangmoor Bog National Natural Landmark). As the need arises, implement research to answer questions that have been raised regarding the management of Trust Resources.	**Objective 1.1: Trust Resources:** Implement a monitoring program to track the presence, abundance, population trends, and/or habitat associations of select Trust Resources, including but not limited to Region 3 Conservation Priority Species, habitats, communities and ecosystems (e.g., patterned fen in Strangmoor Bog National Natural Landmark). As the need arises, implement research to answer questions that have been raised regarding the management of Trust Resources.
Strategies: ■ Conduct annual review of monitoring plan to assess trends of Trust Resources and determine if there are any priorities for research. ■ If a Trust Resource research issue has been identified, initiate research at the station level. If the issue goes beyond the boundary of the Refuge, take lead role in contacting other federal, state, and NGO partners and develop a broader scale research project to solve those issues.	*Strategies:* ■ Follow the monitoring plan. ■ Conduct annual review of monitoring plan to assess trends of Trust Resources and determine if there are any priorities for research. ■ If a Trust Resource research issue has been identified, initiate research at the station level. If the issue goes beyond the boundary of the Refuge, take lead role in contacting other federal, state, and NGO partners and develop a broader scale research project to solve those issues.	*Strategies:* ■ Conduct annual review of monitoring plan to assess trends of Trust Resources and determine if there are any priorities for research. ■ If a Trust Resource research issue has been identified, initiate research at the station level. If the issue goes beyond the boundary of the Refuge, take lead role in contacting other federal, state, and NGO partners and develop a broader scale research project to solve those issues.

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Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	**Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)**	**Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)**
Objective 1.2. Wildlife, Habitat, Community and Ecosystem Research: Promote applied research aimed at answering wildlife, habitat, community, and ecosystem-based questions without compromising wildlife, visitor, and Wilderness values.	**Objective 1.2. Wildlife, Habitat, Community and Ecosystem Research:** Promote applied research aimed at answering wildlife, habitat, community, and ecosystem-based questions without compromising wildlife, visitor, and Wilderness values.	**Objective 1.2. Wildlife, Habitat, Community and Ecosystem Research:** Promote applied research aimed at answering wildlife, habitat, community, and ecosystem-based questions without compromising wildlife, visitor, and Wilderness values.
Strategies: ■ Promote applied research and initiate dialogue with federal and state agencies, universities, and NGOs to answer management questions. ■ Seek external research funding through partnerships with others outside of the Service, where and when possible. ■ Communicate research findings with the broader conservation community through peer-reviewed and other publications, lectures, and other outreach activities. ■ Propose the development of the Seney NWR as a Land Management Research and Demonstration Area that would help the Refuge to become a leader in northern forest and wetland research and conservation and would enable the sharing of that knowledge with others to benefit both private and publicly-owned lands. ■ Inform visitors of research findings and explain their importance for planning and management at Seney NWR. ■ Prioritize research on trust species, habitats, communities, and ecosystems of conservation priority. ■ Develop a better understanding as to how Refuge ecosystems function on a landscape and regional scale.	*Strategies:* ■ Monitor and assess research annually, including access for researchers and the location, duration, and impacts of research. ■ Promote applied research and initiate dialogue with federal and state agencies, universities, and NGOs to answer management questions. ■ Seek external research funding through partnerships with others outside of the Service, where and when possible. ■ Propose the development of the Seney NWR as a Land Management Research and Demonstration Area. This would help the Refuge to become a leader in northern forest and wetland research and conservation and would enable the sharing of that knowledge with others to benefit both private and publicly-owned lands. ■ Communicate research findings with the broader conservation community through peer-reviewed and other publications, lectures, and other outreach activities. ■ Inform visitors of research findings and explain their importance for planning and management at Seney NWR. ■ Prioritize research on trust species, habitats, communities, and ecosystems of conservation priority. ■ Develop a better understanding as to how Refuge ecosystems function on a landscape and regional scale, including the effects of future climate change.	*Strategies:* ■ Monitor and assess research annually, including access for researchers and the location, duration, and impacts of research. ■ Promote applied research and initiate dialogue with federal and state agencies, universities, and NGOs to answer management questions. ■ Seek external research funding through partnerships with others outside of the Service, where and when possible. ■ Propose the development of the Seney NWR as a Land Management Research and Demonstration Area that would help the Refuge to become a leader in northern forest and wetland research and conservation and would enable the sharing of that knowledge with others to benefit both private and publicly-owned lands. ■ Communicate research findings with the broader conservation community through peer-reviewed and other publications, lectures, and other outreach activities. ■ Inform visitors of research findings and explain their importance for planning and management at Seney NWR. ■ Prioritize research on trust species, habitats, communities, and ecosystems of conservation priority. ■ Develop a better understanding as to how Refuge ecosystems function on a landscape and regional scale.

Table 1: Comparison of Objectives by Management Alternative

Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	**Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)**	**Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)**
Goal 2: Habitat – Restore and enhance a natural landscape within the Refuge to emulate naturally functioning ecosystems within the Eastern Upper Peninsula of Michigan.		
Objective 2.1: Scrub-Shrub 1: Maintain current condition of 28,954 acres for the diversity of species present, including R3 priorities American Woodcock, Black-billed Cuckoo.	**Objective 2.1: Scrub-Shrub 1:** Reduce (3,541 acres) through Rx fire after adding 122 acres by eliminating Spur Pools and Delta Creek Pool. Acres: 25,535 (% Change: -12%)	**Objective 2.1: Scrub-Shrub 1:** Increase (3,554 acres) by eliminating pool areas in Units 2 and 3 (1,297 acres) and by further area (2,257 acres) due to no Rx fire in open wetlands in these units (Fire Use only). Acres: 32,508 (% Change: +12%)
Strategies: ■ Implement annual burn plans to accomplish target acres.	*Strategies:* ■ Modify annual burn plans to accomplish target acres. ■ Add 122 acres by eliminating Spur Pools and Delta Creek Pool. ■ Unit 1 = reduce 1,002 acres (north end of Unit) ■ Unit 2 = reduce 886 acres (A-2 Pool area) ■ Unit 3 = reduce by 1,653 acres (Marsh Creek Pool and C-3 Pool areas)	*Strategies:* ■ Modify annual burn plans to accomplish target acres. ■ Remove dikes and water control structures on pools.
Objective 2.2: Open Wetlands: Maintain current condition of 16,617 acres for the diversity of species present, including R3 priorities American Bittern, Le Conte's Sparrow, Northern Harrier, Sedge Wren, Yellow Rail.	**Objective 2.2: Open Wetlands:** Increase 3,847 acres through Rx fire in scrub-shrub (3,541 acres) and T-2 East Pool (306 acres). Acres: 20,464 (% Change: +23%)	**Objective 2.2: Open Wetlands:** Estimated loss of 2,257 acres due to no Rx fire in open wetlands in Units 2 and 3 (Fire Use only) Acres: 14,416 (% Change: -13%)
Strategies: ■ Continue research that promotes the understanding of how this habitat type functions. Parameters to be measured should include hydrology (surface and subsurface water flow), soils, and vegetation response to management actions. ■ Use prescribed and natural fire, where and when appropriate.	*Strategies:* ■ Continue research that promotes the understanding of how this habitat type functions. Parameters to be measured should include hydrology (surface and subsurface water flow), soils, and vegetation response to management actions. ■ Use prescribed and natural fire, where and when appropriate. ■ In Unit 2, add 306 acres in T-2 East Pool. ■ Continue monitoring Region 3 Conservation Priority Species response before, during and after management actions.	*Strategies:* Same as Alternative 1, but without prescribed fire.

Table 1: Comparison of Objectives by Management Alternative

Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)	Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)
Objective 2.3: Mixed Forest – Uplands: Maintain diversity of seral stages and (where and when possible) restore historic composition and structure on current 11,396 acres for the diversity of species present, including R3 priorities Black-throated Blue Warbler, Canada Warbler, Connecticut Warbler, gray wolf, Northern Goshawk.	**Objective 2.3: Mixed Forest – Uplands:** Same as Alternative 1	**Objective 2.3: Mixed Forest – Uplands:** Same as Alternative 1
Strategies: ■ Understand the natural disturbance regime inherent to the forest types within this broad habitat and work within the confines of seral pathways dictated by soil, climate, and hydrology. ■ Promote stands dominated by early seral stages at the Refuge periphery. ■ Promote stands dominated of later seral stages of mixed forest in the Refuge interior. ■ In managed stands, promote increased compositional and structural heterogeneity, including large-diameter coarse woody debris and snags. ■ Use management techniques that emulate natural ecological disturbances (e.g., single tree mortality for multi-aged stands, stand (cohort) replacement for even-aged stands). ■ Use commercial and non-commercial mechanical treatments, where and when appropriate. ■ Use prescribed and natural fire, where and when appropriate. ■ Ensure white-tailed deer populations do not negatively affect the habitat. ■ Manage invasive species aggressively.	*Strategies:* Same as Alternative 1	*Strategies:* Same as Alternative 1

Table 1: Comparison of Objectives by Management Alternative

Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)	Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)
Objective 2.4: Coniferous Forest – Uplands: Maintain diversity of seral stages and (where and when possible) restore historic composition and structure on current 8,857 acres for the diversity of species present, including R3 priorities Cape May Warbler, gray wolf, Northern Flicker, Olive-sided Flycatcher, Whip-poor-will.	**Objective 2.4: Coniferous Forest – Uplands:** Increase 95 acres from West Walsh Farm (56 acres) and East Walsh Farm (39 acres) eliminated. Acres: 8,952 (% Change: +1%)	**Objective 2.4: Coniferous Forest – Uplands:** Increase 312 acres from Walsh Farms (95 acres) and Diversion Farm (217 acres). Acres: 9,168 (% Change: +4%)
Strategies: ■ Understand and emulate the natural disturbance regime inherent to the forest types within this broad habitat type and work within the confines of seral pathways dictated by soil, climate, and hydrology. ■ Increase 95 acres from West Walsh Farm and East Walsh Farm. ■ Promote stands dominated by early seral stages at the Refuge periphery. ■ Promote stands dominated by later seral stages in the Refuge interior. ■ In managed stands, promote increased compositional and structural heterogeneity, including large-diameter coarse woody debris and snags. ■ Use management techniques that emulate natural ecological disturbances (e.g., single tree mortality for multi-aged stands, stand (cohort) replacement for even-aged stands in other instances). ■ Use commercial and non-commercial mechanical treatments, where and when appropriate. ■ Use prescribed and natural fire, where and when appropriate. ■ Ensure white-tailed deer populations do not negatively affect the habitat. ■ Manage invasive species aggressively.	*Strategies:* Same as Alternative 1	*Strategies:* Same as Alternative 1

