

WILDLAND FIRE MANAGEMENT PLAN
SENEY NATIONAL WILDLIFE REFUGE



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Wildland Fire Management Plan

Seney National Wildlife Refuge

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I. INTRODUCTION

United States Department of Interior policy states that refuge lands with burnable vegetation must have an approved Fire Management Plan (FMP). The following FMP for Seney National Wildlife Refuge (NWR) has been developed to provide guidelines for fire management operational procedures. These procedures involve consideration of the use of fire in restoring and maintaining Refuge and regional-level biodiversity through the restoration and maintenance of Refuge forest/wetland structure and composition. To this end, this plan incorporates information from a number of existing documents including the Refuge Technical Report (1979), prior fire management plans, a fire history report, and various published works.

Since other related resource management plans do not address the environmental impacts of fire management activities, this FMP is subject to National Environmental Policy Act/National Historic Preservation Act compliance. Seney NWR does not at present have either a Comprehensive Conservation Plan (CCP) or a Habitat Management Plan (HMP).

A. MISSION STATEMENTS

The mission of the U. S. Fish and Wildlife Service (Service) is:

Working with others to conserve, protect, and enhance fish, wildlife, plants and their habitats for the continuing benefits of the American people.

The mission of the National Wildlife Refuge System is:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

The mission of Seney NWR as described in the approved "Vision for the Future" statement is:

Maintain a complex mosaic of habitats that supports an array of both wetland and upland wildlife species. Plant succession will be actively managed to maintain a wide range of conditions. Prescribed fires and forest cutting will be utilized to replace the effects of wildfires in regenerating and maintaining fire dependent plant communities.

Management at the Refuge is from an ecological perspective with consideration of the effects of management practices on existing patterns and processes. While management for migratory waterfowl and other migrants is of primary importance at Seney NWR, attention is given to providing habitat for a wide range of species. In doing so, managers consider the use of fire as a tool useful in restoration and maintenance of wetland and upland habitat.

B. STATUTORY AUTHORITIES

Several related statutory authorities govern this plan. These include the Clean Air Act, the Clean Water Act, the Endangered Species Act, the Refuge System Improvement Act, the National Environmental Policy Act, and the Wilderness Act. The Department Manual (910 DM) and the Fire Management Handbook (621 FW) contain other cited statutes authorizing and providing the means for prevention, pre-suppression, and suppression of wildfire on or threatening lands under the jurisdiction of the National Wildlife Refuge System. For ease of reference, these Authorities are listed below.

1. Protection Act of September 20, 1992 (42 Stat. 857; 16 U.S.C. 594).
2. McSweeney-McNary Act of 1928 (45 Stat. 221; 16 U.S.C. 487).
3. Economy Act of June 30, 1932 (47 Stat. 417; 31 U.S.C. 1535).
4. Taylor Grazing Act of June 28, 1934 (48 Stat. 1269; 43 U.S.C. 315).
5. O. and C. Act of August 28, 1937 (50 Stat. 875; 43 U.S.C. 1181e).
6. National Park Service Acts as amended (67 Stat. 495; 16 U.S.C. 1b).
7. Federal Property and Administration Services Act of 1949 (40 U.S.C. 471; et seq.).
8. Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66; 42 U.S.C. 1856a).
9. National Wildlife Refuge System Administration Act of 1966 as amended (80 Stat. 927; 16 U.S.C. 668dd through 668ee).
10. Alaska Native Claims Settlement Act of December 18, 1971 (85 Stat. 688; 43 U.S.C. 1601).
11. Disaster Relief Act of May 22, 1974 (88 Stat. 143; 42 U.S.C. 5121).
12. Federal Fire Prevention and Control Act of October 29, 1974 (88 Stat. 1535; 15 U.S.C. 2201).
13. Federal Land Policy and Management Act of 1976 (90 Stat. 2743).
14. Federal Grant and Cooperative Agreement Act of 1977 (P.L. 95-224, as amended by P.L. 97-258, September 13, 1982 (96 Stat. 1003; 31 U.S.C. 6301 through 6308).
15. Alaska National Interest Lands Conservation Act of December 2, 1980 (94 Stat. 2371).
16. Supplemental Appropriation Act of September 10, 1982 (96 Stat. 837).
17. Wildfire Suppression Assistance Act of 1989 (P.L. 100-428, as amended by P.L. 101-111, April 7, 1989).
18. Indian Self-Determination and Education Assistance Act (PL 93-638 as amended).
19. National Indian Forest Resources Management Act (P.L. 101-630, November 28, 1990).
20. Tribal Self-Governance Act of 1994 (P.L. 103-413).
21. Department of the Interior and Related Agencies Appropriations Act (P.L. 103-132).

II. COMPLIANCE WITH U.S. FISH AND WILDLIFE SERVICE POLICY

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 and 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. Approximately 20 species of herptofauna, 48 species of mammals, 26 species of fish, and over 200 species of birds have been documented on the Refuge. Many of these species are Conservation Priorities for Region 3 (**Appendix 1**).

The wide array of both year-round residents and migratory species found on Seney NWR is due to the varied habitat types found in the open water/wetland/forest complex. The mix of young and mature forests, forested wetlands, and emergent marsh and sedge meadows contributes to the overall biodiversity of the Refuge. As part of the native ecosystem, fire functions as a critical process of early successional habitats required by many wildlife species of management concern (e.g., sandhill crane, *Grus canadensis*; yellow rail, *Coturnicops noveboracensis*; see Stenzel 1982 and Burkman 1993).

III. DESCRIPTION OF REFUGE

A. LOCATION

Seney NWR is located in the east-central portion of Michigan's Upper Peninsula equidistant from Lake Superior and Lake Michigan. The Refuge encompasses approximately 95,238 acres; the Seney Wilderness Area and Strangmoor Bog National Natural Landmark encompass 25,150 acres or 26 percent of the Refuge. Located in northeastern Schoolcraft County, the refuge is removed from major population centers; the three nearest major communities are each more than 80 miles away (**Fig. 1**).

B. HISTORY

Before its establishment, the forests and soils of the Seney area and surrounding Schoolcraft County were exploited to a considerable degree starting in the late 1800's. Early timber cutting favored the best stands of white pine, followed by "high-grading" in the red pine and hardwood-hemlock stands. Slash fires fueled by logging debris occurred annually with most areas burning time and time again. 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.

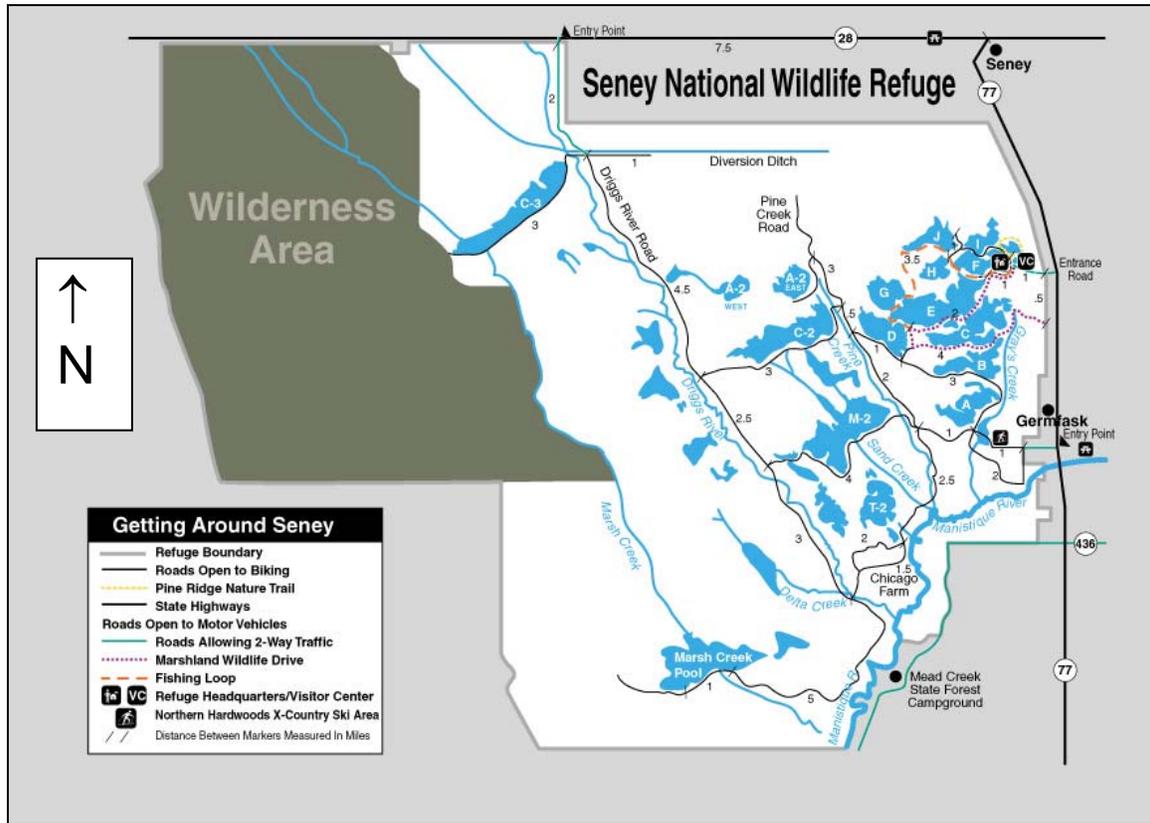
By 1912, drainage of the Seney Swamp was underway. Imperfect drainage of peat soils, poor soil fertility, and the short growing season made the farming venture a disaster and most lands were tax-reverted to the State of Michigan by the early 1930's. Seney NWR was then established in 1935 by Executive Order under the Migratory Bird Conservation Act for the protection and production of migratory birds and other wildlife. The Refuge now receives nearly 100,000 visits from the public each year and a variety of wildlife-oriented activities and programs are available.

C. 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 humidity during spring and fall burning seasons varies from 50 to 60 percent. Temperature extremes are approximately -35 degrees Fahrenheit and 98 degrees Fahrenheit. Burning season temperatures average 56 degrees Fahrenheit. Precipitation occurs throughout the year, with June being the wettest month and March the driest on average. Average annual precipitation is approximately 27 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.

Figure 1 - Seney National Wildlife Refuge



D. TOPOGRAPHY AND GEOLOGY

According to the regional landscape classification system of Albert (1995), Seney NWR lies within the Seney Sand Lake Plain (Sub-Subsection VIII.2.1, **Fig. 2**). This unit is characterized by landforms of lacustrine origin with broad, poorly drained embayments containing beach ridges, swales, dunes, and sandbars.

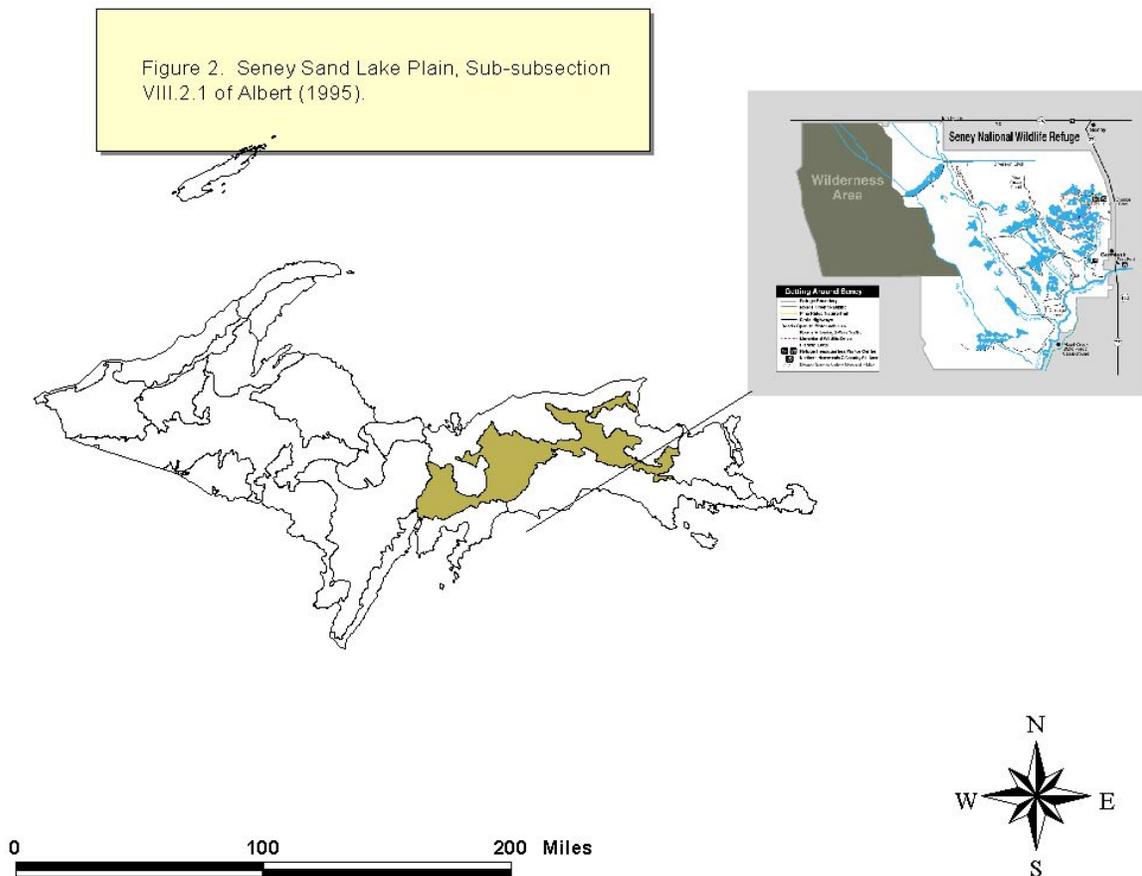
The lands comprising Seney NWR present an area of seemingly little geological variation in comparison with more scenic areas along the shores of Lake Superior and Lake Michigan. Although relatively little topographic relief exists on the Refuge (elevation varies from approximately 803 feet in the northwest 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 east of the Driggs River (Seney Wilderness Area). Finally, the present 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.

Figure 2 – Regional Landscape



E. 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. Very little decomposition has taken place in the areas of yellow peat. The water table is at the surface most of the year. The peats on the Refuge are interrupted by areas of Carbondale and Tawas mucks. 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.

F. WATER

The major trend has been for streams to cross the Seney area at a north-south to northwest-southeast trajectory and to join the northeast-southwest trending Manistique River. This stream channels runoff into Lake Michigan at the town of Manistique. The Manistique River valley, for example, marks an approximate geologic boundary between eroded lowlands of the Seney Marsh and the uplands of earlier glacial outwash deposits to the east. Meltwater from the Valdres ice front apparently channeled water into the pre-existing Manistique River, allowing for the erosion of earlier outwash deposits in the Seney area and the removal of these sediments through the Manistique River.

Twenty-one man made pools have been constructed on the Seney NWR and they impound nearly 6,500 acres of open water (**Table 1**). These pools were created by an intricate dike system that catches water as it flows through the Refuge. Because the general topography of the Refuge is flat with a natural drainage to the southeast, water flows from one pool to another without the aid of pumping stations. The principle source of water for these pools is several streams and ditches that flow into the Refuge from the north.

Table 1 – Pool Size by Unit

Unit	Pool	Acreage (Open Water)
1	Show Pools	57
	Upper Goose Pen	27
	Lower Goose Pen	93
	A-1	259
	B-1	243
	C-1	302
	D-1	197
	E-1	490
	F-1	258
	G-1	202
	H-1	111
	I-1	129

Unit	Pool	Acreage (Open Water)
	J-1	214
Unit 1 Total =		2,582
2	A-2	282
	C-2	501
	M-2	863
	T-2	410
Unit 2 Total =		2,056
3	C-3	702
	Marsh Creek	950
	Delta Creek	50
	Spur Pools	155
Unit 3 Total =		1,857
Total Pool Acreage =		6,495

Water levels within the pools can be regulated to accomplish certain objectives. The water level of each pool is controlled independently of the others by regulating the water control structure. When waterfowl are nesting, water levels are kept high to discourage terrestrial predators. Through the summer and fall, levels are drawn down to promote growth of aquatic plants. During winter months, water is manipulated to either maintain fish populations or to reduce them. The average depth of water in the pools is between 2 and 3 feet and seldom exceeds 5 feet. The pools are composed predominately of fibrous peat and sand (along dikes and islands).

