

WILDLAND FIRE MANAGEMENT PLAN

HARBOR ISLAND NATIONAL WILDLIFE REFUGE



2003

WILDLAND FIRE MANAGEMENT PLAN
HARBOR ISLAND NATIONAL WILDLIFE REFUGE
GREAT LAKES-BIG RIVERS REGION

Prepared: /s/ Cal Gale 12/20/02
Cal Gale Date
Fire Program Analyst, R.S. Staffing Services, Inc.

Tracy Casselman Date
Project Leader, Harbor Island National Wildlife Refuge

Concurred: Brian McManus Date
Regional Fire Management Coordinator

Tom Worthington Date
Chief, Refuge Operations

Nita Fuller Date
Chief, Division of Refuges

Approved: William Hartwig Date
Regional Director

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INTRODUCTION

This document establishes a Fire Management Plan for Harbor Island National Wildlife Refuge (NWR). As this plan is not generating new Federal actions that would affect the environment, it is deemed a categorical exclusion and requires no additional environmental documentation under the National Environmental Policy Act (NEPA). An informal Section 7 consultation will be conducted to ensure no adverse effects on Federally threatened or endangered (T&E) species. Based on past actions and associated reviews, sites subject to the National Historic Preservation Act (NHPA) may be present.

This plan is written as an operational guide for managing the Refuge's wildland fire program. It defines levels of protection needed to ensure safety and protect resources, given current understanding of the complex relationships in natural ecosystems. It is written to comply with a Service-wide requirement that units with burnable vegetation develop a fire management plan (620 DM 1).

This FMP outlines a program of full suppression of all wildland fires. There will be opportunities for prescribed fire on the Refuge. The plan provides guidance to cooperating wildland suppression agencies to protect Island resources.

The Refuge is an un-staffed satellite of Seney NWR. No personnel qualified for wildland fire suppression duties are on site. Suppression forces from the Michigan Department of Natural Resources (MIDNR) are, by state law, responsible for suppression. Refuge staff will respond when notified of wildland fire to assist and assume responsibility for suppression.

COMPLIANCE WITH USFWS POLICY

The Refuge was purchased from The Nature Conservancy on December 14, 1983.

While there are no current management plans or Environmental Assessments (EA) addressing management actions on Harbor Island, only limited application of prescribed fire is planned. As prescribed fire would be used only for habitat management, according to Fire Management Handbook Section 1.4.1, Fire Management Planning, actions under this plan would be a Categorical Exclusion from the full NEPA process.

Authority and guidance for implementing this plan are found in:

- Protection Act of September 20, 1922 (42 Stat. 857; 16 United States Code (U.S.C.) 594): authorizes the Secretary of the Interior to protect from fire, lands under the jurisdiction of the Department directly or in cooperation with other Federal agencies, states, or owners of timber.
- Economy Act of June 30, 1932: authorizes contracts for services with other Federal agencies.
- Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66, 67; 42 U.S.C. 1856, 1856a and b): authorizes reciprocal fire protection agreements with any fire organization for mutual aid with or without reimbursement and allows for emergency assistance in the vicinity of agency lands in suppressing fires when no agreement exists.
- Disaster Relief Act of May 22, 1974 (88 Stat. 143; 42 U.S.C. 5121): authorizes Federal agencies to assist state and local governments during emergency or major disaster by direction of the President.
- Federal Fire Prevention and Control Act of October 29, 1974 (88 Stat. 1535; 15 U.S.C.2201): provides for reimbursement to state or local fire services for costs of firefighting on federal property.
- Wildfire Suppression Assistance Act of 1989. (P.L. 100-428, as amended by P.L. 101- 11, April 7, 1989).
- Departmental Manual (Interior), Part 620 DM, Chapter 1, Wildland Fire Management: General Policy and Procedures (April 10, 1998): defines Department of Interior fire management policies.
- Service Manual, Part 621, Fire Management (February 7, 2000): defines U.S. Fish and Wildlife Service fire management policies.
- National Wildlife Refuge System Administrative Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. 668dd et seq.: defines the National Wildlife Refuge System as including wildlife refuges, areas for the protection and conservation of fish and wildlife which are threatened with extinction, wildlife ranges, game ranges, wildlife management areas and waterfowl production areas. It also establishes a conservation mission for the Refuge System, defines guiding principles and directs the Secretary of the Interior to ensure that biological integrity and environmental health of the system are maintained and that growth of the system supports the mission.
- National Environmental Policy Act of 1969: regulations implementing the National Environmental Policy Act (NEPA) encourages the combination of environmental comments with other agency documents to reduce duplication and paperwork (40 CFR 1500.4(o) and 1506.4).
- Clean Air Act (42 U.S.C. 7401 et seq.): requires states to attain and maintain the national ambient air quality standards adopted to protect health and welfare. This encourages states to implement smoke management programs to mitigate the public health and welfare impacts of wildland and prescribed fires managed for resource benefit.
- Endangered Species Act of 1973.
- U.S. Fish & Wildlife Service Fire Management Handbook.