Table 1: Comparison of Objectives by Management Alternative

Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)	Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)
Objective 2.5: Mixed Forest – Lowlands: Maintain diversity of seral stages and (where and when possible) restore historic composition and structure on current 8,221 acres for the diversity of species present, including R3 priorities Cape may Warbler, Canada Warbler, gray wolf, Olive-sided Flycatcher.	**Objective 2.5: Mixed Forest – Lowlands:** Same as Alternative 1	**Objective 2.5: Mixed Forest – Lowlands:** Same as Alternative 1
Strategies: ■ Understand and emulate the natural disturbance regime inherent to the forest types within this broad habitat type and work within the confines of seral pathways dictated by soil, climate, and hydrology. ■ In managed stands, promote increased compositional and structural heterogeneity, including large-diameter coarse woody debris and snags. ■ Use management techniques that emulate natural ecological disturbances (e.g., single tree mortality in some instances and stand replacement in other instances). ■ Use commercial and non-commercial mechanical treatments, where and when appropriate. ■ Use prescribed and natural fire, where and when appropriate. ■ Ensure white-tailed deer populations do not negatively affect the habitat, ■ Manage invasive species aggressively (see below).	*Strategies:* Same as Alternative 1	*Strategies:* Same as Alternative 1

Table 1: Comparison of Objectives by Management Alternative

Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)	Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)
Objective 2.6: Coniferous Forest-Lowlands: Maintain diversity of seral stages and (where and when possible) restore historic composition and structure of current 7,825 acres for the diversity of species present, including R3 priorities Cape May Warbler, gray wolf, Northern Flicker, Olive-sided Flycatcher	**Objective 2.6: Coniferous Forest-Lowlands:** Same as Alternative 1	**Objective 2.6: Coniferous Forest-Lowlands:** Increase 781 acres by eliminating M2 Pool (462 acres) and C2 Pool (319 acres). Acres: 8,605 (% Change: +10%)
Strategies: ■ Understand and emulate the natural disturbance regime inherent to the forest types within this broad habitat type and work within the confines of seral pathways dictated by soil, climate, and hydrology. ■ In managed stands, promote increased compositional and structural heterogeneity, including large-diameter coarse woody debris and snags. ■ Use management techniques that emulate natural ecological disturbances (e.g., single tree mortality in some instances and stand replacement in other instances). ■ Use commercial and non-commercial mechanical treatments, where and when appropriate. ■ Use prescribed and natural fire, where and when appropriate. ■ Restore hydrology, where adversely impacted. ■ Ensure white-tailed deer populations do not negatively affect the habitat. ■ Manage invasive species aggressively.	*Strategies:* Same as Alternative 1	*Strategies:* Same as Alternative 1

Table 1: Comparison of Objectives by Management Alternative

Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)	Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)
Objective 2.7: Open Water: Maintain current 27 managed pools (5,104 acres) for the diversity of species present, including R3 priorities Bald Eagle, Common Loon, Trumpeter Swan, Wood Duck.	**Objective 2.7: Open Water:** Reduce 428 acres by eliminating T-2 East Pool, Spur Pools, and Delta Creek. Acres: 4,676 (% Change: -8%)	**Objective 2.7: Open Water:** Reduce by eliminating all pools in Units 2 and 3 (2,078 acres). Acres: 2,975 (% Change: -42%)
Strategies: ■ Continue managing the pools in accordance with the 1993 Long Range Marsh and Water Management Plan until CCP has been implemented. ■ Upon CCP implementation, develop new Marsh and Water Management Plan with new goals and objectives that support the CCP and mission of the Refuge. ■ Continue yearly monitoring of waterbird use of the pools. ■ Continue monitoring fisheries of the pools every 3 – 5 years. ■ Develop fish population data (species, age class, etc) for each pool. ■ Continue monitoring aquatic vegetation every 5 years.	*Strategies:* Same as Alternative 1 plus: ■ Remove the dikes at Spur Pools, Delta Creek and T-2 (East). Conduct appropriate biotic and abiotic monitoring, before, during and after these projects. ■ Maintain all remaining water control infrastructure.	*Strategies:* Same as Alternative 1 plus: ■ Eliminate all pools in Units 2 and 3. Conduct appropriate biotic and abiotic monitoring, before, during and after these projects.

Table 1: Comparison of Objectives by Management Alternative

Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)	Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)
Objective 2.8: Deciduous Forest – Uplands: Maintain diversity of seral stages and, when possible, restore historic composition and structure on 4,372 acres for the diversity of species present, including R3 priorities Black-throated Blue Warbler, gray wolf, Northern Goshawk.	**Objective 2.8: Deciduous Forest – Uplands:** Increase 232 acres by eliminating all old fields on hardwood soils. Smith = 22 acres, SHQ=64 acres, Misc. = 10 acres, Conlon=39 acres, Chicago=97 acres Acres: 4,600 (% Change: +5%)	**Objective 2.8: Deciduous Forest – Uplands:** Increase 232 acres by eliminating all old fields on hardwood soils.. Acres: 4,600 (% Change: +5%)
Strategies: ■ Understand the natural disturbance regime inherent to the forest types within this broad habitat type and work within the confines of seral pathways dictated by soil, climate, and hydrology. ■ In managed stands, promote increased compositional and structural heterogeneity, including large-diameter coarse woody debris and snags. ■ Promote early seral stages dominated by aspen at the Refuge perimeter. ■ Stands with late seral characteristics should be conserved wherever they exist, and restored in the interior of the Refuge. ■ Enhance representation of more uncommon species such as yellow birch and eastern hemlock and conserve as much American beech as possible. ■ Use management techniques that emulate natural ecological disturbances (e.g., single tree mortality in late seral stands). ■ Use commercial and non-commercial mechanical treatments, where and when appropriate. ■ Ensure white-tailed deer populations do not negatively affect the habitat. ■ Manage invasive species aggressively.	*Strategies:* Same as Alternative 1, plus: ■ Eliminate the following old fields, either passively by allowing forest succession to occur or promote forest succession by plantings: Smith Field (22 acres), Sub-Headquarters Field (64 acres), Conlon Farm (39 acres), Chicago Farm (97 acres), and miscellaneous forest openings (10 acres). ■ Continue to monitor the spread of beech bark disease and treatment effectiveness.	*Strategies:* Same as Alternative 2

Table 1: Comparison of Objectives by Management Alternative

Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)	Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)
Objective 2.9: Deciduous Forest-Lowlands: Maintain diversity of seral stages and (where and when possible) restore historic composition and structure on current 2,515 acres for the diversity of species present, including R3 priorities Black-throated Blue Warbler, gray wolf, Northern Goshawk.	**Objective 2.9: Deciduous Forest-Lowlands:** Same as Alternative 1	**Objective 2.9: Deciduous Forest-Lowlands:** Same as Alternative 1
Strategies: ■ Understand and emulate the natural disturbance regime and work within the confines of seral pathways dictated by soil, climate, and hydrology. ■ Ensure white-tailed deer populations do not negatively affect the habitat. ■ Manage invasive species aggressively.	*Strategies:* Same as Alternative 1	*Strategies:* Same as Alternative 1
Objective 2.10: Upland Old Fields and Openland: Maintain current condition of 1,302 acres for the diversity of species present, including R3 priorities Bobolink, Upland Sandpiper, Northern Harrier.	**Objective 2.10: Upland Old Fields and Openland:** Reduce 327 acres by area in all fields except Diversion Farm. Acres: 979 (% Change: -25%)	**Objective 2.10: Upland Old Fields and Openland:** Reduce 544 acres by area in all fields. Acres: 768 (% Change: -41%)
Strategies: ■ Use a combination of tools including prescribed fire and late-season mowing to maintain open areas. ■ Ensure white-tailed deer populations do not negatively affect the habitat. ■ Manage invasive species aggressively (see below).	*Strategies:* ■ Conserve Diversion Farm using a combination of tools, including prescribed fire and late-season mowing. ■ Elsewhere, restore fields to upland deciduous forest stands (on a case-by-case basis) either passively through natural secondary succession or through active management that could include planting of seedlings. ■ Ensure white-tailed deer populations do not negatively affect the habitat ■ Manage invasive species aggressively.	*Strategies:* ■ Same as Alternative 2 except acreage reduction can be taken from Diversion Farm opening.

Table 1: Comparison of Objectives by Management Alternative

Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)	Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)
Objective 2.11: Invasive Plant Species Control: For duration of CCP, prevent infestations of invasive plant species from spreading beyond 2007 levels.	**Objective 2.11: Invasive Plant Species Control:** By 2020, reduce invasive plant species locations by 50 percent from 2007 levels and eliminate new infestations as they occur.	**Objective 2.11: Invasive Plant Species Control:** Same as Alternative 1
Strategies: ■ When available, use biological control as a preferred strategy. ■ Use chemical and mechanical means to control infestations in cases where biological control techniques have not been developed. ■ Fire can be effective in controlling some invasive plant species. ■ Monitor the infestations and effectiveness of control measures through field work.	*Strategies:* ■ Document the location and size of targeted invasive populations. ■ Use chemical, mechanical, prescribed and natural fire (where appropriate) as a means to manage infestations in cases where biological control techniques have not been developed. ■ Monitor the infestations and effectiveness of control measures through field work. ■ When available, use biological control as a preferred strategy.	*Strategies:* ■ Same as Alternative 1
Goal 3: People – Provide visitors and the community with opportunities to experience quality, wildlife-dependent activities and to understand and appreciate the rich mosaic of wildlife and habitats found within the Eastern Upper Peninsula of Michigan.		
Objective 3.1: Hunting: Provide 200 days of quality upland hunting experiences per year with less than 10 complaints annually.	**Objective 3.1: Hunting:** Same as Alternative 1	**Objective 3.1: Hunting:** Same as Alternative 1
Strategies: ■ Continue annual small game hunting opportunities (Ruffed Grouse, American Woodcock, snowshoe hare) within framework of Michigan DNR and Refuge restrictions. ■ Continue annual firearms and archery White-tailed deer and Black bear hunting opportunities (within framework of Michigan DNR and Refuge restrictions). ■ Continue to provide camping opportunities and open roads during white-tailed deer firearms season.	*Strategies:* Same as Alternative 1 plus: ■ Eliminate toxic shot for all species except white-tailed deer and black bear. ■ Conduct count to determine numbers of Ruffed Grouse, American Woodcock and snowshoe hare hunters. ■ Develop operational definition of success and measures for hunting through a survey of hunter satisfaction.	*Strategies:* Same as Alternative 2