The Manistique River from Germfask flows south through the southeastern corner of the Refuge. The river at this location is about 50 to 100 feet wide and varies from 2 to 6 feet in depth. The streambed is composed mostly of sand and some gravel. Stream flow is rather placid with few riffles located along the river course.

The highest average discharge of water in one day recorded on the Manistique River near Manistique, Michigan, was 16,500 cubic feet per second (cfs) in 1960. Climatic conditions in the Upper Peninsula result in the high water levels occurring during spring snowmelt. One hundred year runoff conditions would be 16,295 cfs, with a probability of exceedence of 10 percent. Lowest daily discharge in the Manistique River near Manistique was 290 cfs and this value coincides with the driest month on record for the area (October 1947). Control of pool elevations on the Refuge may cause fluctuations in the tributaries that run through the Refuge in seasons other than those normally expected.

Recently, a large-scale Marsh and Walsh Creek Restoration Project was initiated at the Refuge. The purpose of the Project is to restore the hydrology and ecological integrity of the wetlands and streams that have been affected by the drainage of Walsh Ditch. The Walsh Ditch drains wetlands for 6 miles within the Seney Wilderness Area. This restoration was compelled by mandate of the Wilderness Act of 1964 and the Improvement Act of 1997. Wilderness is defined as:

an area where earth and its community of life are untrammelled by man, . . . an area of undeveloped Federal Land retaining its primeval character and influence without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable . . .

In the National Wildlife Refuge System Improvement Act of 1997, the Secretary of Interior was directed to:

ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans.

G. AIR

The Seney Wilderness was designated as a Class I Area in 1977 under the Federal Clean Air Act giving the area special protection from air pollution impacts. The Refuge has the responsibility to protect air quality related values in the area from adverse impacts from human-caused air pollution. Air quality related values include flora, fauna, soil, water, visibility, odor and cultural and archeological resources. Despite this protection, the Service has documented impacts to Refuge resources from air pollution, primarily from sources outside the refuge. For example, Refuge surveys conducted from 1999-2001 found injury to vegetation from ozone pollution formed from industry, power plant, and auto emissions. Power plants and other sources also release mercury, which bioaccumulates in fish and wildlife at the Refuge. In addition, visibility at the Refuge is often impaired by fine particulate pollution. A review of air quality issues pertaining to the Refuge can be found in the Air Quality Briefing, Seney NWR (2001).

The Clean Air Act, as amended, requires the Refuge to comply with all Federal, state, and local air quality standards and regulations to the same degree as any non-Federal entity. These standards and regulations impact how the Refuge manages fire. The primary combustion products emitted by wildland fires include carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons, and nitrogen oxides. Some of these combustion products are considered to be air pollutants and can adversely affect human health and air quality related values. For example, small particulate matter can impact visibility by scattering and absorbing light, affecting how far and how well we can see. However, wildland fires are infrequent and relatively short in duration and, as a result, their impact to visibility is also limited to short periods of time. In addition, the Refuge uses smoke management techniques, such as scheduling prescribed fires during those periods when fuel and meteorological conditions will minimize air quality impacts.

Monitoring by the nationwide IMPROVE (Interagency Monitoring of Protected Visual Environments) network has shown that, in general, most visibility impairment at Class I areas is caused by sources outside the Class I areas, including power plants, industry, and autos. In 1999, the Refuge joined the IMPROVE network and is now collecting information to determine the causes of visibility impairment at Seney. In addition, an automatic camera continuously records visibility conditions at the Refuge, which are updated every 15 minutes at www.mwhazecam.net. Real-time particle measurements from the Refuge are also available at the website.

The Service is working with States, Tribes, and the Environmental Protection Agency and others to protect and improve visibility in Seney and other Class I areas. This effort is a result of the EPA's 1999 regional haze regulations, which require States to develop plans to make progress towards the national visibility goal of preventing any future and remedying any existing visibility impairment due to human-caused pollution in Class I area. The Service, States, Tribes, and EA recognized that fire is a natural part of the ecosystem. As such, it is likely that emissions from wildfire and some prescribed will be considered as part of the natural visibility background. The Service along with States, Tribes, EPA and others are participating in regional planning and analysis which will likely result in emissions controls programs to protect and improve visibility in Class I areas throughout the country.

H. HABITAT TYPES

Pre-European forests consisted of large tracts of sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), eastern hemlock (*Tsuga canadensis*), yellow birch (*Betula alleghaniensis*) and red and white pine (*Pinus resinosa* and *Pinus strobus*). Fire, which periodically altered this association, allowed successional species, particularly white pine (*Pinus strobus*), paper birch (*Betula papyrifera*), and aspen (*Populus* spp.) to become abundant. Swamp forests were dominated by black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*) (**Fig. 3**).

During the late 19th century the pine forests (and to a lesser extent, the hardwood stands) were heavily logged. The swamp conifers, on the other hand, were logged only to a limited extent as access to this resource was difficult. Early logging was usually associated with uncontrolled fires that burned much of the soil humus needed for rapid forest regeneration. As a result, much of the forest re-growth and maturation (i.e., closing of forest openings) has occurred only in recent years. Large areas of present vegetation consist of the aspen-birch and white-red-jack pine types (*Pinus banksiana*)

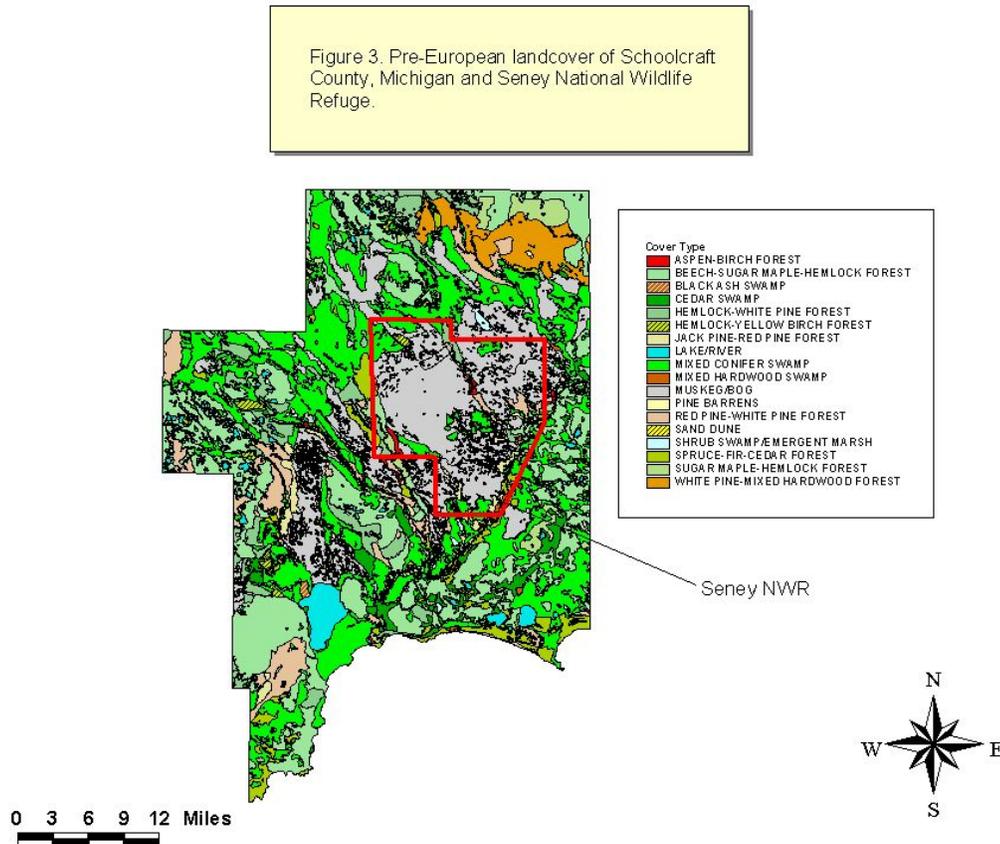
Due to many parameters, the present condition of the second growth forest is quite variable. On good upland sites there is an abundance of sugar maple, beech and yellow birch. Swamp forests, however, presently cover large areas of wilderness. Refuge visitors only infrequently use these areas. A brief discussion of major community types is given below, see **Table 2** and **Fig. 4** for major land cover types.

Table 2 shows approximate acreage of major landcover types of Seney National Wildlife Refuge as derived from interpreted 1992 National Aerial Photography Program (NAAP) airphotos. Although desired minimum resolution is approximately 2 acres, considerable ground-truthing is necessary to enhance quality and to reduce classification error. Due to the need to lump and/or split categories, these cover types differ from the community types discussed below.

Table 2 – Major Landcover Types

Cover Type	Approximate Acreage	Percent
Shrub-Scrub	24,755	26
Coniferous Forest	22,851	24
Marsh	17,138	18
Bog	7,616	8
Broadleaf Forest	5,713	6
Wetland Broadleaf Forest	3,808	4
Wetland-Coniferous Forest	2,856	3
Openlands	2,856	3
Open Water	2,856	3
Submergent	1,904	2
Wetland Mixed Forest	1,904	2
Mixed Forest	478	<1
Unclassified	503	<1
Total	95,238	100

Figure 3 – Pre-European Landcover



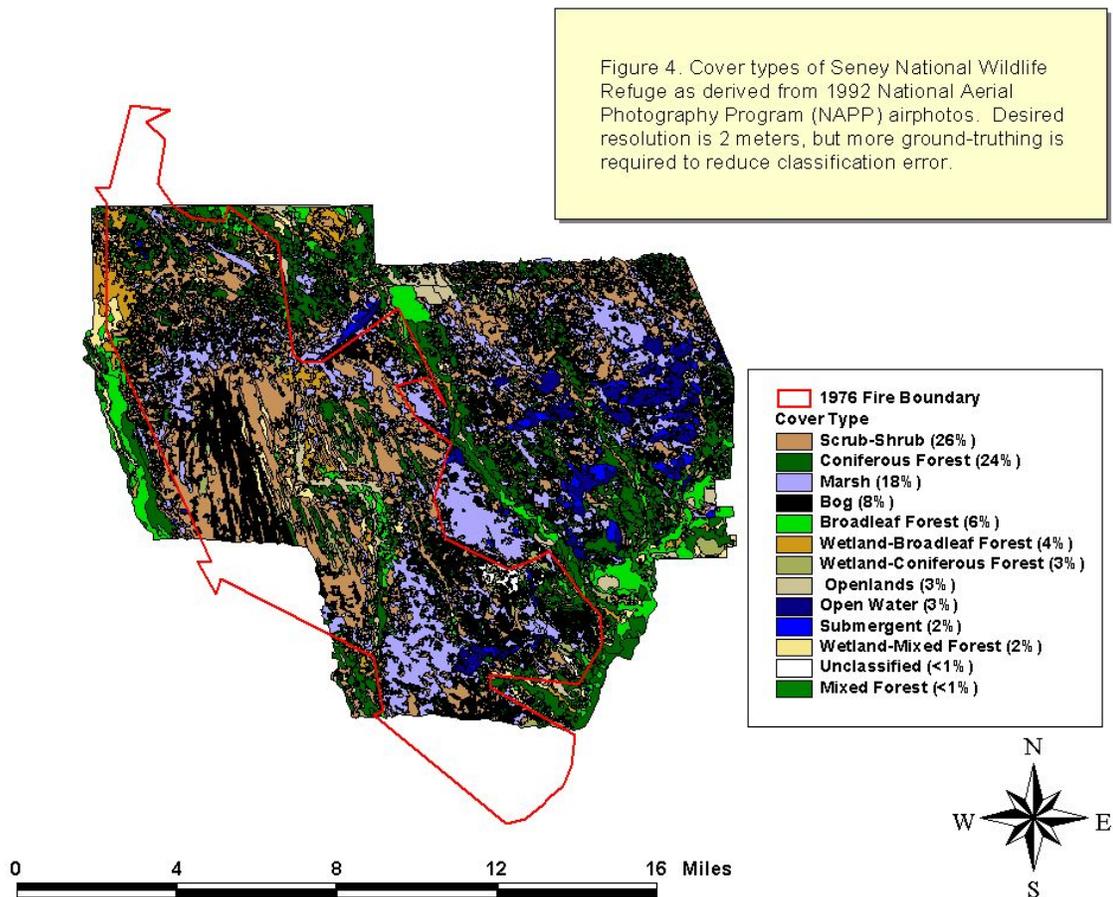
The white, red, and jack pines are major constituents of the **upland coniferous forest community**. Associated species vary but would include primarily aspen, red maple (*Acer rubrum*), and others. Understory species include wild raisin (*Viburnum cassinoides*), bracken fern (*Pteridium aquilinum*), hazels (*Corylus* spp.), wild strawberry (*Fragaria virginiana*), princess pine (*Lycopodium* spp.), blueberry (*Vaccinium* spp.), and huckleberry (*Gaylussacia baccata*). Lichens, grasses and sedges are also represented, especially in the second growth aspen stands. White pine was a dominant forest component in the Seney area before logging and burning converted thousands of acres to second growth aspen and jack pine. This forest type still exists, but is scattered throughout Seney NWR.

The **upland hardwood forest community** 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 (*Tilia americana*), black cherry (*Prunus serotina*), paper birch, white spruce (*Picea glauca*), and balsam fir. When the tree canopy closes in, the herbaceous plants disappear. However, in suitable areas, several shrubs (e.g., Canada Yew (*Taxus canadensis*), elderberry (*Sambucus* spp.), leatherwood (*Dirca palustris*) and hazel) and other plants (e.g., partridge berry (*Mitchella repens*), bunchberry (*Cornus canadensis*), twinflower (*Linnaea borealis*), baneberry (*Actaea* spp.), trillium (*Trillium* spp.)) could occur. This forest type is located in the southwest section of the Refuge.

The **lowland conifer forest community** 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, while white cedar (*Thuja occidentalis*), black spruce and tamarack (*Larix laricina*) constitute the majority in the second forest type. Typical associates include paper birch, red maple, and alder (*Alnus* spp.). Common shrubs include round-leaved dogwood (*Cornus rugosa*), hazel, honeysuckle (*Lonicera* spp.), thimbleberry (*Rubus parviflorus*), and blueberries. Other understory plants include sweet gale (*Myrica gale*), leatherleaf (*Chamaedaphne calyculata*), bog rosemary (*Andromeda glaucophylla*), and cranberry (*Viburnum* spp.). However, when the canopy is closed little understory exists.

The **peatland community** is one of the most significant features of the Refuge. Within this area, pine knolls, bog forests, bog hollows, and bog ridges all occur in a unique association. The pine knolls are composed of sand dunes and the following plants are commonly found on them: white and red pine, red maple, paper birch, white cedar, black spruce, huckleberry, and bunchberry (*Cornus canadensis*). The bog forest is usually located downslope from these knolls and plants commonly found here are tamarack, sphagnum moss, willows (*Salix* spp.), sedges (*Carex* spp.), red maple, labrador tea (*Lecum groenlandicum*), royal fern (*Osmunda regalis*), and dwarf blackberry (*Rubus allegheniensis*). The bog hollows will support bog rosemary, cranberry, pitcher plant (*Sarracenia purpurea*), horsetail (*Equisetum*), cottongrass (*Eriophorum spissum*), and three-way sedge. Finally, the bog ridges are composed of bog birch (*Betula pumila*), leatherleaf, bog rosemary, cranberry, blue flag (*Iris versicolor*), bluejoint (*Calamagrostis canadensis*), and wintergreen (*Gaultheria procumbens*).