This plan meets NEPA /NHPA compliance and will be implemented in coordination with the Endangered Species Act of 1973, as amended, under the section 7 programmatic review, and will take appropriate action to identify and protect from adverse effects any rare, threatened, or endangered species. The authority for funding (normal fire year programming) and all emergency fire accounts is found in the following authorities:

Section 102 of the General Provisions of the Department of Interior's annual Appropriations Bill provides the authority under which appropriated monies can be expended or transferred to fund expenditures arising from the emergency prevention and suppression of wildland fire.

P.L. 101-121, Department of the Interior and Related Agencies Appropriation Act of 1990, established the funding mechanism for normal year expenditures of funds for fire management purposes.

31 US Code 665(E)(1)(B) provides the authority to exceed appropriations due to wildland fire management activities involving the safety of human life and protection of property.

Authorities for procurement and administrative activities necessary to support wildland fire suppression missions are contained in the Interagency Incident Business Management Handbook.

FIRE MANAGEMENT OBJECTIVES

The overall objectives for fire management are to promote a program to ensure firefighter and public safety, aimed at reducing human-caused fires and to ensure appropriate suppression response capability to meet expected wildland fire complexity and increase use of prescribed fire for habitat management.

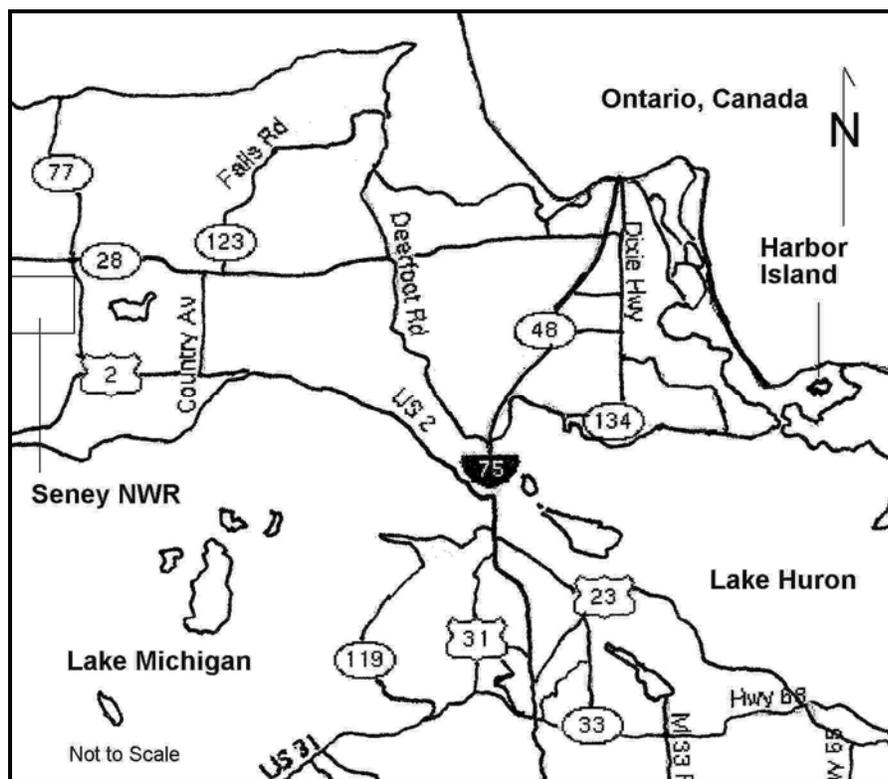
Specific fire management objectives are:

- Promote a fire management program and control all wildland fires.
- Protect life and resources from wildland fires at costs commensurate with resource values at risk.
- Use appropriate suppression tactics and strategies that minimize long-term impacts of suppression actions, particularly related to water quality
- Institute a program of prescribed fire application to manage resources and enhance ecosystem productivity.
- Protect active and potential bald eagle nest trees from wildland fire loss.

DESCRIPTION OF REFUGE

This island Refuge, approximately 695 acres in size, is in Chippewa County, Michigan (Figure 1). Located in Potagannissing Bay of Lake Huron, Harbor Island is part of a group of islands dominated by Drummond Island (Figure 2). Sault Sainte Marie, MI is approximately 45 water miles north. The refuge is a satellite of Seney NWR which is located approximately 125 miles west.

Figure 1 – Vicinity Map



CULTURAL RESOURCES

No cultural surveys have been conducted on Harbor Island. At acquisition at least one 1950's or 1960's era home was removed from the island. Based on the size of the Island, its location relative to other islands, the vegetation present and other indicators, pre-historic and historic sites are quite likely to be present.

Prior to any prescribed fire operations, some level of cultural survey will be necessary to avoid adverse or unnecessary impacts on potential cultural sites.

FISH AND WILDLIFE

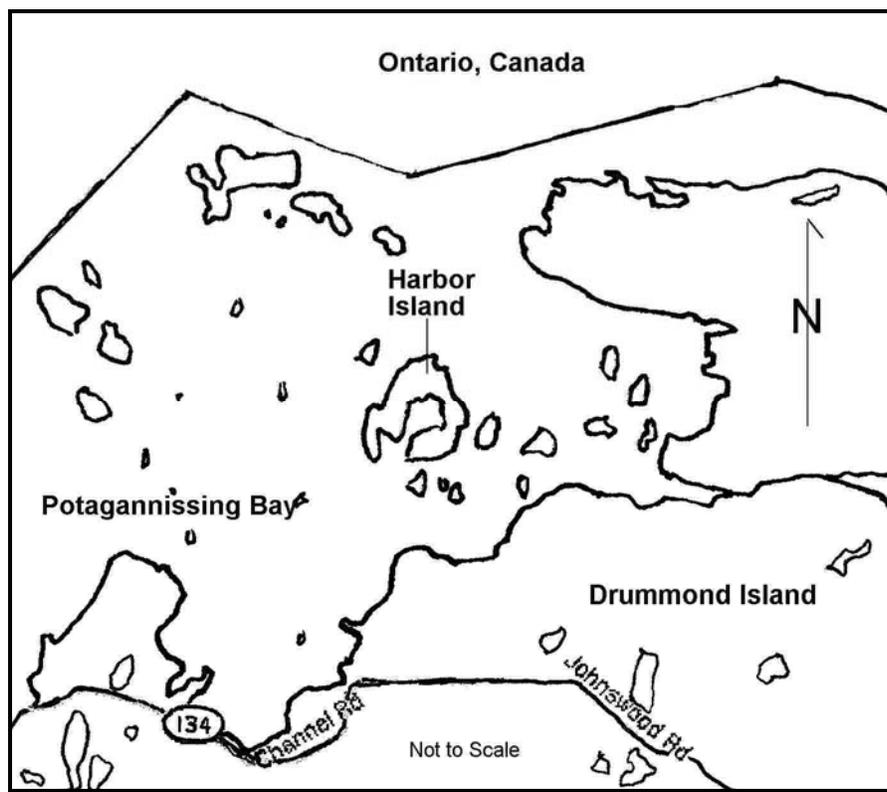
Wildlife harvest regulations on the Refuge are the same as State of Michigan regulations. White-tailed deer (*Odocoileus virginianus*) are of primary concern. A 1978 pre-acquisition survey indicated a year round deer population and island vegetation was showing the stress imposed by an overabundant deer population. Deer herbivory appears to be changing the composition of understory species (Scharf and Chamberlin, 1978, Selzer, 2000). There is a strong potential for deer browsing to cause a fast, significant, vegetative change should a major disturbance to forest stands occur.