Table 1: Comparison of Objectives by Management Alternative

Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)	Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)
Objective 3.2: Fishing: Provide 125 days of quality fishing experiences per year with less than 10 complaints annually.	**Objective 3.2: Fishing:** Provide 125 days of quality fishing experiences per year with less than 10 complaints annually.	**Objective 3.2: Fishing:** Same as Alternative 2
Strategies: ■ Maintain accessible fishing platform. ■ Maintain roads for fishing route. ■ Maintain fish line disposal containers. ■ Continue Children's Fishing Day event.	*Strategies:* Same as Alternative 1 plus: ■ Provide fishing platform at Wigwam access area. ■ Conduct count to determine number of anglers. ■ Develop operational definition of success and measures for hunting through a survey of hunter satisfaction.	*Strategies:* Same as Alternative 2
Objective 3.3: Wildlife Observation and Photography: Provide year-round opportunities for at least 25,000 visitors annually to observe and photograph wildlife and habitat.	**Objective 3.3: Wildlife Observation and Photography:** Same as Alternative 1	**Objective 3.3: Wildlife Observation and Photography:** Same as Alternative 1
Strategies: ■ Continue annual amateur photo contest ■ Maintain 7-mile Marshland Wildlife Drive. ■ Maintain 1.4-mile hiking trail. ■ Maintain 10 miles of groomed ski trails. ■ Maintain 6 viewing platforms with scopes and interpretive panels.	*Strategies:* Same as Alternative 1 plus: ■ Provide viewing platform at Wigwams access area. ■ Provide guided photo opportunities and/or workshops. ■ Increase facilities (i.e. trails, observation platforms) at Whitefish Point. ■ Develop operational definition of success and measures for wildlife observation and photography through a survey of visitor satisfaction.	*Strategies:* Same as Alternative 2

Table 1: Comparison of Objectives by Management Alternative

Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)	Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)
Objective 3.4: Environmental Education and Interpretation: Annually provide no less than 400 quality EE experiences and 700 quality Interpretive experiences per year to promote an understanding of the rich mosaic of wildlife and habitats found within the eastern U.P..	**Objective 3.4: Environmental Education and Interpretation:** Same as Alternative 1	**Objective 3.4: Environmental Education and Interpretation:** Same as Alternative 1
Strategies ■ Provide facilities and programs for EE activities for area schools, universities, community groups, and other Refuge visitors, with a curriculum-based message that emphasizes the importance of habitat diversity, natural patterns and processes, and wildlife management. ■ Increase use of education trunks. ■ Continue to provide interpretive programs, events, festivals, tours for Refuge visitors, with a message that emphasizes habitat diversity, natural patterns and processes, and wildlife management. ■ Conduct at least 2 special events, 12-24 guided auto tours, 12-24 programs on-site to interpret the Refuge, its habitat diversity, natural patterns and processes, and wildlife management. ■ Maintain interpretive signs/panels on nature trail and viewing platforms ■ Provide and maintain 14 kiosks that orient visitors and help interpret habitats, wildlife, management, and regulations. ■ Update the Refuge orientation slide show using new DVD technology. ■ Improve parking site to accommodate trailers used by Refuge volunteers.	*Strategies* Same as Alternative 1 plus: ■ Increase programming and use of facilities for environmental education activities for area schools, universities, community groups, and other Refuge visitors, with a curriculum-based message that emphasizes habitat diversity, natural patterns and processes, and wildlife management. ■ Develop operational definition of success and measures for environmental education. ■ Encourage partnerships with local schools, community groups and surrounding agencies. ■ Provide teacher workshops with partner schools. ■ Increase environmental education/interp presence at Whitefish Point. ■ Develop operational definition of success and measures for Interpretation through a survey of visitor satisfaction. ■ Update the Refuge orientation slide show using new DVD technology. ■ Hire a full-time visitor services manager. ■ Replace the Refuge Visitor Center and office. ■ Improve parking site to accommodate trailers used by Refuge volunteers.	*Strategies* Same as Alternative 2

Table 1: Comparison of Objectives by Management Alternative

Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)	Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)
Objective 3.5: Protection of Cultural Resources: Ensure archeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings. (The intent of this objective is to cover Section 106 of the National Historic Preservation Act and Section 7(e)(2) of the FWS Improvement Act.)	**Objective 3.5: Protection of Cultural Resources:** Same as Alternative 1.	**Objective 3.5: Protection of Cultural Resources:** Same as Alternative 1.
Strategies: ■ Initiate a Cultural Resources Management Plan within 3 years of CCP approval that incorporates all existing surveys and investigations and identifies future needs. Develop a step-down plan for surveying lands to identify archeological resources and for developing a preservation program. (The intent of this statement is to meet the requirements of Section 14 of the Archaeological Resources Protection Act and Section 110(a)(2) of the National Historic Preservation Act.). ■ Prepare a museum property Scope of Collections Statement for the Refuge. (The intent of this statement is to meet the requirements of the DOI Departmental Manual, Part 411.) ■ Develop an oral cultural history to preserve the "community memory" about the area.	*Strategies:* Same as Alternative 1 plus: ■ Explore the idea of converting CCC cabin into historic/cultural museum.	*Strategies:* Same as Alternative 1
Objective 3.6: Cultural Resources Appreciation: Seventy percent of visitors will understand and appreciate the cultural history of the Refuge.	**Objective 3.6: Cultural Resources Appreciation:** Same as Alternative 1	**Objective 3.6: Cultural Resources Appreciation:** Same as Alternative 1
Strategies: ■ Incorporate cultural history messages into programs, exhibits and other media with an emphasis on use of the Refuge landscape throughout time.	*Strategies:* Same as Alternative 1	*Strategies:* Same as Alternative 1

Table 1: Comparison of Objectives by Management Alternative

Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	Alternative 2: Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)	Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)
Objective 3.7: Whitefish Point Unit: Within 5 years of CCP completion, implement the Service's provisions of the 2002 Human Use/ Natural Resource Management Plan for Whitefish Point.	**Objective 3.7: Whitefish Point Unit:** Same as Alternative 1	**Objective 3.7: Whitefish Point Unit:** Same as Alternative 1
Strategies: Same as Alternative 2 with the exception of Strategy 1, which would be: ■ No designated trails are provided.	*Strategies:* ■ Designate trails to allow public access while protecting environmentally sensitive areas. One trail will lead from the parking lot to the tip of the Point. The second will run along an old cobble road in a southeasterly direction. ■ Close the southeast beach from April to August to promote nesting of Piping Plovers. ■ Work with the GLSHS to route visitors to the beach via their boardwalk and revegetate the cut-through from the parking lot to the beach. ■ Hire a Refuge Manager trainee with a major responsibility for on-site work, mitigation approvals and coordination with partners. ■ Occupy a portion of a Second Keeper's Quarters if the building is re-constructed. The building will also be used by other partners to the Whitefish Point plan.	*Strategies:* Same as Alternative 2 with the exception of Strategy 1, which would be: ■ Close existing, undesignated trails to the public.
3.8 Other Recreational Access: Provide additional access opportunities upon request on a case-by-case basis if compatible with Refuge purposes.	**3.8 Other Recreational Access:** Same as Alternative 1	**3.8 Other Recreational Access:** Same as Alternative 1
Strategies: Consider recreational access requests on a case-by-case basis.	*Strategies:* Same as Alternative 1	*Strategies:* Same as Alternative 1
Note: habitat acreages are "GIS acres" (rounded to the nearest whole number) based on the USGS-created Refuge cover type data layer. Habitat acres include all Seney NWR cover types except "developed" (i.e., roads and building areas, 308 acres across all three alternatives) and "no photo coverage" (24 acres across all three alternatives). Footnotes: **1**=For open water areas lost, these acres were assumed to convert to approximately one-third Coniferous Forest - Lowlands and two-thirds to Scrub-Shrub. **2**=Since the 2004 aerial photos used to create the GIS layer were taken while T-2 East Pool was drawn down, 306 acres shown as "open wetland" in the T-2 East Pool area were allocated to "open water" and carried across all three alternatives.		

Chapter 3: Affected Environment

This chapter includes an overview of the affected environments of Seney NWR. More detail is contained in Chapter 3 of the CCP itself.

3.1. Introduction

Seney NWR is located in Schoolcraft County in Michigan's Upper Peninsula equidistant from Lakes Superior and Michigan. The Refuge encompasses 95,238 acres; the Seney Wilderness Area (which includes the Strangmoor Bog National Natural Landmark) covers 25,150 acres, or 26 percent of the Refuge. The Refuge is removed from major population centers; the three nearest major communities are each more than 80 miles away.

Seney NWR is also responsible for some Service activities on private lands in all 15 Upper Peninsula counties and 21 counties in the Lower Peninsula. Currently administered within this area are 28 Farmers Home Administration easements encompassing 1,252 acres.

3.1.1. Water Management

Water levels are managed on over 6,400 acres of Refuge pools, with water levels manipulated so as to provide a variety of wetland conditions for plants and animals. By raising and lowering these water levels; a natural wetland cycle can be maintained.

3.1.2. Fire

The fire history at Seney NWR is largely responsible for the diversity of trees, shrubs, and plant life present. Lightning-caused fires naturally occurred during dry years and created the present mix of community types. Today, prescribed fire and natural fire use are used to maintain the Refuge's diversity.

3.1.3. Forests

Forest management is conducted on the Refuge to maintain habitat diversity and to restore some forest ecosystem structure and composition. In some areas harvests are combined with prescribed fires. Many areas of the Refuge are managed as reference stands, where cutting isn't permitted.