Figure 4 – Cover Types



Shrub swamps, meadows and marshes are also present on the Refuge. **The shrub swamp community** is represented primarily by alders. Other species include red osier dogwood, willow, meadowsweet (*Spiraea latifolia*), current (*Ribes* spp.), bedstraw (*Galium* spp.), joe-pye-weed (*Eupatorium* spp.), goldenrod (*Solidago* spp.), and marsh fern (*Thelypteris palustris*). **Meadows** contain many different herbaceous species and the composition would be related to moisture, exposure, and soil conditions. **Marshes** provide habitat for grasses, sedges, rushes (*Juncus* spp.), marsh horsetail (*E. palustre*), bladderwort (*Utricularia* spp.), cattails (*Typha* spp.) and bottle gentian (*Gentiana andrewsii*).

I. HISTORICAL AND ECOLOGICAL ROLE OF FIRE

Fire functions in the perpetuation of forests, prairies, and wetlands in the Upper Great Lakes region and thus is important in maintaining and restoring populations of associated wildlife species, many of which are seriously declining nationwide (Niemi and Probst 1990, Loope 1991, Albert 1995). At Seney NWR, fire is considered a natural disturbance mechanism and the communities in which fire is most vital are the shrub-scrub (26%), coniferous forest (24%), marsh (18%), and openlands (3%) which comprise a total of 71% of the Refuge.

Ecological processes affected by fire include succession, surface erosion, vegetation recovery rates, and potential productivity. Fire also affects soil, water, and air quality. Although few wildlife species are considered fire obligates, many species benefit from fire indirectly. Generally managers should consider how species populations at local scales are influenced by the way in which fire alters habitat. For example, although Kirtland's Warbler can nest and reproduce successfully in conifer stands not produced from wildfire, fire-induced stands within the region have higher densities of this species. Moreover, fire typically produces a mosaic of burned and unburned patches, the juxtaposition of which depend on characteristics of the fire, soil moisture, and weather. The connectivity and size of these patches influences species composition, abundance and movement patterns within and between patches. This heterogeneity is almost impossible to mimic without fire as a management tool.

In wetland systems, fire is especially important during times of drought when water levels are reduced. In areas comprised of emergent vegetation and shrubs, fire can be used to reduce woody cover and promote seed bearing plants used by waterfowl and other herbaceous vegetation used by a wide range of non-game species. In forested ecosystems, fire promotes early successional communities and provides structural complexity by producing openings interspersed by standing live and dead trees (snags).

J. REFUGE FIRE HISTORY

Based on General Land Office (GLO) Notes, Albert (1995) states that fire was a regular disturbance of the native ecological communities of the Upper Peninsula. In regards to the communities of Seney NWR, prior to European settlement fires occurred regularly on both the extensive peatlands and on the dunes within the peatlands approximately every 29 years (W. Loope, Pictured Rocks National Lakeshore, *Pers. Comm.*). Most of the larger fires that occurred during the late 19th and early 20th centuries were associated with extensive logging and residual slash.

The first recorded regional fire indicated by the GLO notes was in October of 1871 when approximately 50,000 acres of land burned in the Upper Peninsula. Between 1883 and 1885, large fires occurred throughout the central and eastern Upper Peninsula. In 1902, a fire occurred near Seney and spread west to the town of Munising and north to Grand Marais. This fire is thought to have been particularly intense and destructive. Another fire occurred the following year and again in 1905 and 1906. Over the next twenty years or so, large fires fueled by the slash left behind by logging occurred several times within the region (**Table 3**). In many years (e.g., 1912, 1918, 1920,

1925, 1930, and 1933), fires were reported to be so common in the eastern Upper Peninsula that smoke hung over much of the area throughout the months of July and August.

Thirty-three wildfires occurred on the Refuge during the period 1936 to 2001, with the average occurrence of fire approximately every 2 years. The first wildfire documented in annual reports took place in 1944 and was caused by lightning. All told, this fire occurred over approximately 500 acres of willow shrubs and marsh vegetation.

The Walsh Ditch Fire of 1976, which occurred on the Refuge, has had a long-term impact on the way wildfire is thought of by natural resource managers and wildfire fighters in the State of Michigan. By the time the last flame was put out, this fire became the largest to have ever occurred on the Refuge since its establishment. All told, the fire spread over 100 square miles, burned for 6 weeks, required an interagency fire-fighting force of more than 1,200 to achieve containment, and caused considerable alteration to the local vegetation cover. The fire occurred in primarily northern mixed forest stands and string-bog habitat (Seney Wilderness Area, **Fig. 4** above). Table 3 data are derived from numerous sources compiled by Burkman (1991).

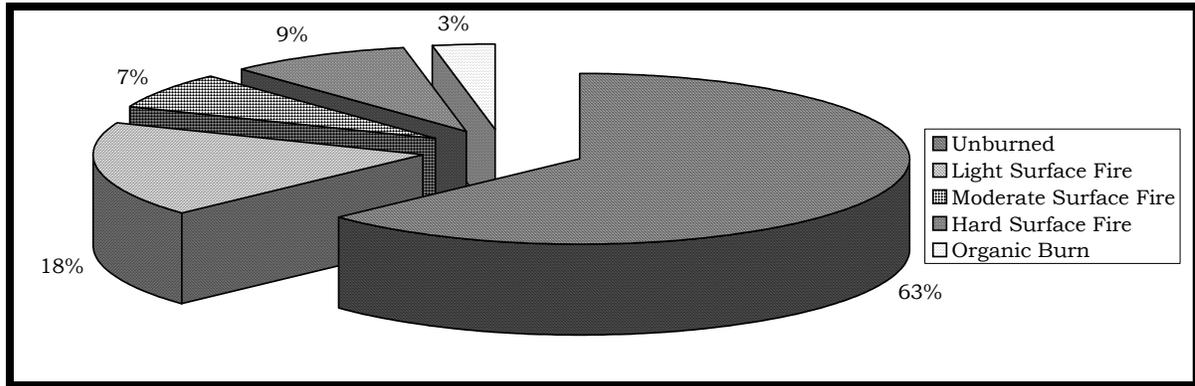
Table 3 – Reported Fire History for the Seney Area, 1915-1936

Year(s)	State(s) or Region	Approximate Acres
1915	Michigan and Wisconsin	203,000
1917	Upper Peninsula	70,000
1918	Wisconsin and Upper Peninsula	100,021
1919	Upper Peninsula	418,000
1922	Michigan	7,750
1923	Michigan, Minnesota, and Wisconsin	1,490,000
1924	Michigan, Minnesota, and Wisconsin	487,000
1925	Schoolcraft County	16,640
1930	Seney area	60,936
1931	Seney area	11,130
1936	Seney area	9,343

The Walsh Ditch Fire began during the driest year on record since 1872. The weather station in Marquette recorded an 8 inch rainfall deficit, and in the eastern Upper Peninsula deficits in the range of 9 to 12 inches were recorded. The water table at the Refuge was down approximately 1 foot and the fire danger was listed as "extreme" by the end of July. On July 30, a lightning strike ignited a fire in T44N-R15W, Section 1. By August 3, the fire spread to 200 acres and by the 12th to 1,500 acres. On August 23, strong northwest winds, warm temperatures, and low humidity resulted in the fire moving 9 miles and encompassing 20,000 acres by the next day. By the 29th, the fire was determined to have burned 30,850 acres, but the southern point of the fire was considered "contained." By the 30th, the fire moved northwest and by September 3rd the fire had reached 49,000 acres. On September 7th, the fire was considered to be "contained" after 64,000 acres burned. At this point, the perimeter of the fire encompassed 54,000 acres of the Refuge. The fire was declared "controlled" on September 9th, but over the next month strong winds and low humidity flamed the fire a number of times. According to Anderson (1982), of the 76,300 acres that were within the fire perimeter on the Refuge, only 35,623 (37%) actually burned to varying degrees (**Fig. 5**).

During the period 1977 to 2001, a number of fires occurred on the Refuge with the largest being a fire that burned approximately 3,000 acres during August of 1983. This fire began during a severe drought and was first detected on August 14th. It was declared "out" on October 3rd.

Figure 5 – Breakdown of 1976 Walsh Ditch Fire by Acres and Severity of Burn



Wildfires at Seney NWR have started in a number of ways. Lightning strikes have caused 58% of all fires with escaped prescribed fires and human activity the cause of 42% of fires (Table 4).

K. FIRE EFFECTS

The Walsh Ditch Fire provided a rare opportunity to investigate the landscape-scale effect of fire. Using a paired sampling scheme to compare soil, water, and wildlife characteristics of burned and unburned areas, Anderson (1982) concluded that although the Fire had little effect on most abiotic characteristics of the Refuge it had dramatic effect on biotic features. Basic soil data collected after the Fire showed few differences of ecological significance between burned and unburned areas. The Fire did not seem to alter any soil chemistry; only minor impacts occurred to the mineral soils. In regards to water quality, the interrupted pattern and low intensity of fire along the watercourses mitigated the potentially deleterious effects of fire on aquatic resources. Although not discussed to any great degree by the author, smoke was a problem for local citizens and did create localized air pollution issues.

Vegetation structure was the major wildlife habitat component affected by fire and was altered most drastically in the peatland areas of the Refuge. On the treeless bog strips, burn scars will likely remain for many years. The bog forests also showed considerable change since most of this cover type was burned to the ground. On many of these sites, aspen, jack pine, and blueberry became established in a relatively short period of time and at present dominate these areas.

In general, the effects of fire on wildlife at Seney NWR are considered to be favorable. Some of the major wildlife objectives of Seney NWR are to a) maintain a healthy population of nesting waterfowl, and b) to provide habitat for maintaining biodiversity. Fire is an important tool for meeting these objectives. The patchy nature of the Walsh Creek Fire increased the overall wildlife diversity of Seney NWR by creating a more diverse landscape mosaic. Because the Fire did not burn a continuous block of land, many wildlife species likely found refuge in the scattered areas not touched by the fire. Generally, the burned areas attracted larger numbers of some small mammals and bird species along with their predators. Although some forest interior-inhabiting bird species were displaced, existing habitat for these species was still available elsewhere in the Refuge.

In the future, fire should be used to create and maintain quality early successional habitat within both terrestrial and wetland ecosystems by reducing woody vegetation cover. Fire will promote breeding habitat comprised of grasses and sedges for a wide range of wetland obligate species (e.g., waterfowl, yellow rail, sedge wren, *Cistothorus palustris*, Le Conte's sparrow, *Ammodramus leconteii*). Within xeric terrestrial ecosystems, fire and other silvicultural tools can be used to maintain habitat for other

openland species of conservation concern (e.g., sharp-tailed grouse, upland sandpiper). In red and white pine ecosystems, fire use may promote savanna-like ecosystems whereas in jack pine-dominated sites the use of fire should promote a patchy distribution of regenerating jack pine and openlands. Such conditions may favor species such as Kirtland's warbler (*Dendroica kirtlandii*) as well as a number of winter finches that are in global decline. Fire can also promote vigorous aspen regeneration where desired (see Niemi and Probst 1990).

Table 4 – Documented wildfire history 1944-2001 by cause and year.

Name/Location	Cause and Year			
	Lightning	Human Activity	Escaped Prescribed Fire	Other
Diversion Ditch	1944			
C-2 Dike		1946		
SE Corner			1947	
Marsh Creek				1954 (Unknown)
Unit III	1955			
Unknown	1955			
Unknown	1955			
Conlon Area				1962 (Unknown)
A-2/Pine Creek	1962			
Chicago Farm			1963	
Delta Creek	1964			
Walsh Ditch	1964			
Entrance Area				1966 (Downed Powerlines)
M-2	1966			
Driggs River Rd.	1966			
Wilderness Area	1967			
Wilderness Area	1970			
Walsh Ditch	1976			
Pine Creek Road			1976	
Manistique River		1979		
Manistique River		1979		
Marsh Creek Area		1983		
Manistique River		1983		
Mead Creek	1984			
C-3	1987			
North Marsh Creek	1988			
Coyote	1988			
J-G Spillway			1991	
Conlon Farm		1991		
Sub-Headquarters Farm		1997		
A2	1998			
River Road		1998		
Total (Number)	18	8	4	3
Total (Percent)	55	24	12	9

To assess the effectiveness of fire management, vegetation monitoring could be linked to studies of bird and mammal use and abundance so as to measure the effect of fire at different levels in an

ecosystem. Because most birds are relatively easily and affordably assessed and because most species have relatively high habitat specificity, they can be used as good indicators of ecological condition. Thus, an assessment of bird use can be a good measure of the effectiveness of fire on broader ecological patterns and processes.

IV. FIRE MANAGEMENT GOALS AND OBJECTIVES

In the following discussion of fire specific goals and objectives, goals are considered to be general, long range aspirations of the Refuge; objectives are specific, field-observable conditions that the recommended practices are designed to achieve in order to enhance the goals. The goals and objectives have been created within the context of the “Vision Statement” for Seney NWR:

Maintain a complex mosaic of habitats that supports an array of both wetland and upland wildlife species. Plant succession will be actively managed to maintain a wide range of conditions. Prescribed fires and forest cutting will be utilized to replace the effects of wildfires in regenerating and maintaining fire dependent plant communities.

A. FIRE MANAGEMENT GOALS

1. Safety of the general public and all those associated with management of Seney NWR.
2. Protect life, property, and other resources.
3. Use fire as a tool where appropriate to accomplish resource management objectives.
4. Restore fire as an ecological process within fire-regulated ecosystems.
5. Develop and implement a process to ensure the collection, analysis, and application of fire management information necessary to make informed management decisions.
6. Develop a process that incorporates fire in the Wilderness Area while still maintaining a Class 1 Airshed.

B. FIRE MANAGEMENT OBJECTIVES

1. Protect important scientific, cultural, historic, prehistoric, and scenic resources, private lands, and visitor, administrative, and other facilities/structures from wildfire by suppression strategies using Minimum Impact Suppression Techniques (MIST).
2. Restore and conserve habitat necessary to maintain Refuge and regional-level native biodiversity by maintaining and restoring vegetation structure and composition through the use of prescribed fire. This involves maintaining sedge-dominated conditions within existing areas and reducing encroaching woody vegetation. In forested areas fire will also be used (in conjunction with other forest management techniques) to restore structure and composition. In sandy outwash, fire will be used as a disturbance to stimulate new vegetation growth and promote blueberry production.
3. Educate the public regarding the role of fire as a natural disturbance mechanism that regulates vegetation composition and structure. Devise education programs at the Visitor Center specific to fire.
4. When making decisions regarding the Wilderness Area, complete a minimum requirement analysis and a minimum tool analysis before any actions are taken.

V. FIRE MANAGEMENT STRATEGIES

A. STRATEGIES TO MEET FIRE MANAGEMENT GOALS

1. Investigate the use of prescribed fire in the Seney Wilderness Area with consideration of monitoring protocols and staffing needs.
2. The Refuge will utilize the appropriate management response to suppress all wildfire (including lightning ignitions).
3. Suppress all wildfires outside of the Wilderness Area in a safe and cost-effective manner consistent with resources and values threatened by fire.
4. Suppression strategies and tactics will be unique to each incident dependent on safety considerations, weather conditions, cost of suppression, fuel conditions, availability of resources and location of the fire in relation to structures and cultural resource sites.
5. Minimum Impact Suppression Techniques (MIST) will be used whenever possible.
6. Prescribed fire will be utilized to modify vegetative communities for improved wildlife habitat, ecosystem function, the control of invasive, exotic, or noxious weed control, and hazard fuel reduction.