Other mammals reported include snowshoe hare (*Lepus americanus*), beaver (*Castor canadensis*), little brown bat (*Myotis lucifugus*), red bat (*Lasiurus borealis*), woodland deer mouse (*Peromyscus maniculatus gracilis*), red-backed vole (*Clethrionomys gapperi*) and mink (*Mustela vison*). Gray wolves (*Canis lupus*) from St. Joseph Island, Ontario are thought to hunt the island during the winter months. Several other species have been reported on Bald Island just east of Harbor Island and are expected to be visitors to the Refuge.

Numerous avian species use the island for feeding and nesting. Bald eagle (*Haliaeetus leucocephalus*) nests on the island, osprey (*Pandion haliaetus*) and great blue heron (*Ardea herodias*) are frequent visitors. The protected marsh in the embayment provides nesting habitat for pied-billed grebe (*Podilymbus podiceps*), American bittern (*Botaurus lentiginosus*), black tern (*Chlidonias niger*), long billed marsh wren (*Cistothorus palustris*), and red winged blackbirds (*Agelaius phoeniceus*). Broods of mallards (*Anas platyrhynchos*), black ducks (*Anas rubripes*), wood ducks (*Aix sponsa*), common goldeneyes (*Bucephala clangula*), and red-breasted mergansers (*Mergus serrator*) have been reported.

Both Federal and state listed T&E or special emphasis species that may be found in the vicinity of the refuge are found in Tables 5 and 6 in Appendix F.