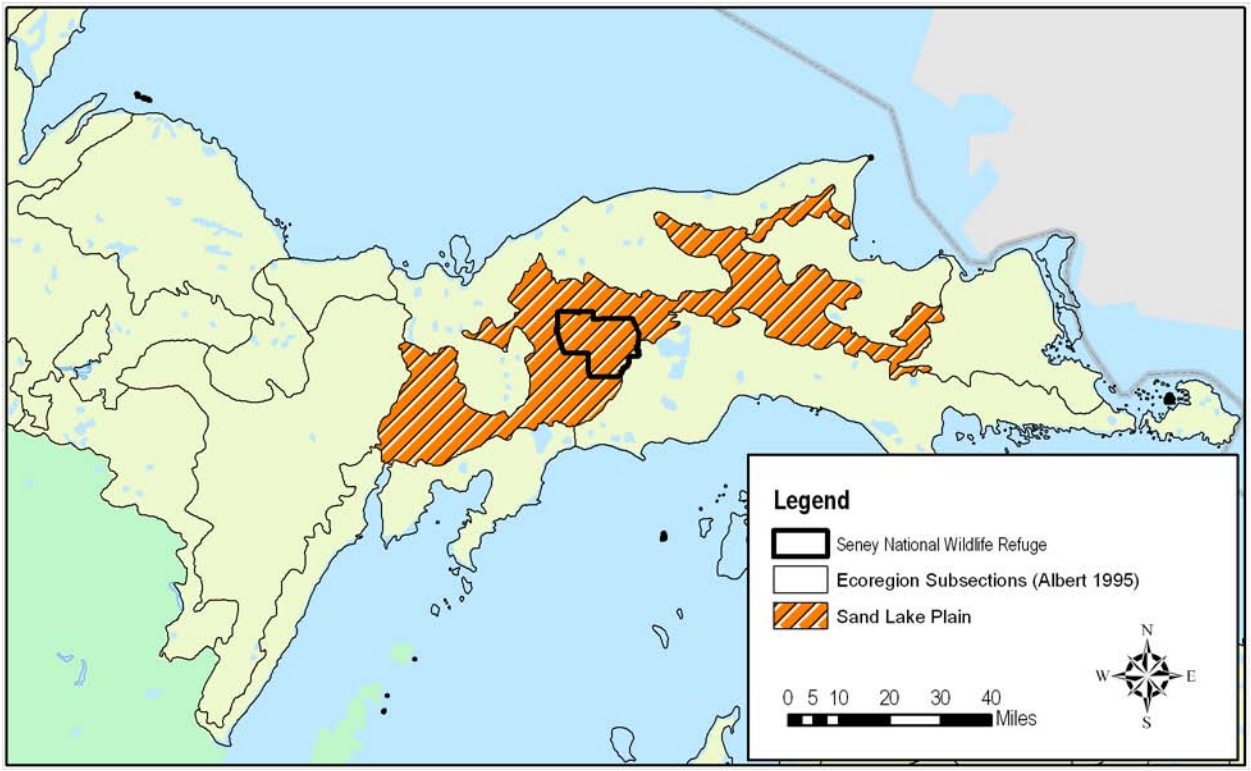
3.2. Climate

The climate of Seney NWR is considerably lacustrine influenced by its close proximity to Lakes Superior and Michigan. The most common spring through early fall winds are from the southwest and northwest and average approximately 10 m.p.h. Average daily humidity during spring and fall varies from 50 to 60 percent. Temperature extremes are approximately -35 degrees Fahrenheit and 98 degrees Fahrenheit. Precipitation occurs throughout the year, with June being the wettest month and March the driest on average. Average annual precipitation is approximately 32 inches and average annual snowfall is approximately 123 inches. During spring and summer months, on-shore breezes cause frequent afternoon thunderstorms. Lightning strikes are common during such storms, probably due to the relative lack of topography in the area. Growing season evaporation averages 25.1 inches. It is expected that only during 5 percent of the time will drought indices (e.g., Keetch-Byram Drought Index) reach extreme severity levels. The growing season averages 119 days.

3.3. Geology and Glaciation

According to the regional landscape classification system of Albert (1995), Seney NWR lies within the Seney Sand Lake Plain (Sub-Subsection VIII.2.1, Figure 4). This unit is characterized by landforms of

Figure 4: Seney Sand Lake Plan



lacustrine origin with broad, poorly drained embayments containing beach ridges, swales, dunes, and sandbars.

The lands comprising Seney NWR present an area of seemingly little geological variation in comparison with more scenic areas along the shores of Lake Superior and Lake Michigan. Although relatively little topographic relief exists on the Refuge (elevation varies from approximately 803 feet in the northwest to 640 feet in the southeast), the broad flat lands of the Refuge reflect a subtle, but highly complex, geologic history.

Between 10,000 and 10,500 years ago, the "Valders" pro-glacial lakes in the Superior basin drained southward across the Upper Peninsula. At about the latter date, the Valders ice border was located along the southern shore of Lake Superior allowing meltwater to drain southward across what is now the Refuge. During this period of time, the present land surface appears to have been sculptured. At least two phases of drainage seem to be visible in the surface patterns of the area. The first of these is a broad channel eroded into earlier outwash deposits that carried meltwaters from the area of Long Lake southward through what is now termed the "Strangmoor Bog." Throughout the length of this channel now occur linear landforms composed of sandy sediments. A second generation of outwash channels is visible as linear peat-filled depressions trending northwest-southeast across Seney NWR. These landforms are now considered to be a unique patterned bog topography and are prominently visible near Creighton and in the Refuge lands west of the Driggs River (Seney Wilderness Area). Finally, the current natural drainage patterns present a still different orientation and one that transects the above peat-filled channels. In the Seney area, the Driggs River best exhibits this pattern.

Since 10,500 years ago, the Seney area has been a site for marsh development. At present, from 3 to 9 feet of peat blanket the area. Among the more conspicuous landforms in the area are parabolic sand dunes, which have spread from northwest to southeast across the Refuge in a disjointed pattern. These landforms indicate arid conditions in the area, which allowed for the disruption of vegetation developed upon the surrounding sand and gravel deposits. At the same time, prevailing northwest winds

winnowed the exposed fine to medium grained sands from the earlier outwash sediments and gave rise to the present dune topography.

3.4. Soils

Within the Seney Sand Lake Plain, 100 to 200 feet of glacial drift generally cover the bedrock. The soils on the Refuge are generally level to somewhat sloping mucks, peats and sands. The dominant mucks are interspersed with sand ridges and knolls in such an intricate pattern that the two soils have been mapped together as a complex of Carbondale muck and Rubicon sand (dune phase). The muck has accumulated on the wet sandy plain at a depth of 3 to 9 feet. The material is a dark brown, spongy, felt-like muck, which is more decomposed than peat soils and in general contains a higher percentage of mineral matter. The natural drainage is very poor in the mucks and excessive in the sands on the ridges and knolls. This complex covers the majority of the Refuge.

A large area of Dawson and Greenwood peats exists in the central portion of the Refuge. These level, very poorly drained soils are composed of brown or yellow-brown mixed fibrous and woody material. Very little decomposition has taken place in these soils in comparison to the muck soils. At depth of 1 to 2 feet, raw yellow peat or muck underlies the peat. The water table is at the surface most of the year. Areas of Carbondale and Tawas mucks interrupt the peats on the Refuge. Wet sands underlie the entire area.

Along the Manistique River Valley, Driggs River, and the other tributaries draining the Refuge, the soils are predominately sands and sandy loams. These soils are well or excessively drained and lie on slopes that are level to steeply sloping. The soil surface consists of forest litter, underlain by gray sandy loam or fine sandy loam, with coarser sand beneath the loam. Under the former Soil Conservation Service Capability Class system, most of the Refuge would be Class V, wet soils. The wet sandy areas are Class II, VI, and VIII, while the better-drained areas are Class II and III. Only small areas along the Manistique River and along the western border of the Refuge are suitable for farming.

According to the habitat typing system of Burger and Kotar (2003), a total of 31 soil types at the Refuge (61 percent) have either primary or secondary habitat types. Of these, 18 (58 percent) have white pine as a climax species and 13 (42 percent) have maple (sugar or red) as climax species (Appendix J). This system does not (at present) provide primary or secondary successional pathways for wetland soils.

3.5. Surface Hydrology

Seney NWR lies within the Manistique River watershed, which encompasses Alger, Delta, Luce, Mackinac, and Schoolcraft counties. The watershed drains approximately 1,465 square miles before emptying into the northeast corner of Lake Michigan (Madison and Lockwood. 2004). General land slopes are approximately 10 feet per mile and southeasterly in direction. Water enters the Refuge from the north-northwest from west to east through the following creeks; Marsh Creek, Ducey Creek, Walsh Creek, Driggs River, Holland Ditch and Clarks Ditch and flows to the south-southeast to the Manistique River. The Manistique River then flows into Lake Michigan.

The Refuge has an abundance of water. Annual precipitation averages approximately 32 inches per year. This precipitation accounts for approximately 60 percent of the Refuge water intake. The remaining 40 percent of the Refuge water supply comes from the ditches, rivers and creeks. Sheet flow (overland flow) is quite substantial each spring as a result of winter snow and ice melting. Ground water is discharged into the peat and streams and flows under streambeds as hyporheic flow. Peak flows through the Refuge marsh and water system normally occur during spring. Snowmelt, frozen ground, and rain can combine to create destructive floods, although such events are rare. Stream flow data for water entering the Refuge is limited to early U.S. Geological Survey gauging station data for the period 1939 – 50 (Table 2). Recent stream flow data (1999 – 2000) is available for the western half of the Refuge from Marsh Creek east to Driggs River. Overall the discharges are relatively low due to the large amount of wetland and depression storage located in the watershed.

Seney NWR includes 27 man-made impoundments where water control capability exists on 21 of the pools. Along with associated potholes, beaver ponds, and ditches, the 27 pools account for approximately 7,456 surface acres of impounded water or 7.8 percent of the total Refuge acreage.

Historically, much of the land in and near what is now Seney NWR in Michigan's Upper Peninsula was an expansive, ground-water-supported sedge

Table 2: Average Peak Inflow of Water Into Seney NWR

Flowage	Drainage Area (Acres)[1]	Inflow (cubic feet/ second)
Marsh Creek[2]	12,800	122
Walsh Ditch	7,680	156
Driggs River	44,800	512
Holland Ditch	8,320	128
Clark Ditch	5,120	98

1. *Drainage area north of the Refuge*
2. *Includes Ducey Creek drainage.*

fen. In support of agricultural development, the largest wetland drainage project in Michigan's history was begun in 1912 (Wilcox et al.) The Walsh Ditch was constructed to redirect Walsh and Marsh Creeks and to lower the water tables. Despite this effort, agriculture proved unsustainable and was soon abandoned. The unintended consequences of the wetland drainage project were far reaching and will be discussed in another section of the document.