B. FIRE USE STRATEGIES

1. Conduct a literature review to determine the effectiveness of prescribed fire to achieve resource objectives.
2. Use Minimum Impact Suppression Techniques and indirect attack to suppress all wildfires.
3. Provide increased wildfire protection by either constructing fuel breaks around all exterior boundaries or increasing patrols during periods of high fire danger.
4. Establish long-term monitoring transects / plots in all major upland habitat types to detect change in vegetation structure and composition between pre and post-burn.
5. Prescribed fire may be used to restore and maintain wildlife habitat and to reduce hazardous fuel accumulations, provided resource objectives are also achieved.
6. Determine the effects different aerial retardants have on wetland patterns and processes.

C. LIMITS TO STRATEGIES

1. Some aerial retardants may alter natural wetland/riparian processes. After a review of different retardants is done, those considered to directly affect wetlands will not be used.
2. Studies of firefighting foams has indicated some degree of toxicity to fishery resources. Foam will not be applied within 200 feet of open water. Preparation and cleaning of equipment with foam residue will be in accordance with the guidelines found in **Appendix ??**

VI. FIRE MANAGEMENT RESPONSIBILITIES

A. PERSONNEL

Currently, only one member of the Refuge staff is fire qualified. An increased interest in a fire management program warrants additional qualified staff. Table 5, below, shows the minimum number of personnel needed for wildland fires, including Wildland Fire Use. Table 6 shows the needs for prescribed fire operations. An individual may qualify for more than one position and not every position will be filled on every incident or prescribed fire operation.

An example in Table 5 is the Incident Commander, Type 4; a prerequisite for this position is satisfactory performance as a single resource boss, the Engine Boss is a single resource boss. At the same time, a prerequisite for Engine Boss is satisfactory performance as a Firefighter, Type 1, the same requirement exists to be an Incident Commander, Type 5.

Table 5 – Staffing Needs for Suppression and Wildland Fire Use

Position	Mnemonic	Number Required	Physical Level
Incident Commander, Type 5	ICT5	1	Arduous
Incident Commander, Type 4	ICT4	1	Arduous
Engine Boss	ENGB	1	Arduous
Engine Operator	ENOP	1	Arduous
Firefighter, Type 2	FFT2	3	Arduous
*Fire Effects Monitor	FEMO	2	Arduous

* - Required for Wildland Fire Use

In Table 6, the Ignition Specialist, Type 2 must be qualified as a single resource boss. Again, the Engine Boss, with some additional training, qualifies. The Prescribed Burn Boss, Type 2 must be qualified as both an Ignition Specialist, Type 2 and Incident Commander, Type 4. A Prescribed Burn Boss, Type 3 is a Fish and Wildlife Service specific position created to conduct low complexity prescribed fires.

Table 6 – Staffing Needs, Low to Moderate Complexity Prescribed Fires

Position	Mnemonic	Number Required	Physical Level
Prescribed Burn Boss, Type 3	RXB3	1	Arduous
Prescribed Burn Boss, Type 2	RXB2	1	Arduous
Ignition Specialist, Type 2	RXI2	1	Arduous
Engine Boss	ENGB	1	Arduous
Engine Operator	ENOP	1	Arduous
Firefighter, Type 2	FFT2	3	Arduous

B. REFUGE STAFF RESPONSIBILITIES

Below is a list of positions associated with Refuge burn programs. Some positions are not necessarily associated specifically with Seney NWR, but are included to provide an overview of Service fire management program.

Refuge Manager (RM): The Refuge Manager is responsible for the full range of management duties within the Refuge, including fire management activities that implement an effective fire management program. The appropriate action will be taken by the manager for fires on Refuge lands. Related fire

management activities include delegation of authority, approval of agency advisors, implementing the Wildfire Situation Analysis (WFSA) and approval of prescribed fire operations.

Fire Management Officer (FMO): The Zone FMO is a resource shared by the stations within his/her zone. The FMO advises the Refuge Manager or staff as requested on matters relative to fire planning, fire pre-suppression, suppression and prescribed burning. The FMO also assists in intraagency and interagency fire management needs. The FMO supplies technical assistance relative to fire management activities and also advises the assigned stations on priorities, strategies and tactics to reduce adverse fire impacts. The FMO can assist with oversight and coordination of the Refuge's fire management program, including wildfires, prescribed burning, and fire related dispatch and mobilization. The FMO can also assist with matters pertaining to preparation and implementation of the Fire Management Plan and can represent the assigned stations and coordinate fire related activities with: other refuges, regional fire coordinator, and local, state and other federal fire organizations as directed by the RM. The FMO also reviews refuge annual prescribed burn plans; maintains training and qualification records for Refuge personnel; coordinates Refuge fire training; maintains fire records and systems; assists in developing and implementing fuel management and prescribed fire projects; and coordinates mobilization of Refuge resources for off-Refuge assignments.

Regional Fire Management Coordinator (RFMC): Provides coordination, training planning, evaluation and technical guidance, as requested, to the Refuge. Reviews and approves refuge annual prescribed burn plan and budget requests. The RFMC will be informed of all wildfire suppression activity occurring on the refuge. As conditions warrant, approves Refuge step-up plan implementation, and may request fire personnel from the Refuge to meet suppression needs elsewhere. The RFMC may be called upon to gather additional resources to implement the fire management program.

Administrative Officer (AO): The AO is responsible for posting of firefighter time and meeting procurement needs at the local level during an ongoing incident; serves as communications link for ongoing wildfires and prescribed fires; and is responsible for the administrative support needed to assist the FMO with budget, time and procurement. The AO also serves as a support dispatcher regionally and nationally as qualified.

Remainder of Refuge Staff: All staff members assist with fire planning, preparation, operations, and monitoring as qualified, or support rolls as determined by Refuge Manager. Staff members also assist as national wildfire resources as qualified and available.

C. FIRE COOPERATORS AND INTERAGENCY COORDINATION

Hiawatha National Forest, Pictured Rocks National Lakeshore, and lands managed by the Michigan Department of Natural Resource are within close proximity to Seney NWR. Private lands border the refuge to the east and south. Seney NWR benefits from an excellent relationship with cooperators in regards to fire management and fire fighting. Agreements for fire fighting exist with Hiawatha National Forest (effective until May 2005) and Pictured Rocks National Lakeshore (effective until April 2003, **Appendix 3**). An agreement with the Michigan Department of Natural Resources is in progress. A list of phone numbers of personnel associated with cooperators (Michigan Department of Natural Resources 2001 UP Wildfire Mobilization Plan for Cooperators) is given in **Appendix 4**.

VII. NORMAL UNIT STRENGTH

A. ENGINES, TOOLS, AND OTHER EQUIPMENT

To carry out an active and effective fire management program, the Refuge must have access to proper equipment and qualified manpower. Without equipment and expertise, the program is severely limited. For a list of Refuge equipment that can be used in the fire management program and the Normal Unit Strength (NUS) of the Refuge see **Appendix 5**. See **Appendix 6** for a list of equipment available from cooperators.

The Refuge Automotive Worker, who will report any problems that cannot be immediately corrected to the Assistant Refuge Manager, will conduct a pre-season inspection of all fire equipment. The operator will inspect all mechanized equipment deployed on a fire, with assistance by the Automotive Worker.

B. EQUIPMENT AND SUPPLIES (CACHE ITEMS)

See **Appendix 5** for a list of recommended cache items.

C. PERSONNEL AND LEVEL OF FIRE QUALIFICATION

The Refuge staff will fill positions to the fullest extent possible. However, at present the Refuge is understaffed and requires additional qualified personnel from nearby Michigan Department of Natural Resources offices and/or Hiawatha National Forest offices in Manistique or Munising to accomplished prescribed fires. A list of required positions for wildfire management and prescribed burn activities can be found in **Section VI, Table 5**. The current staffing status of Seney NWR by position is found in **Appendix 2** other Refuge contact numbers are found in **Appendix 7**.

VIII. PREPAREDNESS

A. CURRENT STAFF AVAILABLE TO MEET POSITION NEEDS

At present, only one staff member is fire qualified. See **Appendix 2** for the Refuge personnel list.

B. PRE-SEASON READINESS ACTIVITIES

1. Training and Qualifications

Service policy sets training, qualification, and fitness requirements for all wildland firefighters and prescribed fire positions. All personnel involved in fire management functions will be provided with the training required to meet Service qualifications standards for the position they are expected to perform. Interagency training opportunities will be utilized whenever possible.

a. Training

The Regional Office will pay for all approved fire training if the following criteria are met:

1. Participant completes and submits to the Complex FMO a National Wildfire Coordinating Group Interagency Training Nomination form (NFES 2131), complete with supervisory approval and an estimated cost of training, travel, and *per diem* prior to the commencement of training.
2. The Regional Fire Management Coordinator approves the training.

3. Upon completion of training, a copy of the Certificate of Completion and a copy of the travel voucher are sent to the Budget Assistant for Refuges and Wildlife in the Regional Office.

b. Annual Refresher

All personnel involved in Fire Management activities are required to participate in annual fire management refresher training to be qualified for fire management activities. Refresher training will concentrate on local needs as well as *Standards for Survival* or *Look Up, Look Down, and Look Around*. The National Wildfire Coordinating Group's (NWCG) course *Standards for Survival* provides appropriate refresher training. Fire shelter deployment and use will also be included as part of the annual refresher training.

c. Physical Fitness

All personnel involved in fire management activities are required to pass an annual wildland fire work capacity test commensurate with the fitness requirements of the positions to which they will be assigned. Work capacity tests will not be given to anyone who has obvious physical conditions--such as known heart problems--which would put them at risk. All individuals are required to complete a pre-test physical activity readiness questionnaire prior to taking a physical fitness test. They must read and sign the PAR-Q health screening questionnaire, an informed consent form. The administrator of the test will determine if a fitness test should be given or refer the employee to the employee's supervisor for a physical examination. If an employee cannot answer "NO" to all the question in the PAR-Q health screening questionnaire the test administrator will recommend consultation with the employee's supervisor and the Regional Staff Office for further determination on the employees ability to participate in fire activities before the person is administered the physical fitness test.

d. Physical Examinations

The Office of Personnel Management has concluded that agencies have the authority to require physical examinations for positions with specific medical standards or physical requirements. The Service has determined that certain designated fire management positions require physical examinations prior to appointment.

A physical examination is required for all new permanent employees and all seasonal employees assigned to arduous duty as firefighters prior to reporting for duty. A physical examination may be requested for a permanent employee by the supervisor if there is a question about the ability of an employee to safely complete one of the work capacity tests. All new permanent fire funded employees are required to have a physical examination. All permanent employees over 40 years of age who take the pack or field test to qualify for a wildland or prescribed fire position are required to take an annual physical examination before taking the test.

- Physical examination shall use Standard Form 78 (SF-78), Certification of Medical Examination specific for arduous and moderate duty fire management activities and Form 1400-108 Physical Requirements for Firefighter and Smokejumper Positions (Supplement to SF-78).

- All examinations are at Government expense and should be charged against the 9251 sub-activity for preparedness personnel and 9263 for dedicated prescribed fire personnel.
- The physical examination required for refuge law enforcement officers may be substituted for the fire physical examination. Two separate physical examinations are not required.
- Completed physical examination forms requiring a second opinion are to be submitted through Personnel to the Chief, Division of Medical and Health Services, at the Department for certification of an employee's fitness for duty.

Each refuge may designate the examining physician, but must offer the individual an opportunity to submit medical documentation from his or her own personal physician. The Regional Fire Management Coordinator should audit medical examination costs periodically to avoid unnecessary expenditures.

All Service employees considered for firefighting duties will meet the Job-Related Work Capacity Tests for Wildland Firefighters. When the Job-Related Work Capacity Tests for Wildland Firefighters is to be given, the Work Capacity Test Record will serve as the record that the employee has met the physical requirements as mentioned above. If the Fire Management Officer or the employee has any question concerning the person's ability to physically perform firefighting duties, the employee should not be qualified for a wildland or prescribed fire position.

Personnel participating in prescribed fire activities on refuges which have gentle terrain and light to moderate fuel loads are required to attain a "Moderate" physical fitness rating as defined in the PMS 310-1. Moderate is the standard fitness level for Service prescribed fire operations. Exceptions to the standard are necessary when a Refuge analysis of prescribed fire operations reveals that terrain, tactics and fuels present require physical fitness standards more restrictive than a "Moderate" standard for a specific prescribed fire project. Refuge personnel will meet the highest physical fitness category required to safely conduct prescribed fire operations on the Refuge, determined by terrain, tactics and fuels. Prescribed fire fitness standards may differ from wildland fire fitness standards because prescribed fire activities are a management action and the pace of work is normally set by individuals as opposed to an emergency situation in which the pace of work is generally set by the emergency situation.

C. EMERGENCY PREPAREDNESS (PRELIMINARY STEP-UP PLAN)

The following Refuge Step-Up Plan is based upon Fire Danger Rating system used by Michigan Department of Natural Resources (**Table 7**). See **Appendix 8** for Seney NWR Dispatch Plan.

When fire danger is "**High**," all fire-qualified personnel will maintain a communication link with their supervisor or their designate. All fire equipment used for project work will be brought in at the end of each day and maintained in a fire ready condition. Prescribed burning will be permitted, although staffing contingencies must be taken into account.

As the fire danger increases to "**Very High**," all fire equipment will be kept in a fire ready condition and positioned appropriately. At this level, emergency preparedness funding may be triggered by expanding work weeks and/or daily tours of duty for wildfire qualified personnel to cover seven days a week and through the daily burning period. Initial attack will be done using a combination of FWS and Michigan DNR resources to fill needed positions. Personnel may be resource ordered to fill initial attack needs based on cooperator availability. If any prescribed burning is being considered, a management decision should take into account whether the National Preparedness level is at Level V and are there any other restrictions in effect.

Finally, when the fire danger reaches "**Extreme**," all "**Very High**" actions will be in effect. Temporary closures may be imposed on areas within the Refuge and/or some activities may not be allowed in conjunction with similar impositions by adjacent land managing agencies. Prescribed fire activities will not be conducted when the National Preparedness is at Levels IV or V without approval of the Regional Fire Management Coordinator.

Table 7 - Preparedness Actions by Fire Danger Level

Preparedness Action	Fire Danger Level				
	Low	Mod.	High	Very High	Extreme
Station staffing for fire control not required	X				
At least one assigned person "on call"		X	X	X	X
Maintain cell phone contact w/Refuge Headquarters		X	X	X	X
Fire-ready engine at Refuge Headquarters		X	X	X	X
Carry PPE while on duty, wear nomex and boots				X	X
Tour of duty changed at Manager's discretion				X	X
Monitor Michigan DNR fire frequency				X	X
Detection patrol conditional				X	
Refuge fire ban conditional				X	X

1. Initial Attack

Initial attack is the first suppression work on a fire. All wildland fires that are controlled by suppression forces undergo initial attack. The number and type of resources responding to initial attack varies depending upon fire danger, fuel type, values at risk, and other factors. Generally, initial attack involves relatively few resources, and the fire size is small. Seney's initial attack crew, at a minimum, needs to include the following personnel: 2 firefighters, 1 dozer operator, 1 tracked vehicle operator (one of the above must be at least ICT5 qualified).

Staff meeting the "**arduous**" fitness standard should, within reason and after notifying the Refuge office, take immediate action to suppress the fire (**see above**). All personnel responding to a wildfire should be trained and qualified. Unqualified personnel taking initial action to suppress a wildfire should be replaced by qualified personnel as soon as possible.

2. Extended Attack

An Extended Attack is a wildfire that has not been contained/controlled by the Initial Attack Forces and additional firefighting resources are arriving, *en route*, or being ordered by the Initial Attack Incident Commander.

a. Characteristics of an Extended Attack Incident

An Extended Attack Incident is normally characterized by:

1. Less than 100 acres in size, although in some areas where the values at risk are low and fuels are primarily 3 inches in diameter or less the fire size could be significantly larger.
2. Firefighting resources vary from several single resources to several Task Force/Strike Teams.
3. The incident may be divided into divisions, but would not meet the Division Supervisor complexity in regards to span-of-control.