Figure 2 – Refuge Area



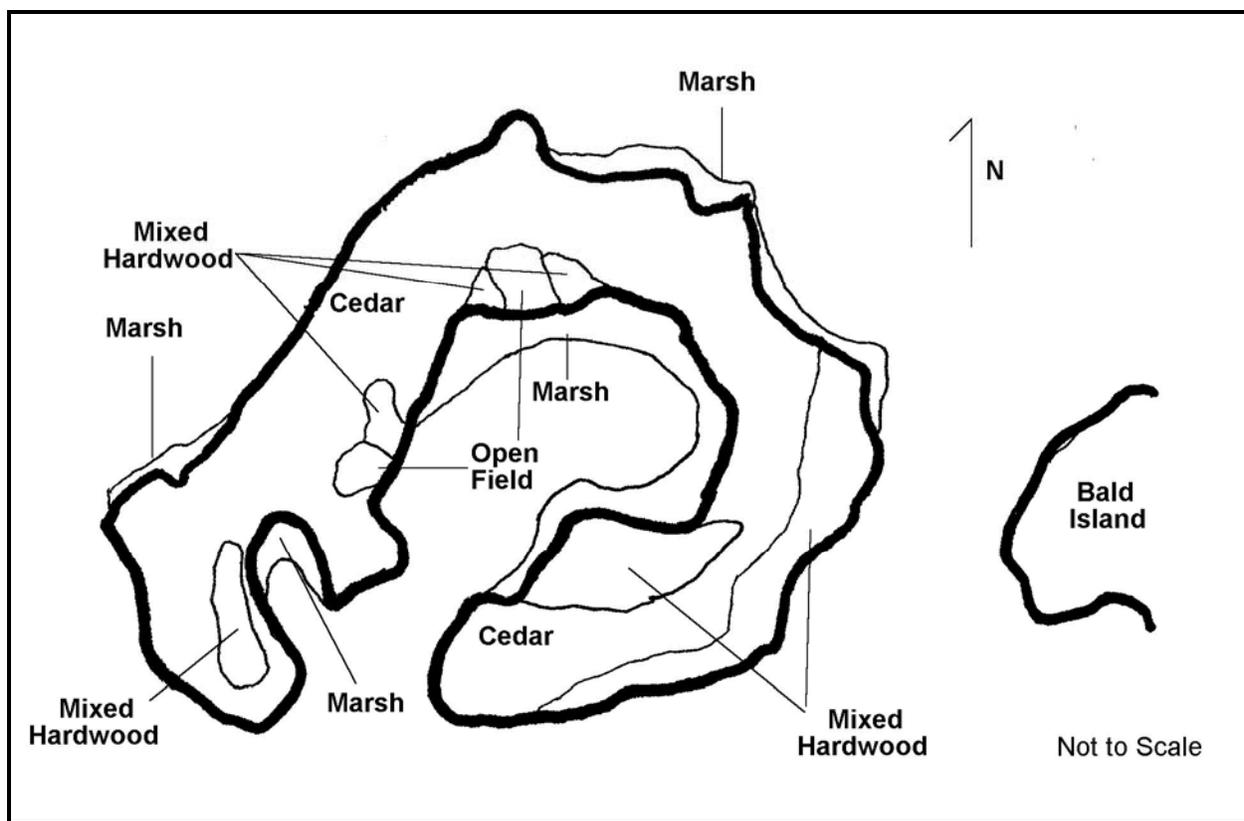
VEGETATION

Four major vegetative associations are found on the island. Areas containing northern white cedar (*Thuja occidentalis*) and balsam fir (*Abies balsamea*) predominate. The next most prevalent community is a mixed upland community containing red oak (*Quercus rubra*), sugar maple (*Acer saccharum*), trembling aspen (*Populus tremuloides*), ash (*Fraxinus spp.*) and white birch (*Betula papyrifera*). Marsh is found around the interior bay and along the northeast side of the island. Some acreage of open field is found

just inland from the bay. The species composition is unknown but likely contains timothy (*Phleum pratense*), Canada bluegrass (*Poa canadensis*) and other species based on similar abandoned agricultural sites in the Upper Peninsula. Figure 3 shows the major vegetative associations and is adapted from the plant community survey by Selzer (2000). Figure 4 is an aerial view of the island.

Several sensitive orchids reported by Scharf and Chamberlin (1978) were not found during the field survey by Selzer (2000). It is not clear why they were not found but references cited by Selzer indicate that heavy deer browsing may be responsible.