3.6. Archeological and Cultural Values

Cultural resources are "those parts of the physical environment (natural and built) that have cultural value to some kind of sociocultural group....[and] those non-material human institutions." Schoolcraft County contains four properties on the National Register of Historic Places. The Ten Curves Road bridge over the Manistique River in Germfask Township could (in theory) be threatened by a wildfire that escapes the Refuge boundaries.

On the Refuge are 40 recorded cultural resource sites, three of which have been determined ineligible for the National Register. These sites include most of the buildings in the Refuge Headquarters area, structures constructed by the Civilian Conservation Corps, logging camps, cabins, a farm, a ditch, and other types. No prehistoric sites have been identified on the Refuge.

Five Indian tribes have an interest in Schoolcraft County and may be concerned about traditional cultural properties and sacred sites if any exist on the Refuges. During a "Master Planning" process in 1976, Commonwealth Associates, Inc. identified areas along the Manistique River as having the best potential for such sites. To date no resources have been found.

3.7. Social and Economic Context

Seney NWR is located in northern Schoolcraft County. One of 15 counties in Michigan's Upper Peninsula, it stretches from the shores of Lake Michigan north to within 4 miles of Lake Superior. Its poor soils and cold climate contribute to low populations and limit economic activities. Only 8903 people live in the 1,178-square-mile county (7.5 people per square mile). The population decreased slightly between 2000 and 2005.

The two nearest towns, Germfask and Seney, host 491 and 108 people, respectively. The closest towns with a population greater that 2,000 people are Manistique, Munising and Newberry, all of which are 40 miles away from the Refuge. The racial makeup of the county is 89 percent white, 6 percent Native American, 2 percent African American with Asians, Hispanic and other races contributing 3 percent (see Table 3). Interestingly, 16 percent of U.P. residences claim Finnish ancestry, making it the largest concentration of Finns outside of Europe.

The median income for a household in Schoolcraft County was $32,306, with about 12 percent of the population living below the poverty line. This compares to $46,291 and 11 percent for the State of Michigan. In Schoolcraft County, government agencies provide 23 percent of the jobs followed by service industry at 22 percent, retail at 20 percent, manufacturing at 10 percent and construction at 7 percent. Much of the area is forested and attracts summer visitors who enjoy hunting, hiking, camping and fishing. In the winter snowmobiling is a big attraction (U.S. Census Bureau, 2005).

Seney NWR was one of the sample refuges investigated in a national study of the economic benefits to local communities of national wildlife refuge visitation (Laughland and Caudill, 2004). This study found that that in 2004, resident and non-resident visitors to Seney NWR spent about $547,300 in the

Table 3: Socioeconomic Characteristics of Schoolcraft County, Michigan

Characteristic	Schoolcraft County	Michigan
Population, 2005 estimate	8,819	10,120,860
Population, percent change, April 1, 2000 to July 1, 2005	-0.9%	1.8%
Population, 2000	8,903	9,938,444
Land area (square miles)	1,178	56,803
Persons per square mile, 2000	7.6	175
White persons, percent, 2005 (a)	90.0%	81.3%
Black persons, percent, 2005 (a)	2.0%	14.3%
American Indian and Alaska Native persons, percent, 2005 (a)	5.4%	0.6%
Asian persons, percent, 2005 (a)	0.5%	2.2%
Persons of Hispanic or Latino origin, percent, 2005 (b)	1.0%	3.8%
White persons not Hispanic, percent, 2005	89.2%	77.9%
Foreign born persons, percent, 2000	1.0%	5.3%
Language other than English spoken at home, pct age 5+, 2000	3.0%	8.4%
High school graduates, percent of persons age 25+, 2000	79.4%	83.4%
Bachelor's degree or higher, pct of persons age 25+, 2000	11.3%	21.8%
Persons with a disability, age 5+, 2000	1,695	1,711,231
Households, 2000	3,606	3,785,661
Persons per household, 2000	2.36	2.56
Median household income, 2003	$32,306	$46,291
Per capita money income, 1999	$17,137	$22,168
Persons below poverty, percent, 2003	11.7%	11.0%
Source: US Census Bureau State & County QuickFacts (2005)		

Refuge (Table 4). When this spending had cycled through the economy, the Refuge had generated $671,800 in final demand, $235,000 in job income, 11 jobs, and $112,600 in total tax revenue.

The study concluded that Seney NWR had a net economic value of $538,700. While the Refuge is a small part of the regional economy, Seney NWR helps define the region's character and maintain its quality of life, and thus is important for the promotion of a diverse regional economy.

3.8. Natural Resources

3.8.1. Historic Habitat Conditions

The plant species that presently dominate the Seney area are primarily the result of two major events: (1) species migration in response to climate change after the retreat of the Wisconsin glacier, and (2) human intervention during the last two centuries (Zhang et al. 2000). General Land Office notes depict the Seney area prior to European settlement as consisting of a mosaic of upland and wetland cover types. The scrub-shrub matrix was inter-

Table 4: 2004 Recreation-related Expenditures (2004 $ in thousands)[1]

Activity	Resident	Non-resident	Total
Non-consumptive	$29.0	$442.1	$471.1
Hunting	$11.0	$48.6	$59.6
Fishing	$8.0	$8.6	$16.6
Total	$48.0	$499.3	$547.3

1. *Laughland and Caudill, 2004*

spersed by herbaceous species such as *Carex* and deciduous and coniferous forests of red and white pine, black spruce, balsam fir, American beech, eastern hemlock, sugar maple, and yellow birch.

In the Eastern Upper Peninsula of Michigan, mixed-conifer forests comprised approximately 1.7 million ha or 38 percent of the pre-European landscape (Zhang et al. 2000). The distribution of these forests across the landscape was regulated primarily by the interaction of topography, soil moisture, and fire. Generally speaking, wildfires tended to burn more erratically and less frequently on ice-contact landforms than on dry, sandy outwash plains. As a result, many areas of the Refuge were historically dominated by large, interspersed mature red pine and eastern white pine (Vogl 1970, Whitney 1986).

Prior to Refuge establishment, the forests and soils of the Seney area and surrounding Schoolcraft County were exploited to a considerable degree. Early timber cutting favored the best stands of white pine, followed by "high-grading" in the red pine and hardwood-eastern hemlock stands (Karamanski 1989). Slash fires fueled by logging debris occurred annually with most areas burning on numerous occasions. As sawtimber diminished, efforts were shifted to cutting of poles, posts, ties, and pulp. At this time, an attempt was made to settle cut-over lands and develop farming communities. By 1912, drainage of the Seney Swamp was underway, through the creation of ditches like the Walsh Ditch. Imperfect drainage of peat soils, poor soil fertility, and the short growing season made the farming venture a disaster and most lands were tax-reverted to the State of Michigan by the early 1930s. See Table 5.

On excessively drained to well drained ice-contact landforms with higher water-holding capacity and nutrient levels than outwash barrens, mixed-pine stands dominated by red pine and eastern white pine were common historically at Seney NWR, with jack pine, aspens, and other early successional hardwood species as common associates (Comer et al. 1995). These mixed-conifer forests existed on primarily linear outwash channels and "pine islands" interspersed among a matrix of lowland swamp forests or patterned fens (Silbernagel et al. 1997). Now, it is estimated that less than 1 percent of the primary white and red pine forests exist in the regional landscape and much of the Refuge forests too have been structurally and compositionally altered due to past management actions (Frelich and Reich 1996, Thompson et al. 2006, Drobyshev et al. In Press).

Both biotic and abiotic natural disturbances have historically regulated composition and structure of these forests (Frehlich 2002). Historically, fire occurred frequently in mixed pine-dominated landscapes, with relatively low-intensity surface fires occurring once every 5-40 years (Simard and Blank 1982, Engstrom and Mann 1991, Loope 1991). These low-intensity fires usually created small gaps or left the basic structure of the overstory unaltered while maintaining a relatively open understory. Over time, these disturbances tended to produce a mixed-conifer stand with an uneven age structure (Bergeron et al. 1991, Drobyshev et al. In Press). Under certain conditions (e.g., low fuel moisture, low humidity, high temperatures, and strong winds), these fires sometimes intensified and resulted in a stand-replacing fire. The frequency of stand-replacing fires ranged from 160 years for mixed-conifer stands dominated by jack pine, eastern white pine, and red pine, to 320 years for stands dominated by eastern white pine and red pine (Zhang et al. 1999, Frehlich 2002).

Table 5: Ranked Order of Pre-European Settlement Cover Types, Seney NWR, by Acres[1] and Percent of Total (Comer et al. 1995)

Cover Type	Acres	Percent (%) of Total
Muskeg-Bog	64,678	68.1
Mixed Conifer Swamp	11,699	12.3
White Pine-Red Pine	5,354	5.6
Jack Pine-Red Pine	4,462	4.7
Hemlock-White Pine	2,479	2.6
Beech-Sugar Maple-Hemlock	1,785	1.9
Spruce Fir-Cedar	1,719	1.8
Hemlock-Yellow Birch	859	0.9
Shrub Swamp-Emergent Marsh	661	0.7
Aspen-Birch	595	0.6
Lake or River	264	0.3
Mixed Hardwood Swamp	165	0.2
Black Ash	132	0.1
Cedar Swamp	66	0.07
Sugar Maple-Hemlock	33	0.03
Total	94,851	99.9

1. *Information derived from pre-European cover type layer supplied by the Michigan Department of Natural Resources (MDNR). This information is based on General Land Office Notes (see Comer et al. 1995). Refuge boundary GIS layer does not correspond exactly to present-day ownership size of 95,238.*

Major native biotic disturbances to forests included jack pine budworm (*Choristoneura pinus*) and spruce budworm (*C. fumiferana*). The eruptive and cyclical nature of the disturbance brought about by these species likely coincided with fire as induced tree mortality altered fuel loading and the connectivity of fuels.