4. The incident is expected to be contained/controlled in the first operational period. If not, it may transition into a Type II Incident.
 5. A written Incident Action Plan would not be needed or prepared.
 6. Some of the Command and General Staff positions such as Planning, Logistics, Safety, and Liaison may be filled, but the Division/Group Supervisor and Unit Leader level as opposed to Type I or Type II.
 7. Staging areas may be utilized and in some instances a small base established.
- b. Transition from an Initial Attack Incident to an Extended Attack Incident

The Initial Attack Incident Commander is usually the individual who must recognize the need for transition into Extended Attack and is usually one of the following:

1. First-in Single Resource Boss or a single resource response; or
2. A Designated Single Resource Boss of a Multi-Resource response; or
3. A more senior officer dispatched with the initial attack forces.

Early recognition by the Initial Attack IC that the Initial Attack Forces will not control a fire is important. As soon as the IC recognizes that the additional forces are needed or knows additional forces are en route he/she must withdraw from direct fireline suppression and:

1. Establish an Incident Command Post (ICP) to receive, brief, and assign incoming forces. In most situations this will be the IAIC's vehicle located at an identified point.
2. Sketch a map of the fire and identify resource assignments using an ICS Form 201.
3. Document the fire organization.
4. Keep track of all resources that are on scene, en route, and ordered.
5. Document strategy, tactics, and current actions.

If available, the IC should assign a Status/Check-in Recorder to handle the 201 when;

1. The fire is expanding rapidly.
2. Numerous resources are arriving or are being ordered.
3. Radio traffic is constant.

Keep the designated officer, dispatch, the incoming replacement IC, or other higher level officer informed of:

1. Status of fire.
2. Progress of the suppression forces.
3. Additional resources needed.
4. Weather conditions, especially changes.
5. Special situations such as values threatened.

As additional forces arrive:

1. Divide the fire into areas of responsibility (e.g., right and left flank, Division A and Division B).
2. Assign individuals responsibility for these areas. At fires these will usually be the most qualified people available, but as multiple single resources arrive consideration should be given to aggregating them into Task Forces with a qualified leader.

As the Incident continues to escalate, there may be need for:

1. An Operations Section Chief to directly supervise the suppression efforts.
2. A Logistical person to begin assessing logistical needs such as feeding, fuel, special equipment, sleeping, etc.
3. A Planning person to establish formal check-in; gather, record, and provide on-site information to firefighting personnel and dispatch; collect on-site weather data, weather reports, and weather forecasts; start an Incident Action Plan; prepare maps, and assist in developing a Wildfire Situation Analysis.
4. A Safety Officer.

Due to geographical distances and other issues, a Type III incident on the Refuge will in all likelihood be run by the MDNR with the Refuge Manager (or designated line officer) as the Service liaison. They will probably already be on site, so it would make sense to use their expertise.

c. Control of the Fire or Transition to a Type II Incident

At some point, the fire will be contained/controlled or the decision will be made to transition to a Type II organization. Indications as to when to make this transition are:

1. The fire will not be controlled in the first operational period.
2. A written Incident Action Plan will be needed for the next operation period.
3. Logistics are getting complicated and you need to establish an Incident Base and possibly camps to feed, sleep, and supply personnel on the fire.
4. There is a need to fill most or all of the Command and General Staff and support Unit Leader positions.
5. Fire complexity exceeds capability of extended attack organization.

The primary objective of all IC's is to control the fire, but that is not always possible. When it is not, the IC's effectiveness (success) can and will be measured by how smoothly and efficiently the transition of Command can be accomplished due to appropriate suppression action, ordering of needed resources (including support), adequate staffing, good planning, and thorough documentation.

IX. FIRE MANAGEMENT UNITS AND FIRE BEHAVIOR

A. BACKGROUND

At 95,238 acres, Seney NWR is divided into 3 Fire Management Units (FMUs): FMU-1 25,150 acres (26% of Refuge), FMU-2 36,431 acres (38% of Refuge), and FMU-3 33,657 acres (36%) of Refuge. FMUs were devised based upon existing and potential vegetation features, location to access sites, size and shape, known hazards, as well as management mandates that dictate management strategies to a considerable degree. Other criteria, such as proximity to human development, were deemed not significant enough to further delineate additional FMUs (**Fig. 6**).

FMU-1 (Seney Wilderness Area) was herein considered a unique Unit because of its designation as a Wilderness area, problems associated with access, and the special associated habitat type (i.e., string bog). FMU-2 (area to the west of the Driggs River Road and east of the Wilderness Area) is unique because it has the greatest proportion of upland habitat, has limited access, but has virtually no

buildings contained within. Finally, FMU-3 (area east of the Driggs River Road) is considered unique in that it is the most easily accessed, contains the majority of the Refuge's pools, and has numerous buildings within.

Possible wildfire fire suppression strategies that may be employed in these FMUs include the following:

Control: To complete the control line around a fire, any spot fires therefrom, and any interior islands to be saved; burn out any unburned area adjacent to the fire side of control line; and cool down all hot spots that are immediate threats to the control line, until the line can reasonably be expected to hold under foreseeable conditions.

Contain: To surround a fire, and any spot fires therefrom, with a control line, as needed, which can reasonably be expected to check the fire's spread within a predetermined area under prevailing and predicted conditions.

Confine: To confine (to a geographic area) a fire, and any spot fires therefrom, with the use of existing barriers (e.g., roads, pools, etc.), which can reasonably be expected to check the fire's spread within a predetermined area under prevailing and predicted conditions.

B. FIRE MANAGEMENT UNIT 1

Fire Management Unit 1 (FMU-1) is the westernmost FMU at Seney NWR and is comprised of the Seney Wilderness Area and the associated Strangmoor Bog National Natural Landmark. Total area of this unit is 25,150 acres (roughly 26 percent of the Refuge). The Strangmoor Bog located within the Wilderness Area is comprised of 9,700 acres. State Highway 28 borders to the north and the Creighton Truck Trail borders the western edge of the Unit. State lands are the primary ownership type adjacent to the Unit. Major cover types are Scrub-Shrub (47%), Bog (12%), Coniferous Forest (11%), and Marsh (9%). All other cover types comprise 21% of the area (**Fig. 7**). No buildings are found in the Unit and, overall, the area is characterized by treeless string bogs and topographically oriented strips of bog forest. According to a seminal paper by Heinselman (1965) this unit is perhaps the southern limit of patterned bog (patterned fen) in North America and is most closely associated with more northern peatlands developed through processes different from the bog succession found in typical land-filled pitted outwash terrains. Located on the Seney Sand Lake Plain, much of this Unit is covered by a continuous peat blanket several feet in thickness. The peat has the same southeastward slope as the underlying mineral substratum. Higher areas are characterized by bog forest comprised of tamarack and black spruce (see discussion of **peatland community type** in **Section III** above).

An overriding management objective of this Unit is to satisfy the requirements of the Wilderness Act and the Refuge Improvement Act. In brief the definition of wilderness is:

....an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain.an area of undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation....

To meet the Wilderness criteria briefly described above, certain uses are prohibited. These can be summarized as:

....except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act....there shall be no temporary road, no use of motor vehicles, motorized

equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.

The entire Unit is open to hunting in accordance with the Refuge hunting policies, but the interior of the Unit is essentially devoid of roads. Possible fuel types include islands within coniferous trees, the scrub-shrub cover and the organic soils. Fire fighting in FMU-1 is likely to prove difficult and a potential for fire to spread to adjacent state lands does exist. Either **Control, Contain, or Confine** suppression strategies will be used in FMU-1. However, when deciding what fire management actions are to take place within the Wilderness Area a minimum requirement analysis and a minimum tool analysis should be completed beforehand to guide managers (**Appendix 9**).

Fire management objectives for the FMU-1 are:

1. The protection of human life.
2. Satisfy the requirement of the Wilderness Act by minimizing the perceived influence of humans.
3. Restore and conserve habitat necessary to maintain Refuge and regional-level native biodiversity by maintaining and restoring necessary vegetation structure and composition through prescribed fire.
4. Educate the public regarding the role of fire as a natural disturbance mechanism.
5. Minimizing soil disturbance (i.e., not plowing lines unless absolutely necessary, washing all equipment to remove unwanted seeds) to reduce the potential for invasive plant colonization.

C. FIRE MANAGEMENT UNIT 2

Fire Management Unit 2 (FMU-2) is approximately 36,431 acres (38% of Refuge). The Unit borders FMU-1 to the west, the Driggs River to the east, and the Manistique River to the southeast. Its northern border includes State Highway 28. To the south, some private lands are adjacent to the Unit. Two large pools (C-3 and March Creek Pool) are found in the Unit as are the historic Walsh and East Walsh Farm fields. No buildings are associated with the Unit. Although the interior of the Unit lacks roads, access roads do exist on the northern, southern, and eastern flanks. The predominant cover types are: Scrub-Shrub (28%), Bog (28%), Coniferous Forest (17%) and Marsh (13%). The remaining cover types comprise 14% of the Unit (**Fig. 8**). For a discussion of the community types associated with the Unit, see discussion regarding **Shrub swamps, meadows and marshes, peatlands, and upland coniferous forest community** in **Section III** above.

The entire Unit is open to hunting, but more restrictions exist than in FMU-1. The existing mosaic of cover types corresponds to a wide variety of fuel types. Fires of moderate to high rates of spread could be expected within much of this unit, most severe fires would likely occur within areas dominated by coniferous trees on xeric, upland soils. The potential to spread to adjacent lands is moderate. Either **Control, Contain, or Confine** suppression strategies will be used in FMU-2.

Fire management objectives for the Unit are:

1. The protection of human life.

2. Restore and conserve habitat necessary to maintain Refuge and regional-level native biodiversity by maintaining and restoring necessary vegetation structure and composition through prescribed fire.
3. Confine wildfires in the FMU to the smallest size possible through the use of roads and natural features.
4. Maintain existing roads as firebreaks, access sites.
6. Educate the public regarding the role of fire as a natural disturbance mechanism.

D. FIRE MANAGEMENT UNIT 3

Fire Management Unit 3 (FMU-3) is approximately 33,657 acres (36% of Refuge). The Unit borders the Manistique River to the west and State Highway 77 to the east. Its northern border includes primarily state-owned lands. To the south, some private lands are adjacent to the Unit. The vast majority of the Refuge pools and buildings are associated with the Unit as are the historic Conlon and Chicago Farm fields. Much of the Unit has roads. In many ways, this Unit is the most diverse in terms of percentage of land associated with different cover types. The predominant cover types are: Coniferous Forest (29%), Scrub-Shrub (22%), and Marsh (19%). The remaining cover types comprise 30% of the Unit (**Fig. 9**). For a discussion of the community types associated with the Unit, see discussion regarding **Shrub swamps, meadows and marshes** and **upland coniferous forest community** in **Section III** above.

Approximately 50% of the Unit is closed to hunting. The existing mosaic of cover types corresponds to a wide variety of fuel types. Fires of moderate to high rates of spread could be expected within much of this unit, most severe fires would likely occur within areas dominated by coniferous trees on xeric, upland soils. The potential to spread to adjacent lands is moderate. Either **Control, Contain, or Confine** suppression strategies will be used in FMU-3.

Fire management objectives for the Unit are:

1. The protection of human life and property.
2. Restore and conserve habitat necessary to maintain Refuge and regional-level native biodiversity by maintaining and restoring necessary vegetation structure and composition through prescribed fire.
3. Confine wildfires in the FMU to the smallest size possible through the use of roads and natural features.
4. Maintain existing roads as firebreaks, access sites.
7. Educate the public regarding the role of fire as a natural disturbance mechanism.

A. Fire Behavior

Fire behavior depends upon many variables including relative humidity, air temperature, fuel type, fuel moisture, wind speed, slope, aspect, time of day, and season. On site predictions of estimated fire behavior can be made with the above inputs and provide outputs of rate of spread, fireline intensity, heat per unit area, and flame length through the use of nomograms developed for this purpose. Below are listed the major fuel models at Seney NWR. See Anderson (1982) for a more

detailed account of these general fuel models. See **Section XI** for a description of fire behavior and prescribed fire.

- *Fuel Model 2 (NFDRS Fuel Models C and T): Fire spread is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to the litter and dead-down stemwood from the open shrub or timber overstory, contribute to the fire intensity. **Open shrub lands and pine stands** or scrub oak stands that cover 1/3 to 2/3 of the area may generally fit this model; such stands may include clumps of fuels that generate higher intensities and that may produce firebrands.*

At Seney NWR, the upland grass type most closely fits this model.

- *Fuel Model 3 (NFDRS Fuel Model N): Fires in this fuel are the most intense of the grass group and display high rates of spread under the influence of wind. Wind may drive fire into the upper heights of the grass and across standing water. Stands are tall, averaging about 3 feet, but considerable variation may occur. Approximately 1/3 or more of the stand is considered dead or cured and maintains the fire. **Wild or cultivated grains that have been harvested can be considered similar to tall prairie and marshland grasses.***

At Seney NWR, the marsh and wetland type most closely fits this model.

- *Fire Model 4 (NFDRS Fuel Models B and O): Fire intensity and fast-spreading fires involve the foliage and live and dead fine woody material in the crowns of a nearly continuous secondary overstory. Stands of mature shrubs, 6 or more feet tall, such as....the **closed jack pine stands of the north-central States** are typical candidates. Besides flammable foliage, dead woody material in the stands significantly contributes to the fire intensity. Height of stands qualifying for this model depends on local conditions. A deep litter layer may also hamper suppression efforts.*

At Seney NWR, dense stands of jack pine within the pine forest type most closely fits this model.

- *Fuel Model 7 (NFDRS Fuel Models D and Q): Fires burn through the surface and shrub strata with equal ease and can occur at higher dead fuel moisture contents because of the flammability of the live foliage and other live material. Stands of shrubs are generally between 2 and 6 feet high.....**Black spruce-shrub combinations**...may also be represented.*

At Seney NWR, areas with black spruce in the pine forest type (in wetlands) most closely fits this model.

- *Fuel Model 8 (NFDRS Fuel Models H and R): Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional "jackpot" or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidities, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Representative conifer types are **white pine**, and lodgepole pine, **spruce, fir, and larch**.*

At Seney NWR, areas comprised of large, mature red and white pines in a closed canopy situation (within the pine forest type) most closely fits this model.

- *Fuel Model 9 (NFDRS Fuel Models E, P, and U): Fires run through the surface litter faster than model 8 and have longer flame height. Both long-needle conifer stands and hardwood stands,*

especially the oak-hickory types, are typical. Fall fires in hardwoods are predictable, but high winds will actually cause higher rates of spread than predicted because of spotting caused by rolling and blowing leaves. Closed stands of long-needled pine like ponderosa, Jeffrey, and red pines, or southern pine plantations are grouped in this model. Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting, and crowning.

At Seney NWR, areas comprised of large, decadent, red and white pines in a closed canopy situation (within the pine forest type) most closely fits this model.

- *Fuel Model 10 (NFDRS Fuel Models G): The fires burn in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3-inch or larger limbwood resulting from overmaturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching or individual trees are more frequent in this fuel situation, leading to potential fire control difficulties. **Any forest type** may be considered if heavy down material is present; examples are insect or disease-ridden stands, windthrown stands, overmature situations with deadfall, and aged light thinning or partial-cut slash.*

At Seney NWR areas comprised of large, decadent, red and white pines in a closed canopy situation (within the pine forest type) most closely fits this model..

- *Fuel Model 12 (NFDRS Fuel Model J): Rapidly spreading fires with high intensities capable of generating firebrands can occur. When fire starts, it is generally sustained until a fuel break or change in fuels is encountered. The visual impression is dominated by slash and much of it is less than 3 inches in diameter. The fuels total less than 35 tons per acre and seem well distributed. Heavily thinned conifer stands, clearcuts, and medium or heavy partial cuts are represented. The material larger than 3 inches is represented by encountering 11 pieces, 6 inches in diameter, along a 50 feet transect.*

At Seney NWR, slash most closely fits this model.