Figure 3 – Vegetative Associations



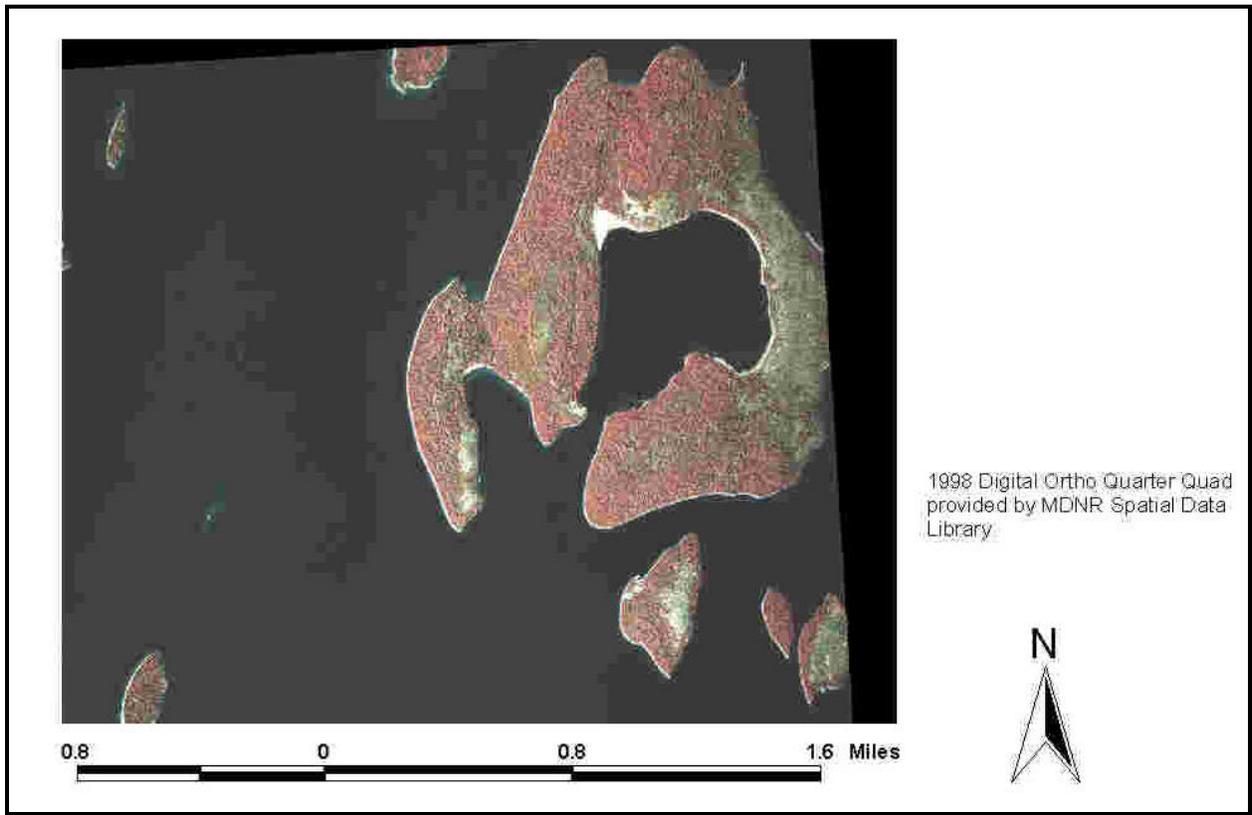
PHYSICAL RESOURCES

Geologically the area is typical of the glaciation found near the upper Great Lakes. Soils are generally a stony, silt-sand complex, deep enough to be well drained above the normal lake level water table. There are areas of limestone and dolomite outcrops. Topographically, the refuge is characterized by gently rolling terrain. The estimated high point on the island is at elevation 680 feet above mean sea level or 100 feet above the lake.

There are no streams on the island, although some ponding of run-off occurs. The water table depends on Lake Huron water levels. Lake Huron has had a significant drop in recent years, with forecasts for receding lake levels to continue.

The area is rated as Class II air quality. This means that actions under the plan will be designed to prevent significant deterioration in air quality. Visibility is considered an important resource in the area with thousands of visitors and residents enjoying scenic views of the islands in Potagannissing Bay.

Figure 4 – Aerial View of Harbor Island



STRUCTURES AND FACILITIES

There are no structures on the island and no private inholdings are present. On nearby islands there is considerable development as most are privately owned. Much of the visitation on Harbor Island is thought to result from the residents of the neighboring islands. Separation is generally by a mile or more, so wildland fires on Harbor Island are not likely to threaten nearby islands although smoke could be a consideration.