3.8.2. Current Habitat Conditions

At present, the vast majority of areas that were forested during pre-European times in the Upper Peninsula of Michigan are still forested; relative to most areas in the Midwest, the Eastern Upper Peninsula is still comprised of native cover types and has a high degree of ecological integrity. That is, relative to many other parts of the Midwest, the Upper Peninsula of Michigan represents a region where: 1) many ecological processes are intact and within their natural range of variation; 2) for most species their distribution, composition, and relative abundance are within their natural range of variation; 3) the communities found are resilient, or able to recover from severe disturbance events. However, only 13 percent (562,125 acres) of the present landscape of the Eastern Upper Peninsula is now domi-

nated by mixed-conifer stands, and the structure of these forests on today's landscape is dramatically different than that on the pre-European landscape (Zhang et al. 2000, Drobyshev et al. In Press).

Based upon General Land Office (GLO) survey records, the mean stem density in the pre-European mixed-conifer forests of the eastern Upper Peninsula was significantly lower than in current mixed-conifer stands. With these presently higher stem densities and corresponding lower stand basal areas, sites that were originally mixed-conifer stands are obviously presently dominated by jack pine and thus differ from their pre-European condition in both composition and structure.

For the purpose of this plan, we combined the resulting 41 vegetative cover types (not including Developed and No Photo Coverage) into 10 habitat types. In ranked order by acreage, these 10 habitat types are Scrub-Shrub (28,954 acres), Open Wetlands (16,617 acres), Mixed Forest-Uplands (11,396 acres), Coniferous Forest-Uplands (8,857 acres), Mixed Forest-Lowlands (8,221 acres), Coniferous Forest-Lowlands (7,825 acres), Open Water (5,103 acres), Deciduous Forest-Uplands (4,372 acres), Deciduous Forest-Lowlands (2,515 acres), Upland Old Fields and Openland (1,302 acres).

Scrub-Shrub Habitat Type (28,954 acres): This habitat type includes scrub-shrub, lowland; tag alder; willow; and scrub shrub, upland cover types. This habitat type dominates the Refuge. Common species (and species groups) include alder, red osier dogwood, willow, meadowsweet, current, bedstraw, joe-pye-weed, goldenrod, and marsh fern.

Open Wetland Habitat Type (16,617 acres): This habitat type includes sedge-bluejoint grass; mixed emergents-grasses-forbs; cattail; and sphagnum-leatherleaf cover types. This habitat type contains many different herbaceous species, with composition related to moisture, exposure, and soil conditions.

Mixed Forest-Upland Habitat Type (11,396 acres): This habitat type includes aspen-pine; forested broadleaf-coniferous mix, upland; northern hardwood-white pine-hemlock, and aspen-birch-fir-spruce, upland cover types. Common overstory species include white pine, red pine, and jack pine, and deciduous species such as red maple, quaking and large-toothed aspen, and red oak. Understory species include wild raisin, bracken fern, hazels, wild strawberry, princess pine, blueberry, and huckleberry.

Coniferous Forest-Upland Habitat Type (8,857 acres): This habitat type includes forested coniferous mix, upland; red pine-jack pine; jack pine; red pine-white pine; red pine; spruce-fir; hemlock, upland; white pine; and northern white cedar, upland cover types. Understory species include wild raisin, bracken fern, hazels, wild strawberry, princess pine, blueberry, and huckleberry. Lichens, grasses and sedges are also represented, especially in the second growth aspen stands.

Mixed Forest-Lowlands Habitat Type (8,221 acres): This habitat type includes forested broadleaf-coniferous mix, lowland and aspen-birch-fir-spruce, lowland cover types. Overstory species include coniferous species such as black spruce, balsam fir, and tamarack, as well as deciduous species such as black ash, quaking aspen, and red maple.

Coniferous Forest-Lowland Habitat Type (7,825 acres): This habitat type includes tamarack-spruce; forested coniferous mix, lowland; black spruce; tamarack; northern white cedar, lowland; and hemlock, lowland cover types. This habitat type represents a combination of two basic forests: the spruce-fir or boreal forest, and the northern lowland or swamp conifer forest. White spruce and balsam fir comprise the majority of tree species in this forest type (with some hemlock), while white cedar, black spruce and tamarack constitute the majority in the second forest type. Typical associates include paper birch, red maple, and alder. Common shrubs include round-leafed dogwood, hazel, honeysuckle, thimbleberry, and blueberries. Other understory plants include sweet gale, leatherleaf, bog rosemary, and cranberry. However, when the canopy is closed little understory exists.

Open Water Habitat Type (5,103 acres): Habitat includes water; rooted-floating vegetation; and submergent vegetation cover types. Open water consists of anthropogenic pools and natural stream channels. The pools were created by using dikes and channels to impound water on what was once scrub-shrub and lowland coniferous forest.

Deciduous Forest-Upland Habitat Type (4,372 acres): This type includes aspen, upland; northern hardwoods (maple-beech-yellow birch); forested broadleaf mix, upland cover types. This habitat type is commonly referred to as the broadleaf forest, northern mesic, northern hardwood, or hardwood-hemlock forest, and is comprised of sugar maple, American beech, and yellow birch, with eastern hemlock as an important associate. Other associates include American basswood, black cherry, paper

birch, white spruce, white ash, and balsam fir. When the tree canopy closes in, the herbaceous plants disappear. However, in suitable areas, several shrubs (e.g., Canada yew, elderberry, leatherwood, and hazel) and other plants (e.g., partridge berry, bunchberry, twinflower, baneberry, trillium) can occur. This forest type is scattered through the Refuge, usually on the most nutrient rich soils.

Deciduous Forest-Lowland Habitat Type (2,515 acres): This habitat type includes aspen, lowland; forested broadleaf mix, lowland; and hardwoods, lowland cover types. This habitat type is comprised of red maple, black and white ash, and American basswood and is scattered through the Refuge, usually next to riparian corridors.

Upland Old Fields and Openland Habitat Type (1,302 acres): This habitat type includes grass-ferns and hayfields cover types. This habitat type consists of primarily anthropogenic habitats created prior to the Refuge's establishment in 1935. Many non-native grass species, such as Kentucky bluegrass and several brome species, characterize these areas.

3.8.3. Wildlife

3.8.3.1. Birds

Relative to pre-European times, Seney NWR is presently richer in bird species due to anthropogenic habitats such as Refuge pools and old hayfields. A total of 231 bird species comprise the Refuge's species list of migrants and residents, including breeding and stopover species (Appendix C), and it comes as no surprise then that Seney NWR is an Important Bird Area (American Bird Conservancy) and has 46 USFWS R3 Priority Species, 23 of which utilize primarily terrestrial habitats. The Refuge is also comprised of many species that are listed on United States Forest Service and Michigan DNR conservation lists (Appendix C). Species of high public interest include Common Loon, Bald Eagle, Osprey, Yellow Rail, Sandhill Crane, Trumpeter Swan, Sharp-tailed and Spruce Grouse, Black-backed Woodpecker, Connecticut Warbler, Le Conte's Sparrow and many other passerines, as well as game species such as American Woodcock and Ruffed Grouse.

Because of the spatial habitat heterogeneity at Seney NWR, the Refuge should continue to have a high degree of bird diversity, while providing for many species of conservation concern. In particular, because Seney NWR has more area in forest habitat types relative to most other Refuges in the Midwest (and even Lower 48 states), the Refuge will have the opportunity to be a leader in forest habitat management for bird conservation.

3.8.3.2. Mammals

There are approximately 50 mammal species at the Refuge, with other species (e.g., fox squirrel and opossum) likely to colonize the area in future years due to range expansion in light of climate change (Appendix C). Some of the mammals found at the Refuge are listed as USFWS R3 Priority Species, including the gray wolf, and many other species are listed on United States Forest Service and Michigan DNR conservation lists. Species of high public interest include gray wolf, fisher, American marten, river otter, beaver, snowshoe hare, and white-tailed deer.

Seney NWR's mammal community composition is likely similar to what it was during pre-European times. The predator-prey systems are likely not significantly altered at the Refuge. For instance, the predator-prey relationship that now exists between the small number of gray wolves on the Refuge and the white-tailed deer and beaver they prey upon seems to be in concert, with neither the predator nor the prey species causing ecological concern. Also, as a site for the release of individuals, the Refuge has played an integral part, for instance, in the regional restoration of populations of species such as fisher and American marten.

3.8.3.3. Fish

Approximately 43 fish species have been observed at (or near) the Refuge. Some of these species are listed as USFWS R3 Priority Species, the brook trout for example, and many other species are listed on United States Forest Service and Michigan DNR conservation lists (Appendix C). The Refuge's fish community composition is likely very different to what it was during pre-European times, primarily due to the large number of non-native salmonids and other species such as sea lamprey. Therefore, unlike the mammal community, the fish predator-prey systems are likely significantly altered at the Refuge.

3.8.3.4. Reptiles and Amphibians

The herptofauna community at Seney NWR consists of approximately 22 extant species (Appendix C). Although none of these species are listed as USFWS R3 Conservation Priority Species, some are listed on United States Forest Service and Michigan DNR conservation lists. The Refuge's mink frog population is of special interest in Michi-

gan. This species is at its southern range periphery in the Upper Peninsula of Michigan and is not widely distributed in the region.

3.8.3.5. Threatened and Endangered Species

On March 12, 2007 the gray wolf was officially delisted as an endangered species. However, a federal court decision on September 29, 2008 overturned the delisting action and gray wolves in the Great Lakes area are once again listed as endangered under the Endangered Species Act. The Refuge has two or three collared wolves and four to six non-collared wolves using the Refuge during any time of the year. The Michigan DNR conducts aerial surveys for the wolves all year long and reports the information to the Refuge.

The Bald Eagle was delisted on August 9, 2007. There are nine Bald Eagle nests on the Refuge, four to five of which are in good to fair condition. There are nine Bald Eagle nests on the Refuge, and two to four eaglets are produced on the Refuge annually. Eaglets are banded every other year by researchers from Clemson University, and the data are added to the national database. Immature eagle use peaks at about 10 birds in the fall. Active territories are located on B-1, D-1 C-2 and C-3 pools.

Habitat conditions on the Refuge are favorable for the listed lynx (*Lynx Canadensis*) if they return to the Upper Peninsula of Michigan.

3.9. Refuge Recreation

3.9.1. Hunting

Hunting on the Refuge is very popular with local residents and many visiting hunters. There are two hunting units on the Refuge. Hunting Area A encompass 49,522 acres in the center of the Refuge. Area B covers much of the wilderness, a strip of land along the north boundary and in the southeast corner; it contains 36,200 acres. The Refuge unit containing the office and visitor use facilities is closed to hunting.