X. FIRE SUPPRESSION

A. BACKGROUND

All suppression efforts will be directed towards safeguarding life while protecting Refuge property from harm. Since fire is still an important aspect of the ecosystems associated with these FMUs, prescribed fires will be a management tool used. Mutual aid resources from Cooperating Agencies will be required to meet suppression goals and objectives. These forces will respond to the Incident Commander (in person or by radio/phone) and if additional forces are needed, appropriate procedures will be used to acquire them.

B. SUPPRESSION STRATEGIES AND TECHNIQUES

1. Below a “**Very High**” danger rating, the Refuge will depend on other agencies to take the lead in providing personnel for suppression purposes. Once a “**Very High**” danger rating is achieved, a request for qualified personnel will be initiated.
2. Utilize existing roads and trails, bodies of water, and areas of sparse or non-continuous fuels as primary control lines, anchor points, escape routes, and safety zones.

3. When appropriate, conduct backfiring operations from existing roads and natural barriers to halt spread of fire.
4. Use burnouts to stabilize and strengthen the primary control lines.
5. Depending on the situation, either direct or indirect attack methods may be employed. The use of backfire in combination with allowing the wildfire to burn to a road or natural firebreak would be least damaging to the environment. However, direct attack by constructing control lines as close to the fire as possible may be the preferred method to establish quicker control.
6. Retardants may be used on upland areas. On peat soils and other wetland areas, retardants will be used only when absolutely needed to meet objectives.
7. Constructed fireline will be rehabilitated prior to departure from the fire or scheduled for rehabilitation by other non-fire personnel.
8. The Incident Commander will choose the appropriate suppression strategy and technique. As a guide:
 - a. on low intensity fires (generally, flame lengths less than 4 feet) the primary suppression strategy will be direct attack with hand crews and dozers;
 - b. if conditions occur that sustain higher intensity fires (those with flame lengths greater than 4 feet) then indirect strategies which utilize back fires or burning out from natural and human-made fire barriers may be utilized. Those barriers should be selected to safely suppress the fire, minimize resource degradation and damage, and be cost effective.
9. Utilize wet lines whenever possible instead of plowed lines to reduce long-term damage to grassland rootmats and to prevent conditions favorable for invasive plant colonization.

C. LIMITS TO SUPPRESSION ACTIVITIES

The use of earth moving equipment (e.g., dozers, graders) for suppression activities on the Refuge will not be permitted without the completion of a Minimum Analysis. All heavy equipment will remain on roads and trails to the fullest extent possible. Aerial retardants will not be used until a review of all labeling is done.

D. RECORDS AND REPORTS

The following old records presently in the Refuge will be maintained as permanent historic fire management records:

1. Fire Reports (10-400, DI-1201, and DI-1202);
2. Annual Narrative;
3. fire weather records;
4. historic records of the refuge, including any photographs showing vegetative cover, cover type maps, etc.;
5. monthly reports or other files which may represent the only documentation of fire occurrence or fire behavior in the refuge;
6. all other maps or records pertinent to fire management.

Situation reports contain current information about fire danger, fire status, and resource availability. Situation reports will be prepared under the following circumstances:

1. daily, when in very high or extreme fire danger.
2. daily, whenever a fire has occurred, is in progress, or is planned.
3. additionally, as required by Regions/zones.

In accordance with local or regional procedures, the Refuge will also provide situation reports to local cooperators or interagency coordination centers.

Historic situation report files will be used in the FIREBASE prescribed fire monitoring needs analysis to monitor staffing requirements. Daily entries for all wildland fires and prescribed burns will therefore be made. The Refuge will also maintain or reference fire weather stations. Weather observations will be entered directly into WIMS.

Each wildland fire and support action will have a fire report prepared and archived to document the fire incident. In the event that a prescribed fire does not meet established objectives, and/or exceeds its established prescription and is reclassified as an unwanted wildland fire, two separate reports will be prepared. The narrative of the prescribed fire report will indicate that the fire was reclassified and reference the new assigned wildland fire number, and report only those acres burned within prescription. A new report will be started for the newly declared wildland fire, and report acres burned from the point of reclassification to the declared out acres. The cause and narrative should indicate that the unwanted wildland fire resulted from a prescribed fire that was reclassified. All unwanted wildland fires caused by prescribed fires will be reviewed.

The Service Fire Management Information System (FMIS) has an on-line data entry and editing application for direct entry of occurrence information. The Refuge will use computer telecommunications capability to file the reports, and retain the hard copy report on file in the refuge.

XI. PRESCRIBED FIRE PROGRAM

A. BACKGROUND

Seney NWR was established in 1935 when 95,455 acres of the Great Manistique Swamp were acquired under the provisions of the Migratory Bird Conservation Act for the purpose of waterfowl production and as a resting-feeding area along a major flyway.

While waterfowl are of major importance, attention is given to all wildlife species and to all habitat types that occur on the refuge. Management is from an ecological perspective with the long term effect on associated species considered before any actions take place.

To meet the goals and objectives of the Fire Management Program (see **Section IV**), prescribed fire can be a useful management tool. In brief, prescribed fire can be used to:

1. Effectively maintain sedge-dominated marshes for yellow rails, Le Conte's sparrows, and other species. Burning invading woody vegetation comprised of willow, alder and bog birch in sedge marshes will favor fire adapted sedges and grasses.
2. Maintain xeric openland ecosystems that benefit a variety of species, both openland species that nest on or near the ground (e.g., sandhill crane, sedge wren, LeConte's Sparrow) and cavity-nesting species (e.g., American kestrel, black-backed woodpecker, eastern bluebird, northern flying squirrel) that will utilize retained snags. Blueberry production on these open areas will be enhanced benefiting several species.

3. Compliment silvicultural prescriptions aimed at forest restoration. Prescribed fire will be utilized to restore red and white pine stands in areas where they historically were found. Fire will also be used to maintain and regenerate jack pine and aspen in a dense manor that also provides for snags.
4. Reduce wildfire hazards in conjunction with mechanical removal of trees in areas where wildfire potentially threatens local communities.

B. PROGRAM POLICIES

Before attempting a prescribed fire, adequate fire breaks will surround the burn area. These will be in the form of ditches, dikes, plow lines, block lines, wet lines, roads, streams, or pool margins. Ample water is available on most of the Refuge if the need should arise for large quantities of water. The Refuge has a number of possible control lines that could be used in the event of escape by a prescribed fire, including: roads, pools and pool dikes, ditches, and rivers. The Refuge is also interspersed with many marsh areas that under normal conditions would break up any long runs of fire.

When the Refuge is planning to set a prescribed burn, all Cooperators will be notified as to the time of day and exactly where the burn will occur. As an added protection measure to protect the communities of Germfask and Seney from wildfire and potential prescribed fire escapes, a firebreak will be constructed on Refuge boundaries adjacent to both communities pending Service financial support.

C. PROGRAM DESCRIPTION, PROBLEMS, AND SOLUTIONS

Many problems must be faced when fire is used as a management tool. In burning any given area, many different elements must be considered before the burning process begins. Some of the factors that must be evaluated are: weather, fuel, topography, soil moisture, season of the year, crew experience, and smoke management.

1. **Weather:** Fire weather and fire danger rating are maintained by the Seney Station of the Michigan Department of Natural Resources. Under the National Fire Danger Rating System, which is constantly being upgraded, an accurate and current measurement of buildup index, timber spread index, fine fuel spread index, humidity, fine fuel moisture, temperature, wind speed and direction, and rainfall is kept from April through November. At the same time, the Refuge maintains rainfall, temperature, total wind movement, and evaporation records. The amount and type of information available allows prediction of proper burning conditions and the proper time for ignition.
2. **Fuel:** Another major factor in fire behavior is the amount and type of fuel to be burned (see **Section IX** for a description of possible fuel models). The area to be burned will be inspected prior to ignition to identify possible problem areas after the burn has begun. Any trouble spots that are identified, such as large piles of slash or large quantities of fine fuels, will then be given special attention during the burn.
3. **Topography:** Topography is a factor affecting burning from an accessibility standpoint. The topography of the Refuge is generally flat with an interspersion of sandy knolls. In flat areas, saturated soils may limit access of vehicles. One problem that could occur on these knolls would be a hot fire on the southwest facing slopes. Control of the heat generated by fire in these locations would be considered in the prescription for the area.

4. **Season:** The season in which burns are done influences fire behavior. Spring and fall burns are generally hotter because the herbaceous vegetation is either in the cured or transitional stage. This corresponds to higher buildup, timber spread, and fine fuel indices and a fire that is more difficult to control. Backfire lines must therefore be wider and head fires will be allowed only short runs.

The effects of fire on vegetation depend on climate, site and topography, soil moisture, site condition (including fire frequency), species composition, and timing of fire. Spring burning usually favors warm-season species over cool-season species. The later the fire occurs in spring, but still prior to the emergence of green shoots, the greater the production of warm-season species. However, some vegetation responds negatively to burning in dry areas, or during drought.

Since natural fires are generally associated with lightning strikes at the Refuge, fire regulated vegetation can be considered to have generally evolved to burn during the growing season (including July-August when lightning strikes are most common). Thus, growing season prescribed fire may more closely emulate natural conditions.

5. **Smoke Management:** Smoke management has become an increasingly important consideration in fire management with the enactment of air pollution legislation and the creation of a Class I Airshed in the Seney area. Thus, smoke management will be a part of all prescribed fire operations. Research has shown that most of the localized effects occur within two miles of the fire. Planning will be done to minimize the effects of smoke on highways and residential areas. Wind direction will be the most important factor in smoke management on the Refuge. Moreover, it has been determined that many chemical components of burning forest fuels are polycyclical organic compounds that are generally recognized as carcinogens. However, the amount of these compounds produced during prescribed burning is relatively small. Other organic compounds emitted include various aldehydes, hydrocarbons, as well as carbon dioxide and monoxide. In addition to the organic compounds mentioned, some quantities of oxides of nitrogen and sulfur may be produced. However, these compounds are not likely to produce problems.

In most cases, a properly conducted prescribed burn would not result in a significant amount of air pollution. However, at Seney NWR, organic soils can cause considerable smoke production. Rather than burning completely, as a fuel source organic soils tend to smolder. This issue was dramatically illustrated in the 1976 Fire. More study of ways to manage burns on organic soils is needed. Nonetheless, to keep pollutants to a minimum, burning will be done on days when the combustion will be as complete as possible. Days when the atmosphere is unstable will be used for burning to obtain better smoke dispersion.

The following is a list of techniques useful in minimizing smoke production and impacts (from Prescribed Fire and Fire Effects Working Team 1985):

1. Do not burn when air stagnation advisories are in effect, during pollution episodes, or when temperature inversions exist.;
2. Burn when conditions are good for rapid dispersion (i.e., the atmosphere should be unstable so smoke will rise and dissipate).;
3. Burn under favorable moisture conditions for the specific fuel type to be encountered.;
4. Use backing fires when applicable.;
5. Burn in small blocks when appropriate.;
6. Mop-up.;

7. Expand the burning season.;
8. Keep soil out of dozer piles and windrows by using rake-type blades.

D. PROCEDURES FOR BURNING

Each prescribed fire will have a complete and approved formal Prescribed Fire Plan. The Prescribed Fire Plan will discuss all key issues and concerns identified during Refuge strategic and operational planning. The formal Prescribed Fire Plan will be made up of many operational elements. Each element addresses a specific aspect of the prescribed fire operation. In some cases, special prescription elements, variables, or other requirements unique to the Refuge will require additional entries.

The Service provides a general outline for Prescribed Fire Plans (see: <http://fire.r9.fws.gov/fm/policy/handbook/1-4-2.htm>) and the following are key issues that will be addressed in all Prescribed Fire Plans.

1. prescribed burn objectives and how they support the land use objectives for the area;
2. expected fire behavior;
3. buffer and safety zones;
4. fire perimeter length and acreage burned limit.
5. analysis of the cumulative effects of weather and drought on fire behavior. This should include a historical analysis of a drought index (i.e., Palmer, Keetch-Bryan, ERC, etc.);
6. potential risks to and impacts on visitors, users, and local communities, both on and off site;
7. considerations of environmental, economic, and social effects, both on and off site;
8. regional and national fire activity are within planned limits;
9. the number of fires burning in the planning area at one time is within planned limits.

Items to be checked during the burn day go-no-go determination must include:

1. predicted weather, environment, and fire behavior are within prescribed limits;
2. availability of implementation personnel, contingency forces, equipment, and supplies are within planned limits;
3. implementation personnel are briefed;
4. required notifications are made.

The following are key Prescribed Fire Plan elements that will be in all Prescribed Fire Plans or other supporting documents:

1. Signature page: Provide spaces for signatures of those persons who prepared the plan, the prescribed fire burn boss, the reviewers and the final approval authority.
2. Burn unit description: Describe the physical and biological features of the burn unit including the location, topography, fuels, vegetation, slopes, and aspect.
3. Vicinity map: Include an overall map showing the position of the project in relation to the surrounding geographical area.
4. Project map: Provide a detailed map showing the project boundary, its topographic features, fuel types and/or loadings, potential hazards, areas of special concern, type and size of control line locations and ignition patterns.

5. Goals and objectives statements: State the goals and objectives for this specific burn. They must include the prescribed burn objectives that should be measurable treatment objectives (i.e., tons per acre of fuel removed, percentage of plants killed, percentage of mineral soil exposed, etc.) that support the land use objectives.
6. Complexity: Identify the degree of difficulty in executing the planned fire.
7. Burn organization: List the essential qualified personnel who will be utilized and the positions that they fill. Specify the number of crew personnel that are needed.
8. Costs: Estimate the time and costs for the following categories: planning, pre-burn monitoring, preparation for the burn, including line construction; burning; holding; monitoring; mop up; and evaluation. Estimate the costs of equipment used for the burn, including tools, aircraft, supplies, and vehicles.
9. Scheduling: State the general time period in which the burn will take place. Show any periods during this time when the burn cannot take place. Provide space to enter the start date, date declared out, and date the DI-1202 is submitted.
10. Pre-burn considerations: Preparations on site: Include line to be built, line standards, snags to be felled or protected, equipment to be pre-positioned, special features to be protected, warning signs to be placed, weather recording and monitoring needs, etc.
11. Preparations off site: Include equipment readiness, supplies to be purchased, signs to be made, personal protective equipment to be issued, etc.
12. Fire prescription: Describe in detail the acceptable ranges of fire behavior and parameters of weather and fuel moisture content or other site variables that are used to define the prescription, acceptable smoke duration and patterns of dispersal, seasons when the burns can be done, and other specific parameters. The use of fire behavior and smoke management prediction aids (e.g., BEHAVE, RXWINDOW, nomograms, SASEM, is recommended).
13. Firing/holding plan: Describe in detail the methods and procedures to be used during the firing and how the lines are to be held. This should include the number and types of personnel, equipment, and assignments. Include day, night, and weekend shifts. What are acceptable holding actions on this fire? What constitutes an escape? (refer to "Holding Actions", section in this chapter).
14. Contingency plan: Define what contingency actions constitute a significant departure from what was planned or expected and where conversion to a wildland fire is appropriate. Include procedures to be followed and actions to be taken if the fire exceeds the abilities of the holding crew to keep it within prescribed parameters and/or unit boundaries. Fuels both inside and outside (near and distant) the burn unit should be considered. Who is to declare the fire a wildland fire? Who is to be the incident commander after escape is declared? Define the number and type of contingency forces to be used as initial action. Who is to be notified of the escape? What role will the holding crew take? Should they remain on the burn or suppress the escape? Account for every person as either reassigned or released from the fire and identify who is to supervise those who are reassigned.
15. Weather information: Specify the weather information required during all phases of the project and the procedures for acquiring it. How and when will spot weather and smoke dispersal

forecasts be requested? How long after the burn will forecasts be required? How is feedback to the Weather Service to be accomplished?

16. Protection of sensitive features: Give instructions for the protection of sensitive features within and adjacent to the burn. These include cultural resources, streams, threatened and endangered species, sensitive soils, buildings and improvements, etc. Obtain necessary archaeological and other types of clearances before the area is disturbed.
17. Smoke management and air quality: Identify potential smoke sensitive areas and management strategies for avoidance, emission reductions, and/or dilution to minimize environmental impacts including impacts on human health and welfare. Identify what air quality compliance steps must be taken and what permits are required, who is to obtain them, and when they must do so.
18. Pre-burn coordination and public involvement: Establish responsibilities for the notification of other agencies, the public, and local landowners, including the notifications and coordination required in the regional preparedness plan. List and identify public information contacts, including local area personnel and press releases. Identify the official local agency public information specialist.
19. Pre-burn notification: Formulate a call-up list of individuals and agencies, when they are to be contacted, how they are to be contacted, and assign responsibilities for making specified contacts. Include addresses, phone numbers, radio call signs, and frequencies.
20. Public and personnel safety: Describe safety and emergency procedures. Specify that all personnel who are within the active burn area will have the personal protective equipment required for fire management. Identify safety hazards on the burn, measures taken to reduce those hazards, and EMS personnel on the burn. Specify emergency medical procedures, evacuation routes, and emergency facilities to be used
21. Monitoring: Include all monitoring, measurements, and frequency needed to determine if conditions for the burn are within prescription, both before it is started and while it is burning. Describe the location of all sampling plots and transects. Include the necessary measurements and observations to determine if the burn objectives were met.
22. Reports: Provide for the documentation of the burn. Include a cost assessment and all required reports such as the DI-1202. Include a critique of the burn by the prescribed fire burn boss. Methods that worked or didn't work and the effectiveness of the prescription in achieving burn or smoke objectives should be evaluated, along with recommendations for future projects. Attach all observation and forecast forms, worksheets and data collected during the burn operation.
- 23 Rehabilitation: Describe in detail any rehabilitation that is to be accomplished, who is to do it, and when it is to be completed. These may include waterbars, trash removal, flush cutting of stumps, scattering or burning of line construction debris and other appropriate treatments.
24. Briefing guide and "Go/No-Go" checklist (Exhibit 2-1-1): A short, concise list of the things to be covered during the crew briefing before the fire is started and at the beginning of each operational period after that. Include a summary of conditions that must be met before the burn can commence and continue. These may include, but not be limited to, the presence of all personnel needed to implement the contingency plan, the presence of all required equipment in specified locations, that the fire behavior and expected weather meet the prescription, and that the required notifications have been made.

25. Persons contacted: Retain a list of persons contacted during the development of the burn plan. Include Fish and Wildlife Service personnel, other agency personnel, concessionaires, inholders, special interest groups, refuge neighbors, concerned public, etc. Where appropriate record the date of contact.

Once it has been determined that the weather, fuel, personnel, and other factors are favorable, the following steps will be taken to carry out the burn (see also **Section VI**).

1. The local Michigan Department of Natural Resources Seney Fire Equipment Station and the District Headquarters in Newberry will be contacted and informed when and where the burn will take place.
2. The crew (likely consisting of personnel from Cooperators) will study aerial photos and maps of the area.
3. The type of fire to be used will be determined: headfire, strip-fire, edge-fire, area ignition, center-fire, or other methods as applicable.
4. Duties will be assigned.
5. A last minute check of equipment will be made.
6. A test fire will be started before burning the entire area to test fire behavior.
7. During the burning operation the Fire Boss will have the responsibility of crew assignments.
8. After the burn, mop-up operations will be done.
9. Periodic checks of the burned area will be made to ensure no flare-ups.
10. Before, during, and after the burn, photos will be done to document burn results.

If any of the following conditions exists, the situation will be further analyzed before a burn is started:

1. No written plan or map.
2. Unusual or unexpected fuels are found.
3. Inadequate firelines, equipment or personnel.
4. Forecast unavailable or does not agree with prescription.
5. Questionable visibility or communications.
6. Inadequate notice of plans to burn.
7. Backup not planned or not available.
8. Test fire behavior not as prescribed.

If any of the following exists, burning will be curtailed and any existing fire will be extinguished:

1. Fire exhibits erratic behavior.
2. Wind or other dangerous weather shift occurs.
3. Smoke does not disperse properly.
4. Road or other sensitive area smoked in or adequate traffic control problematic or an alternative route not available.

Start here

E. PROGRAM UNITS

The Refuge is divided into prescribed burning units according to community type, cover type, or management objective (**Fig. 10**). The brief description of these Units that follows should be correlated to the discussion of fuel types found in **Section IX**.

1. **Marsh and Open Wetland Type:** This type includes the wetter lands of the refuge. Primary soil types include peats and muck. The vegetation is composed of grasses, sedges, willow, alder, and bog birch. The objective is to maintain good quality breeding habitat for waterfowl and other wetland obligate wildlife species. Planned burning rotations at these sites is 3 years, depending on the reaction of the vegetation and the groundwater levels. A burning hazard in these types of fires is organic soil fires.
2. **Upland Grass Type:** Here the soils are sands and/or sandy loams. The vegetation is mostly grass with encroaching conifers and hardwoods. The objective is to maintain quality-breeding habitat for grassland obligate species. Planned burning is on a 2-4 year rotation depending on the reaction of the vegetation to the burning.
3. **Upland Forest Types:** The soils here are mainly sands and sandy loams with a duff covering. The vegetation consists of jack pine, red pine, white pine, aspen, maple, and hemlock. The objective is to a range of vegetation types and age classes from dense young stands to open park-like red pine stands maintained with periodic light fires.
4. **Wetland Forest Types:** The soils here are mainly organic. The vegetation consists of jack pine, spruce-fir, and tamarack. The objective is to maintain the range of types and age classes currently present.
5. **Slash:** Slash accumulates from forest management activities and mostly likely on sandy soils at the Refuge. The objective is to eliminate the slash and expose mineral soils for regeneration of paper birch and other early successional or light seeded tree species and to reduce wildfire fuel hazards. Burning will be done as needed after harvesting.
6. **Riparian Types:** These areas are directly influenced by streams/rivers. Objective is to maintain a riparian buffer and restore late successional aspects.

When burning the above types, peat fires, crown fires, and intense slash fires can occur and lead to spot fires. When burning a marsh with organic soils, care will be taken to prevent peat fires. Where possible and when needed, the water table will be raised to saturate the peat before burning. After the burn is completed, a thorough inspection will be made of the area followed by periodic checks.

When burning under a conifer-dominated canopy, there is a possibility of a crown fire. Burning when the risk of a crown fire is at a minimum can control this problem. Burning when the buildup index and timber spread index is low will help to minimize this problem. Another control against crown fire is to allow the head fires only very short runs.

Burning a cut-over area with slash presents the problem of creating intense heat in a concentrated area. Whirlwinds may form and spread live embers to the surrounding lands. Slash burning will take place only during the cooler and wetter months of fall.

F. RECORDS

Records and photos of each burn will be maintained. They will be gathered into a central location for ease of accessibility and reference. Photo points will be set in all burn areas that are expected to be treated on a regular rotation basis to keep track of the vegetation response to fire and the effect of additional treatments. Detailed documentation of the fire weather for each burn will be used to build informational guidelines that will be valuable for predicting success and the proper condition for future burns. For more regarding forms and other aspects of fire records, see **Section X**.

XII. WILDLAND FIRE USE

Wildland Fire Use (WFU) will be considered as part of the fire management process in FMU 1. WFU involves the management of naturally occurring fires (lightning) to achieve resource management objectives. The Federal Fire Performance and Policy Review in 1995 defined the term and allowed Federal agencies to incorporate the process into agency policies. FWS has incorporated WFU into the Fire Management Handbook in

XII. ADDITIONAL OPERATIONAL ELEMENTS

A. PUBLIC SAFETY

Firefighter and public safety shall take precedence over all other aspects of the Fire Management Program. Under moderate to severe fire danger index ratings, flaming fronts are capable of moving at fast speeds in all fuel models. In order to eliminate safety hazards to the public, all public access into the burn units will be closed the day of the burn. The fire crew will keep the area free of any personnel other than Cooperators and qualified Refuge personnel. Fire crews will be directed to escort any unauthorized personnel found within the unit out of the area.

During wildfires, the Incident Commander is responsible for managing hazards from smoke. Smoke mitigation and management will be included in the prescribed burn plan and is the responsibility of the burn boss. Smoke from a Refuge fire could impair visibility on roads and become a hazard. Actions to manage smoke include: use of road guards and pilot cars, signing, altering ignition techniques and sequences, halting ignition, suppressing the fire, and use of local law enforcement as traffic control.

Wildfires that might escape Refuge lands are also a concern and one that is the responsibility of the Incident Commander.

B. PUBLIC INFORMATION AND EDUCATION

Informing the public is an important part of fire suppression, fire prevention, prescribed fire, and the Service mission. Information and education are critical to gaining public support for the Refuge Fire Management Program. There are several different aspects to this task:

1. **Wildfire Suppression:** During wildfire suppression, the Incident Commander is responsible for dispersal of information to the press and public or may delegate this responsibility.
2. **Prescribed Fire:** Informing the public is a vital component of the prescribed fire program. Areas that have been burned will present opportunities for the public to actually see the effects of fires, and offer staff members an opportunity to explain the purpose of the burns to the public. The following will be used to promote prescribed fire to the public:
 - a. Presentation at the Visitors Center,
 - b. Attendance to local fire department meetings as requested,
 - c. Including a prescribed fire message in Refuge interpretive publications and materials,
 - d. Follow prescriptions in burn plans to avoid escapes,
 - e. News releases and other publications.

C. FIRE CRITIQUE AND PLAN REVIEW

All wildland fires, including prescribed burns and fire-related incidents, will be reviewed.

For a detailed discussion see: <http://fire.r9.fws.gov/fm/policy/handbook/3-6.HTM>.

Reviews are conducted for one or more of the following purposes:

1. to examine the progress of an on-going fire incident and to confirm effective decisions or correct deficiencies;
2. to identify new or improved procedures, techniques or tactics;
3. to compile consistent and complete information to improve or refine refuge, regional or national fire management programs;
4. to examine anomalous fire-related incidents in order to determine cause(s), contributing factors, and where applicable, recommends corrective actions. If negligence is indicated, the circumstances will be reported and investigated in accordance with applicable regulations, policies or guidelines; and
5. to determine the cost effectiveness of a fire operation.

The purpose of fire reviews is to examine all or part of the operations on an individual fire. Generally they occur because of some operational deficiency. Fire reviews should also be conducted on well run and efficient fires in order to document efficient procedures for use on future fires. Fire reviews include the following:

1. "Hotline" review.
2. Incident management team closeout and review.
3. Prescribed fire / wildland fire review.
4. Refuge level review.

5. Regional level review.
6. National level review.
7. Entrapment and/or fire shelter deployment review.

"Hotline" Review. The purpose of the hotline review is to examine the progress of an on-going fire incident, regardless of size. The review will provide a confirmation of the decisions being made daily in the Escaped Fire Situation Analysis or determine where the decision process has been faulty and corrective actions are needed. The "hotline" review is normally conducted by the refuge's Fire Management Officer (or an official who has designated fire program management responsibilities) in conjunction with the Incident Commander on the fire. These reviews require no special reporting. Documentation of "hotline" reviews should be included in the normal fire report narrative.

Incident Management Team (IMT) Closeout and Review. The agency administrator will conduct a close-out review with the IMT prior to their release from the fire incident. The purpose of this review is to ensure complete transition of the incident management back to the refuge and to evaluate the status of any incomplete fire business.

Prescribed Fire / Wildland Fire Review. All prescribed fires that are reclassified as unplanned and unwanted wildland fires will be reviewed by the refuge manager or his or her designated representative. This review may be included as part of a Regional or National Level review if necessary. The purpose of the review is to determine why and under what circumstances a prescribed fire had to be reclassified as a wildland fire. It will identify the circumstances leading to the reclassification of the fire, what actions were taken after reclassification as a wildland fire, and possible future actions that need to be taken to avoid similar situations. A formal report will be prepared, signed by the refuge manager, and a copy forwarded to the Regional Fire Management Coordinator and the Fire Management Branch. Costs of the review will be charged to the account assigned to the fire with the approval of the RFMC.

Refuge Level Review. The refuge level review should be convened and conducted by the Refuge Manager or his or her designated representative. The Refuge Manager will appoint other qualified persons, including the refuge Fire Management Officer (or an official who has designated fire program management responsibilities) to be a part of the review. The purpose of this review is to provide the Refuge Manager with information to recognize commendable actions and to take needed corrective action(s). As a minimum an oral review will be conducted. A written evaluation, prepared by the incident commander is required for all extra-period fires. Costs associated with the review will be charged to the account assigned to the fire with the approval of the Regional Fire Management Coordinator. A copy of the complete report will be sent to the Regional Fire Management Coordinator, who will review it and, if appropriate, forward a copy to the Fire Management Branch.

Regional Level Review. The regional level review will be convened and conducted by the Regional Fire Management Coordinator or his/her designated representative. A regional level review will generally be conducted for any fire that:

1. crosses a refuge's boundary into another jurisdiction without the approval of an interagency agreement;
2. results in local adverse media attention;
3. involves a fatality, serious injury, or significant property damage;
4. or results in controversy involving another agency.

Reviews as They Pertain to Prescribed Fires: A Prescribed Fire Plan will be developed each year for each Unit proposed for burning during that season. The Plan will be prepared and approved

before any burning is initiated and will include a separate package for each burn unit proposed for burning. A detailed list of items to include in each package can be found at <http://fire.r9.fws.gov/fm/policy/handbook/2-1.HTM#2.1.3>

In short, each package will include:

- a. A detailed prescription including all elements required by the Fire Management Handbook,
- b. Map displaying the vicinity of the burn in relation to the Refuge and surrounding properties,
- c. Detailed map of the Unit showing point of test fire, ignition sequence, wind direction, fire breaks, control lines, sources of water, and safety zones,
- d. A "Go-No Go" checklist,
- e. A Fire Complexity Analysis (**Appendix 10**).
- f. A Review and Approval signature page.

Prescribed Fire Critique and Review: Prescribed fires will be critiqued by the Burn Boss and documented in the DI 1202. The Regional Fire Management Officer will conduct formal critiques in the event of:

- a. Significant injury, accident, or fatality,
- b. An escaped prescribed fire occurs,
- c. Significant safety concerns are raised,
- d. If a significant smoke management problems occurs.

XIII. AIR QUALITY AND SMOKE MANAGEMENT GUIDELINES

Increasing emphasis on air quality and smoke management affect fire management operations throughout the country including Michigan. While studies indicate that short-term exposure to wood smoke may not be harmful to healthy individuals it may adversely impact those persons who already have existing respiratory problems such as asthma, emphysema or bronchitis. Even healthy individuals may be impacted by extremely high smoke concentrations or long term exposure moderate concentrations. In addition, smoke affects visibility.

The relatively unpopulated Upper Peninsula has no areas that are in violation of the air quality standards set to protect human health. The Seney Wilderness is designated Class I by the Federal Clean Air Act and, as such, is subject to the Act's National Visibility Goal of preventing any future and remedying any existing visibility impairment due to human-caused pollution in Class I areas. Smoke from fire management activities may temporarily impact air quality and visibility. However, research shows that wildfires produce 2-4 times as much particulate matter as prescribed fires because wildfires generally burn during drought periods, consume more total fuel and consume fuels during the less efficient smoldering state (Ottmar et al. 1996). Therefore, fire management activities may, over the long run, reduce the potential for air pollution and visibility impairment. In addition, by using good smoke management techniques including limiting the acreage and fuel burned and burning during optimum fuel and meteorological conditions it is possible for the Refuge to mitigate impacts to sensitive areas such as roads, local residences, and the Class I area. In the event of unpredicted changes in wind direction or other meteorological changes, the Refuge will employ mitigation measures to assure public health, safety and welfare. Refuge staff will also work with neighboring agencies and State air quality staff to address smoke issues. Each year, potential mitigation measures will be included in the Annual Prescribed Fire Plan for each Unit that is proposed to be burned.