When small game populations are high, hunters journey from throughout the mid-west, to the Refuge. Hunting for Ruffed Grouse and American Woodcock is allowed in Unit B. Snowshoe hare hunting is allowed December 1 through March 31 in Unit A and throughout the season in Unit B. All hunting is done in accordance with Michigan DNR regulations.

Hunting for big game (white-tailed deer and black bear) on the Refuge is permitted during the State seasons, however there are restrictions (see list). Area A is open for hunting deer during the regular firearms, muzzleloading and late archery seasons. Area B is open for all big game hunting seasons. These restrictions all but eliminate bear hunting on the Refuge, because the State issues a limited number of bear tags and few hunters are willing to hunt without bait or dogs.

The Refuge's restrictions may have the opposite effect on deer hunting. While some may disagree with the restrictions, an overwhelming number of deer hunters surveyed in 2003 said they hunt at Seney NWR because it is a large area where they can hunt traditionally, without the influence of baiting or the annoyance of ATVs. Despite the low hunter success, 9 percent compared to a state-wide average of 40 percent, many hunters have come back for decades.

Current Refuge hunting regulations include:

- Baiting (including salt, smudge pots and items requiring ignition) for deer, bear or any other species is prohibited.
- Species not listed may not be taken.
- Use of dogs for black bear is prohibited. Dogs are permitted for upland game.
- Vehicles are allowed only on Refuge roads open to the public.
- All-terrain vehicles and snowmobiles are not permitted on the Refuge.
- White-tailed deer hunters may camp on the Refuge west of the Driggs River during Michigan's state fire arms deer season. Camping is prohibited east of the Driggs River, and in Natural, Wilderness and other closed areas. All campers must register and obtain a permit at Refuge Headquarters. Maps are available at Refuge Headquarters.
- Blinds built with natural dead and down material from the area are allowed. No cutting of standing trees or shrubs (dead or alive). No screw in steps or any objects that penetrate through the bark of a tree. Ground blinds built of manufactured material, or portable tree strands must be removed at the close of hunting season. Blind must be clearly marked with the owner's name and address.

- Injuries or accidents must be reported immediately to the Refuge headquarters.
- Cutting shooting lanes is not permitted.

In addition to these regulations, hunters must comply with Michigan's state hunting regulations.

3.9.2. Fishing

Seney NWR provides a 3.5-mile Fishing Loop and a universally accessible pier to facilitate fishing. Many people enjoy fishing for yellow perch and northern pike from the banks of Refuge impoundments. Others fish the Driggs River for brook trout or the Manistique River for walleye, smallmouth bass and brown trout. Impoundment fishing is open from May 15 to September 30 in specified locations and river fishing is allowed in accordance with State regulations. No boats or flotation devises are allowed on the impoundments and lead-free tackle must be used. Ice fishing is permitted on all Refuge impoundments, but this activity is not very popular.

Each year, during the State's "free fishing weekend," Refuge staff, volunteers and the Seney Natural History Association host a Children's Fishing Day. This event began in 1994 and has become a tradition with many local families. Volunteers are stationed along the fishing loop with poles and bait to help children fish, there are fishing related activities in the Visitor's Center and certificates are awarded for the largest perch and pike in 5 age categories. SNHA provides a free fish dinner to participants and their families and local vendors donate fishing related items as door prizes.

Current Refuge fishing regulations include:

- Boats, canoes and other floatation devices are not permitted on Refuge pools and ditches.
- Fishing is permitted on the following rivers and streams during regular state seasons: Walsh Creek and Ditch, Creighton, Driggs and Manistique Rivers.
- Non-motorized watercraft are permitted on the Creighton River, Driggs River and Walsh Creek. Motorized craft are permitted on the Manistique River.
- There is no size limit on northern pike taken in Refuge pools. Live bait or artificial lures may be used.
- Vehicles allowed only on main Refuge roads and trails where gates are open. No off-road travel allowed with any motorized vehicle.
- Fishing is permitted during daylight hours only.
- Camping and fires are not permitted.
- Fishing line must be disposed of properly.
- Use of lead tackle is prohibited on the Refuge.
- All fishing is closed from October 1 to December 31.
- Ice fishing is permitted on all Refuge pools from January 1 to February 28.

3.9.3. Wildlife Observation

Seney NWR is known as a great place to watch wildlife and the Whitefish Point unit is recognized internationally for its importance as a migratory bird stopover. Each year visitors from around the world come to the Refuge to observe wildlife. The road network and impoundments provide excellent opportunities for people, of all ages with various abilities, to observe wildlife. Commonly observed species include: Bald Eagle, Osprey, Trumpeter Swan, Common Loon, Sandhill Crane, several species of ducks, Pied-billed Grebes, snapping and painted turtles, beaver, muskrat and a variety of passerines. Others prefer to walk the Pine Ridge Nature Trail or hike and bike the backcountry roads in search of wildlife. If they are lucky they may glimpse a black bear, moose or gray wolf. During the winter visitors can don cross-country skis or snowshoes to track wildlife.

Staff and volunteers working at the Visitors Center maintain a wildlife observation log and share that information with visitors. They also loan binoculars to visitors and help them locate observation decks with viewing scopes. Tours are given on Wednesday evenings that provide viewing opportunities along the back country roads and yellow rail tours offer a unique nighttime opportunity to see or hear a much sought-after species.

3.9.4. Wildlife Photography

The network of roads and public use structures along the pools affords photographers, of all skill levels excellent, opportunities to photograph wildlife. Many beginners focus their lens on the ever charismatic trumpeter swan or common loon, as is

evident by entries to the Annual Seney NWR Photo Contest. While the more seasoned photographers often venture beyond the auto tour route to capture images of plants, insects, and landscapes bathed in a wide spectrum of light conditions.

3.9.5. Environmental Interpretation

The Refuge Visitor's Center, which is open 9 a.m. to 5 p.m. every day from May 15 to October 15, contains a variety of displays to interpret the natural resources of Seney NWR. It contains permanent exhibits such as the loon diorama, wolves/coyote comparison, who's calling soundboard, lift the flat mural, track box and touch table. Creative temporary displays are used to inform the visitors of what's blooming, who is migrating, the use of fire management, the threats of invasive species and other Refuge management activities.

Refuge kiosks, which are presently being upgraded, provide interpretive information on the Fish and Wildlife Service and specifically Seney NWR. The Marshland Wildlife Drive and Pine Ridge Nature Trail both have interpretive panels along their routes and the observation platforms were built with a focus on loons, eagles and swans. Brochures and posters also provide additional interpretive information.

Wildlife tours are provided every Wednesday evening and special events are held for Children's Fishing Day, Scout Day and Winterfest. Smaller interpretive events, held throughout the season, provide interpretive information on a variety of topics such as hunting and fishing, endangered species backyard wildlife, migratory birds, fire ecology, invasive species management, wildflowers and wildlife films.

The Refuge's interpretive program is heavily subsidized by funds from the Seney Natural History Association (SNHA). Most of the Refuge's events and interpretive activities are carried out by interns who receive monetary stipends provided by SNHA. SNHA has also paid for the publication of brochures and signs as well as the construction of observation decks. A majority of their funds are derived from the sale of books, Refuge-specific clothing and interpretive material sold in a small store located in the Visitor's Center.

3.9.6. Environmental Education

The Refuge welcomes school groups and others interested in environmental education. School field trips are accommodated through tours, hikes, pond studies using a video microscope, games and career talks. On Scout Day we provide educational sessions for boy and girl scouts, grades K-6. Sessions include topics such as: bird banding, weather, water cycles, knots, orienteering, fire safety, tree identification, first aid, wildlife observation and dressing for outdoor activities. There is a growing demand for environmental education both on and off Refuge; unfortunately recently we have had to scale back this activity due to loss of staff.

Chapter 4: Environmental Consequences

4.1. Effects Common to All Alternatives

Specific environmental and social impacts of implementing each alternative are examined according to the five broad issue categories: habitat management, water management, wildlife management, landscape and watershed, and visitor services. However, several potential effects will be very similar under each alternative and are summarized below:

4.1.1. Air Quality

None of the management alternatives would have appreciable, long-term impacts on ambient air quality conditions in the area. Habitat management involving prescribed fire would occur under each alternative, but prescribed fire would be used only under ideal weather conditions. Approved smoke management practices developed by state and federal land management agencies would be implemented in all burning events. The generally low population density of forested lands bordering the Refuge would help to minimize temporary smoke-related, air quality impacts by reducing the number of potential "sensitive receptors" that could be affected by excessive smoke. Nevertheless, under each alternative there would be some potential for temporary air quality impacts from smoke in areas beside the Refuges.

Tailpipe emissions from operation of Refuge equipment and from visitation to the Refuge by the motoring public are negligible in comparison with overall regional emissions.

Due to its remote location, Seney NWR is not near any point-sources of pollution. In many of the national maps, Seney NWR is not located in an area of high deposition of many substances (pH, Hg, NOx) that are elevated further south and east in the Great Lakes Basin. Therefore, The Refuge is not at risk from spills or other releases from facilities. Instead, Seney NWR is more likely to be impacted from air pollution that may originate from other, ore industrialized, areas of the Great Lakes basin and beyond.

4.1.2. Environmental Justice

Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" was signed by President Clinton on February 11, 1994. Its purpose was to focus the attention of federal agencies on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income communities access to public information and participation in matters relating to human health or the environment.

None of the management alternatives for either Refuge described in this EA would disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. The percentage of minorities in Schoolcraft County is lower than in Michigan (and much lower than the United States) as a whole. Average incomes and poverty rates within the county is comparable to other rural counties in the state. Public use activities that would be offered under each of the alternatives would be available to any visitor regardless of race, ethnicity or income level.

4.1.3. Climate Change Impacts

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies, under its direction, that have land management responsibilities to consider potential climate change impacts as part of long range planning endeavors. The increase of carbon dioxide (CO2) within the earth's atmosphere has been linked to the gradual rise in surface temperature commonly referred to as global warming. In relation to comprehensive conservation planning for national wildlife refuges, carbon sequestration constitutes the primary climate-related impact to be considered in planning. The U.S. Department of Energy's "Carbon Sequestration Research and Development" defines carbon sequestration as "...the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere."

Vegetated land is a tremendous factor in carbon sequestration. Terrestrial biomes of all sorts – grasslands, forests, wetlands, tundra, and desert – are effective both in preventing carbon emission and acting as a biological "scrubber" of atmospheric CO2. The Department of Energy report's conclusions noted that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere.

Conserving natural habitat for wildlife is the heart of any long-range plan for national wildlife refuges. The actions proposed in this CCP would conserve or restore land and habitat, and would thus retain existing carbon sequestration on the Refuge. This in turn contributes positively to efforts to mitigate human-induced global climate change.

One Service activity in particular – prescribed burning – releases CO2 directly to the atmosphere from the biomass consumed during combustion. However, there is actually no net loss of carbon, since new vegetation quickly germinates and sprouts to replace the burned-up biomass and sequesters or assimilates an approximately equal amount of carbon as was lost to the air (Boutton et al. 2006). Overall, there should be little or no net change in the amount of carbon sequestered at Seney NWR from any of the proposed management alternatives.

Several impacts of climate change have been identified that may need to be considered and addressed in the future:

- Habitat available for cold water fish such as trout and salmon in lakes and streams could be reduced.
- Forests may change, with some species shifting their range northward or dying out, and other trees moving in to take their place.
- Ducks and other waterfowl could lose breeding habitat due to stronger and more frequent droughts.
- Changes in the timing of migration and nesting could put some birds out of sync with the life cycles of their prey species (Table 6).

The managers and resource specialists on the Refuge need to be aware of the possibility of change due to global warming. When feasible, documenting long-term vegetation, species, and hydrologic changes should become a part of research and monitoring programs on the Refuge. Adjustments in Refuge management direction may be necessary over the course of time to adapt to a changing climate.

4.1.4. Cultural Resources

The USFWS is responsible for managing archeological and historic sites found on national wildlife refuges. Known cultural resources occur at Seney NWR and there may be undiscovered cultural resources awaiting discovery. Under each of the alternatives evaluated in this EA, Refuge management would ensure compliance with relevant federal laws and regulations, particularly Section 106 of the National Historic Preservation Act. Prior to all habitat and facility projects, appropriate efforts would be made to identify cultural resources within the area of potential impact by contacting the Regional Historic Preservation Officer.

4.1.5. Other Common Effects

None of the alternatives would have more than negligible, or at most minor effects on soils, topography, noise levels, land use patterns in and around the Refuge, transportation and traffic, waste management, human health and safety, or visual resources.

Table 6: Global Warming Projections For 42 Bird Species Present at Seney NWR (Price 2000)

Possibly Extirpated		
White-throated Sparrow	Red-breasted Nuthatch	Wilson's Warbler
Olive-sided Flycatcher	Brewer's Blackbird	Sedge Wren
Black-throated Green Warbler	Dark-eyed Junco	Swamp Sparrow
Magnolia Warbler	Blackburnian Warbler	Lincoln's Sparrow
Yellow-bellied Flycatcher	Black-throated Blue Warbler	Bay-breasted Warbler
Philadelphia Vireo	Canada Warbler	Blue Jay
Nashville Warbler	Golden-winged Warbler	Tennessee Warbler
Yellow-rumped Warbler	Connecticut Warbler	Cape May Warbler
Pine Siskin	Mourning Warbler	Northern Parula
Purple Finch	Chestnut-sided Warbler	Winter Wren
Evening Grosbeak	Clay-colored Sparrow	Northern Waterthrush
Range May Contract		
Bank Swallow	Cliff Swallow	Willow Flycatcher
Range May Expand		
Horned Lark	Field Sparrow	White-eyed Vireo
Western Meadowlark	Northern Cardinal	Northern Mockingbird

4.2. Cumulative Impacts Analysis

"Cumulative environmental impacts" refer to effects that result from the incremental impact of the proposed action when added to other past, present and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. In this section, the cumulative impact of each alternative is discussed in terms of Seney vegetative changes and environmental education.

Vegetative Changes: Prior to Refuge establishment, the forests and soils of the Seney area and surrounding Schoolcraft County were exploited to a considerable degree. Early timber cutting favored the best stands of white pine, followed by "high-grading" in the red pine and hardwood-eastern hemlock stands (Karamanski 1989). After the logging era, an attempt was made to settle cut-over lands, drain the Seney Swamp, and develop farming communities. Imperfect drainage of peat soils, poor soil fertility, and the short growing season made the farming venture a disaster. But the scars remained on the land.

The main differences between alternatives is that ditches and water control structures would be restored or removed in Management Units 2 and 3 under Alternative 3. This would result in nearly 3,000 acres of restored scrub-shrub and lowland coniferous forest habitats. Deciduous forest would also increase under both Alternatives 2 and 3 by eliminating all old fields on hardwood-favorable soils (232 acres).

Environmental Education: Environmental education is provided by a variety of institutions inside and outside of the formal class-room. In addition to K-12 public schools, in which environmental education is generally included under the life and physical

Table 7: Summary of Environmental Consequences for Management Alternatives for Seney NWR

Issue	Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	Alternative 2: Habitat Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)	Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)
Habitat Management			
Upland forest habitat	Maintain and enhance existing upland forest	Increase upland forests by reducing old fields and open lands by 25%	Increase upland forest by reducing old fields and open lands by 42%
Invasive plant species	Infestations reduced from current levels	Same as Alternative 1	Same as Alternative 1
Prescribed burning	Maintain existing habitats	Increased use of fire in Units 2 & 3	Prescribed fire in Unit 1 only.
Stream restoration	Continue ditch and stream restoration as opportunities allow	Increase ditch restoration in Unit 2	Increase ditch restoration in Units 2 & 3
Wilderness management	Follow existing wilderness management plan	Modify plan to allow for fire use in the Wilderness	Same as Alternative 2
Role of the Refuge in the landscape	Maintain existing habitat blocks	Encourage large blocks of contiguous habitat to compliment adjacent public lands.	Same as Alternative 2
Aquatic Resources			
Protection of waterbodies from invasive species	Increase monitoring and conduct control measures when necessary.	Same as Alternative 1	Same as Alternative 1
Predator and native fish populations	Maintain current balance of native and non-native fish populations	Enhance fish populations through stream restoration and fishing regulations	Same as Alternative 1
Wildlife Management			
Wildlife research capacity	Slightly increase on-site wildlife research and monitor impacts	Same as Alternative 1	Same as Alternative 1 with emphasis on restoration monitoring
Carrying capacity for trust species	Stable to increasing trust species with minimal monitoring.	Research and monitor species populations and interaction.	Same as Alternative 2
Beaver management	Remove beavers only when their activities threaten infrastructure	Same as Alternative 1	Encourage beaver population in restored waterways
Public Use			
Deer hunting	Firearms season under state regulations.	Same as Alternative 1	Same as Alternative 1

Table 7: Summary of Environmental Consequences for Management Alternatives for Seney NWR

Issue	Alternative 1: Current Management Direction of Opportunistic Conservation, Restoration, and Preservation (No Action)	Alternative 2: Habitat Management Gradient of Conservation Emphasis (Unit 1), to Conservation- Restoration Emphasis (Unit 2), to Restoration-Preservation Emphasis (Unit 3) and Wilderness Preservation (Unit 4) (Preferred Alternative)	Alternative 3: Management to Emphasize Historic Patterns and Processes through Restoration and Preservation (All Anthropogenic Habitats Removed in Units 2 and 3) and Wilderness Preservation (Unit 4)
Upland game hunting	Open during state season	Same as Alternative 1	Same as Alternative 1
Fishing	Allowed on select Refuge waters. No lead sinkers.	Same as Alternative 1.	Same as Alternative 1
Visitor capacity	Current emphasis and high level of public participation continue.	Increase over current status.	Same as Alternative 1
Outreach	Limited due to staffing.	Slight increase if funding is available.	Slight increase if funding is available.
Access			
Developed picnic area	Former Wigwam site opened for day use.	Same as Alternative 1.	Same as Alternative 1.
Miscellaneous Access (Horseback riding, snowmobile crossing)	Maintain prohibition according to Refuge regulations.	Work with snowmobile organizations to establish route in M77 right-of-way. Consider limited horseback riding on designated roads.	Same as Alternative 2

sciences, especially biology, but also within chemistry, geography, civics, and history, museums, zoos, parks, libraries, television and the news media (e.g., newspapers, magazines, the Internet) all contribute to improving environmental education for American students and citizens. As a result of the cumulative impact of these combined efforts, in recent decades the average American's level of environmental knowledge and awareness appear to have gradually increased. At present, Seney NWR provides a small amount of environmental education on and off the Refuge. These efforts are focused primarily on wildlife and habitat. Efforts and results are constrained in part by staffing and budgetary limitations. The Refuge is not able to dedicate an entire staff person's efforts to environmental education, rather it is a collateral duty shared among the staff.

Under Alternative 1, this would remain the same, and there would be a continuing modest contribution to overall environmental education efforts in the region. Under Alternative 2 and 3, environmental education would receive an increased emphasis. This enhanced effort would likely lead to an associated cumulative, beneficial impact on environmental knowledge and awareness in the citizens of Upper Peninsula of Michigan.

Chapter 5: List of Preparers

Refuge Staff:

- Tracy Casselman, Refuge Manager
- Greg Corace, Forester
- Greg McClellan, Deputy Refuge Manager
- Jennifer McDonough, Seasonal Park Ranger
- Dave Olson, Wildlife Biologist

Regional Office Staff:

- Gary Muehlenhardt, Wildlife Biologist/Refuge Planner, Region 3, USFWS
- Gabriel DeAlessio, Biologist-GIS, Region 3, USFWS
- John Dobrovolny, Regional Historian, Region 3, USFWS
- Jane Hodgins, Technical Writer/Editor, Region 3, USFWS

Michigan Department of Natural Resources:

- Sherry Martine MacKinnon, Acting Threatened and Endangered Species Coordinator/ Wildlife Ecologist, Eastern Upper Peninsula Management Unit.

Chapter 6: Consultation and Coordination with Stakeholders

The Service and Refuges have conducted extensive consultation and coordination over several years with stakeholders in developing the CCP and EA for Seney National Wildlife Refuge. In the course of scoping and focus group meetings, the Service consulted with more than two dozen individuals representing Michigan DNR, conservation organizations, neighboring communities, Refuge users, and other stakeholders. See Chapter 2 of the CCP for a more detailed description of the process.