XIV. FIRE RESEARCH AND MONITORING NEEDS

Seney NWR could provide a useful model for the long-term effect fire has on vegetation, soil characteristics, and wildlife habitat. Immediately after the 1976 Fire, a study was instigated that investigated this question. Now, 25 years later, a quality study comprised of sound hypothesis testing and thorough sampling should be undertaken. Some problems, such as finding and comparing plots, likely exist, but could be overcome by good experimental design. Moreover, this work could dovetail into a broader research program that investigates the effectiveness of fire management in providing habitat for openland bird species (both wetland and upland) of conservation concern.

Monitoring should comply with accepted scientific methods. Fire behavior data will be collected on all prescribed fires occurring on the Refuge. These and other data will be useful in improving the Fire Management Program so as to meet Refuge and Service goals and objectives.

APPENDICES

APPENDIX A

REFERENCES

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APPENDIX B: CONSERVATION PRIORITIES FOR REGION 3

Terrestrial vertebrate species listed as Fish and Wildlife Resource Conservation Priorities (FWS Region) that are plausible inhabitants of lands managed by Senej National Wildlife Refuge and may potentially be affected by fire. Inadequate information on plant species precludes their addition to this list. Species are listed by general habitats used and conservation concern status.

Priority Species	Habitats	Concerns
Gray Wolf	Mixed and Coniferous Forests	Endangered
American Bittern	Wetlands, Beaver Ponds	Rare/Declining
Wood Duck	Wetlands, Beaver Ponds, Bottomlands	Recreational/Economic Value
American Black Duck	Wetlands, Beaver Ponds	Recreational/Economic Value
Mallard	Wetlands, Beaver Ponds	Recreational/Economic Value
Blue-winged Teal	Wetlands, Beaver Ponds	Recreational/Economic Value
Bald Eagle	Open Water, Pine Nesting Trees	Threatened
Northern Goshawk	Mixed and Coniferous Forest	Rare/Declining
Northern Harrier	Bog, Open Wetlands w/Shrubs	Rare/Declining
Yellow Rail	Bog, Wet Open Sedge Marsh	Rare/Declining
American Woodcock	Mixed Forest, Wetlands	Rare/Declining/ Recreational/Economic Value
Sedge Wren	Bog, Wetland w/Shrubs	Rare/Declining
Wood Thrush	Mixed Forests	Rare/Declining
Golden-winged Warbler	Mixed Forests, Shrub Wetlands	Rare/Declining
Cape May Warbler	Coniferous Wetlands w/Sphagnum	Rare/Declining
Connecticut Warbler	Mixed Forest	Rare/Declining
Canada Warbler	Mixed Forest	Rare/Declining
Black-billed Cuckoo	Mixed Forest, Shrub	Rare/Declining
Whip-poor-will	Mixed Forest, Dry Open Understory	Rare/Declining
Northern Flicker	Mixed Forest, Open Understory	Rare/Declining
Olive-sided Flycatcher	Mixed Forest, Open Understory	Rare/Declining
LeConte's Sparrow	Bog, Sedge Marsh, Shrubs	Rare/Declining
Bobolink	Bog, Open Upland Grasslands	Rare/Declining
Rusty Blackbird	Wetland Forests Shrubs	Rare/Declining

APPENDIX C: POSITION NEEDS FOR FIRE MANAGEMENT PROGRAM AND EXISTING PERSONNEL

Position	Number Required	Physical Demands
Incident Commander Type 5 (ICT5)	1	Arduous
Prescribed Fire Burn Boss Type 3 (RXB3)	1	Arduous
Prescribed Burn Boss Type 2 (RXB2)	1	Arduous
Ignition Specialist (RXB2)	1	Arduous
Engine Boss (ENGB)	1	Arduous
Engine Operator (ENOP)	1	Arduous
Fire Fighter Type 2 (FFT2)	3	Arduous

Position	Name	Home Phone	Refuge Cellular Phone	Radio ID #
Refuge Manager	Tracy Casselman	293-1970	235-2337	SR-1
Assistant Manager	Gary Heet	283-3509	630-5780	SR-2
Biologist	Michael Tansy	586-6369	630-1596	SR-12
Forester	R.Gregory Corace	586-9851	-	SR-5
Maintenance Mechanic	Lawrence Zellar	586-9860	630-5788	SR-7
Maintenance Worker	Terrence Papple	586-9825	630-5778	SR-8
Biological Tech.	Vacant	-	-	-
Park Ranger	Jen McDonough	942-7268 or 586-6100	-	SR-6
Park Ranger	Marianne Kronk	387-5280	630-5779	SR-9
Administrative Tech.	Laural Tansy	586-6369	-	SR-4

APPENDIX D: COOPERATOR AGREEMENTS

The following are three major items to be addressed in future (and amended) cooperator agreements.

Can we use contracts and cooperative agreements? Local fire departments, qualified contractors, or other cooperators can conduct prescribed fire operations on Refuge lands. Agreements or contracts must clearly state the conditions under which these individuals may conduct prescribed fire operations, liability waivers, qualification and PPE requirements or other items important to the burning operation.

Contractors: Private contractors who specialize in providing fire management services must meet Service standards for qualification and PPE. Contracts should specify these requirements as well as other standards or work accomplishments they are to meet.

Cooperators: Cooperators should meet Service standards for qualification and PPE. It is likely that local cooperators such as Volunteer Fire Departments cannot afford the PPE or the training to meet Service standards. In this case, the inclusion of these cooperators in fire management operations may not be considered essential. If an individual cooperator will be supervising Service employees on the burn operation, he/she must be Service qualifications and experience standards.

APPENDIX E: WILDFIRE MOBILIZATION PLAN

APPENDIX F: NORMAL UNIT STRENGTH

Seney National Wildlife Refuge Normal Unit Strength plus equipment available for use in fire management program.

Equipment Item (Number)	Location
All Terrain Vehicle (3)	Refuge Headquarters
Go-Track with 200 gallon tank (1)	Refuge Headquarters
Dozer with plow (1)	Refuge Headquarters
Thiokol Spryte tacked vehicle (1)	Refuge Headquarters
Mark III Pumps (4)	Refuge Headquarters
Heavy Equipment Trailers (2)	Refuge Headquarters
Dump Trucks (3)	Refuge Headquarters
Well Point Kits (16)	Refuge Headquarters
Chainsaw Kits (2)	Refuge Headquarters
Crisifulli 12" Pump (1)	Refuge Headquarters
Excavator (1)	Refuge Headquarters
Backhoe (1)	Refuge Headquarters
Case Loader (1)	Refuge Headquarters
4x4 Fire Engine with 200 gallon pump (1)	Refuge Headquarters
Fire Hose: 3" --- 400ft 1-1/2" --- 5,600ft 1" --- 1,800ft 3/4" --- 1,200ft	Refuge Headquarters
Shelter, Hard Hats, Head Lamps, Goggles, Packs, Line Gear, First Aid Kits, Water Bottles (1 Per Qualified FF2 Individual + 20%)	Refuge Headquarters
Nomex Pants, Nomex Shirts, Gloves (1 Per Qualified FF2 Individual + 20%)	Refuge Headquarters
Shovels, Pulaskis, McLeods, Flaps, Fire Rakes (Minimum of 3 per Vehicle)	Refuge Headquarters
Back Pack Pump (2)	Refuge Headquarters
Portable Pumps (2)	Refuge Headquarters
Wyes, Tees, Wrenches, etc. (1 per Pump)	Refuge Headquarters

APPENDIX F CONT. Desired pre-season contents of Seney National Wildlife Refuge fire engine.

Equipment Item	Number
Wool Blanket	1
Fly Tent, Type II	1
Brush Coat (XL)	2
Goggles	2
Fire Shelters	2
Pair Gloves (Large)	2
Pair Gloves (XL)	2
Roll Black Plastic	1
Helmet Liners	3
Pants (34)	1
Pants (36)	1
XL Shirts	2
Boxes MREs	2
Jumper Cables	1
Silv-ex Foam (5-Gallon)	1
Snatch Box	1
Tow Strap (2" Nylon, 20')	1
Chain with Hooks (3/8", 20')	1
Hacksaw	1
Belt Weather Kit	1
Headlamp	1
Snap Light Kit	1
Box AA Batteries	2
Box D Batteries	2
Package Moleskin	1
Individual First Aid Kit	1
Insect Repellent	1
4-Quart Canteen	1
2-Quart Canteen	1
1-Quart Canteen	2
Type III First Aid Kit	1
Miscellaneous Fuses	8
Fire Extinguisher (5#)	1
Chainsaw Kit	1
V-Blade Rescue Knife	1
Military Style Flashlight	1
Rolls Tape	4
Chin Straps	2
Rolls Flagging	8
Rolls Hose (1.5", 100')	3
Rolls Hose (1", 100')	3
Rolls Garden Hose (0.75", 50')	2
Rolls Garden Hose (0.5", 50')	1
Collapsible Bucket	2
Bladder Bags	2
Shovels with Sheaths	2

Equipment Item	Number
Pulaski with Sheaths	2
Suction Primer	1
Grease Gun	1
Gated Wye (1.5")	1
Gated Wye (1")	1
Can Oil (WD40)	1
Quart Oil (10W30)	1
Quart ATF	1
Quart 2-Cycle Oil	1
Hose Clamps	2
Shut Off Valves (1.5")	2
Shut Off Valves (1")	2
Foot Valve Strainer (1.5")	1
Forester's Nozzle (1.5")	1
Forester's Nozzle (1")	1
Nozzle with Combination Barrel (1")	1
Nozzle Tips	3
Rubber Gaskets (0.75", 1", 1.5")	12 ea.
Set Wrenches (3/4" to 5/16")	1
Set Allen Wrenches (Screwdriver Type)	1
Set Nut Driver (3/16" to 1/2")	1
C58 Sparkplugs	3
Spanner Wrenches	3
Double Female Couplings (1.5")	2
Double Male Couplings (1.5")	2
1.5" to 2" NPSH	1
1" to 1.5" NH	2
1.5" to 1.5" Pipe to Hose	10
1.5" to 1.5" Hose to Pipe	8
1.5" to 1.5" Pipe to Pipe	1
1" to 3/4" Pipe to Pipe	3
Channel Locks (18")	1
Crescent Wrench (12")	1
Crescent Wrench (8")	1
Ball Peen Hammer (12")	1
Needle Nose Pliers	1
Regular Pliers	1
Pipe Thread Compound	1
Socket Set (3/8" to 1.25" Short Well)	1
Socket Set (7/16 to 11/16" Deep Well)	1
Extension (10")	1
Ratchet (0.5", 10")	2
Breaker Bar (18")	1
Tool Box	1
Pipe Wrench (14")	1
Scottcloth	1
Drip Torch	1
Gas Can	1

Equipment Item	Number
Suction Hose	2
HI 8564 Thermo Hygrometer	1
Battery Holder	1
Bendix/King Radio	1

APPENDIX G: COOPERATOR EQUIPMENT

Hiawatha National Forest fire equipment and its location as of 20001.

Equipment Item	Location
JD450 Widetrack Tractor Plow	Rapid River (Hiawatha NF)
JD550 Widetrack Tractor Plow	Rapid River (Hiawatha NF)
JD450	Raco (Hiawatha NF)
T6 Engine 300 Gallon w/Foam	Rapid River (Hiawatha NF)
T6 Engine 300 Gallon w/Foam	Raco (Hiawatha NF)
T6 Engine 200 Gallon w/Foam	St. Ignace (Hiawatha NF)
T7 125 Gallon w/Foam	Rapid River (Hiawatha NF)
T7 125 Gallon w/Foam	Rapid River (Hiawatha NF)
T7 125 Gallon w/Foam	Manistique (Hiawatha NF)
T7 125 Gallon w/Foam	Munising (Hiawatha NF)
T7 125 Gallon w/Foam	Raco (Hiawatha NF)

APPENDIX H: REFUGE CONTACT NUMBERS

EMERGENCY NUMBERS

Ambulance and Fire (Must specify which ambulance you want Schoolcraft- Manistique Hospital or Luce County – Newberry Hospital) Dial 911

IN CASE OF WILDFIRE CALL:

Tracy Casselman 906-293-1970
Gary Heet 906-283-3509
Terry Papple 906-586-9825
Greg Corace 906-586-9851 X 14
Lawrence Zellar 906-586-9860
Mike Tansy 906-586-6369
Laurie Tansy(dispatch)906-586-6369

Refuge 911 Addresses:

Office: 1674 Refuge Entrance Road
Shop: 1516 Refuge Entrance Road
Visitor Center: 1606 Refuge Entrance Road
Qtrs 1: 1693: Refuge Entrance Road
Qtrs 136: 1636 Refuge Entrance Road
Qtrs 137: 1480 Refuge Entrance Road
Student Cabin: 1504 Refuge Entrance Road
Log Cabin: 9201 Refuge Entrance Road
Riverroad QTRS # 30: 1986 River Road

Manistique Medical Center: 1-800-562-911
Curtis Walk-in Clinic - 586-3300 (Monday – Wednesday 8:00 to 3:30 pm)

Medical EMT: Seney 906-499-3348
Charlie Hollingshead (First responder only cannot transport)

HOSPITAL: Newberry: 906-293-5181
Manistique: 906-341-3200
Munising: 906-387-4110

STATE POLICE

One call to any of the three numbers below is answered by Negaunee dispatch. In case of emergency they can contact all three posts.

Newberry: 906-293-5151
Manistique: 906-341-2101
Munising: 906-387-4550

POISON CONTROL: 1-800-562-9781 (U.P. Crisis Line) 420 W. Magnetic, Marquette, MI 49855

Wrecker Service: Closest is listed first, All are Triple A,
Don's Automotive-Gulliver 906-283-3857
Eagle Towing – Engadine - 906-477-1115 1-800 404Towing
Middletons- Engadine – 906-477-6301

APPENDIX I: REFUGE DISPATCH PLAN

Seney National Wildlife Refuge Dispatch Plan

When a report of smoke or fire is received, the Seney NWR staff member shall gather as much information as possible from the observer. At the minimum, the following shall be obtained:

1. Location of the smoke or fire: _____
2. Location of the observer: _____
3. Name and telephone number of the observer: _____
4. Color of the smoke: _____
5. Estimated fire size: _____
6. Type of fuel (e.g., trees, grass, shrubs, trash): _____
7. Fire character (e.g., running, creeping, etc.): _____
8. Anyone at fire: _____
9. Was anyone observed leaving area: _____
10. If "yes" to #9 above, description of vehicle or vehicle license #: _____

Other actions:

11. Check map location and ownership/protection status: _____
12. If the fire is on or threatening the Refuge, dispatch the engine and at least 2 qualified staff.
13. Notify FMO and/or the Refuge Manager.
14. Maintain a log of all radio and telephone communications. If possible, get someone else to take care of the incoming telephone calls not pertaining to the fire.
15. Remain on duty and dispatch further assistance as ordered from the fire.
16. Refer to FMP for contact numbers and other guidance.
17. Refer to the UP Wildfire Mobilization Plan.

APPENDIX J: MINIMUM REQUIREMENTS

APPENDIX K: FIRE COMPLEXITY ANALYSIS

APPENDIX L: WILDFIRE SITUATION ANALYSIS

APPENDIX M: EFFECTS OF THE 1976 SENEY NATIONAL