WILDLAND FIRE MANAGEMENT SITUATION

HISTORIC ROLE OF FIRE

While it is likely that fire affected Refuge habitats in the past, generalizations based on knowledge of the silvicultural needs of the various forest vegetative associations must be used.

Pre-settlement Fires

The natural fire interval is unknown. However, based on similar habitats in northern Michigan and Wisconsin with some fire history available, the following assumptions may be made. In areas of mixed hardwood favoring sugar maple, the natural fire return interval likely ranges from 300 or more years with very long return interval crown fires and severe surface fires in combination, a Class V Fire Regime according to the 10-Year Comprehensive Strategy. (USDA, USDI, 2001). Where oaks are dominant, the natural return interval would be shorter, possibly 25-100 years (Class III Fire Regime). The white cedar stands are also subject to fire, however, pending drought conditions and an ignition source, return intervals could extend for several hundred years.

Pre-settlement ignition on the island would either be lightning or by Native American use. The quality of the harbor would indicate a potentially higher probability of ignition from Native American use.

Post-settlement Fire History

Fire suppression or exclusion began when logging activities became prevalent in the area, about 1880. In the northern portions of the Lakes States, fires frequently followed logging. Examples include the Pestigo Fire (1871) and the Hinkley Fire (1894). Many other fires are mentioned in numerous diaries and journals kept by the early European settlers. Attempts at farming frequently followed logging and fires from land clearing and slash burning were common.

Little is known about the land-use history of the Island. The majority of the Island supports extensive cedar stands; it is unlikely extensive agricultural operations were present. During visits by Refuge staff, evidence of several old campfires on the Island's shore have been noted. Human activities would likely be the main source of ignition today.

One fire has been recorded since acquisition. This fire was lightning-caused and burned 0.2 acres. It was a persistent fire, burning for 16 days in peat soils. Neither the Department of Interior Fire Management Information System nor Michigan Department of Natural Resources have reports of fire on Harbor Island since 1991.

Northern Michigan typically has a split fire season. The first part is in the spring from the time snow disappears until vegetation has begun its growth (green-up). This part of the fire season usually runs from mid-April until late May or early June. A fall fire season may follow the growing season. The first frost cures remaining fine fuels and this season may last until snow cover is on the ground. Most fires during the established season are human-caused. Lightning has a greater potential as an ignition source during the summer when rainfall is usually at its peak (see Figure 6). Growing season statistics for the area indicate a 110 day growing season on average.

The Refuge, by the nature of its vegetative cover, is not likely to support extensive fires except under extremely dry conditions. Fire occurrence is expected to continue as an extremely rare event. With hunting allowed, primarily in the fall, possible ignitions would be expected to be human-caused, likely from warming fires or smoking material disposal.

Prescribed Fire History

There has been no prescribed fire on the Island since it became a Refuge.

RESPONSIBILITIES

There is no fire management staff at Harbor Island NWR. The Project Leader at Seney NWR is responsible for planning and implementing the fire management program on the refuge. A Zone Fire Management Officer (FMO) located at Leopold Wetland Management District, Portage, WI is responsible for fire management program oversight.

Preparedness planning and work is accomplished by the Refuge Fire Management Officer (FMO) with resources and guidance provided by the Zone FMO. Emergency fire management actions may be handled by MIDNR if transportation access to the island is available. They have the legal responsibility for wildland fire suppression under state law. The Zone FMO will be immediately notified of all emergency actions.

Project Leader (PL)

- Is responsible for implementation of all fire management activities within the unit and will ensure compliance with Department and Service policies.
- Selects the appropriate management responses to wildland fire.
- Identifies pre-suppression projects and biological objectives to Fire Management Officer (FMO) and notifies FMO of project constraints.
- Acts as, or designates, the primary Refuge Resource Management Specialist during fire management planning and operations.

Fire Management Officer (FMO)

- Responsible for all fire-related planning and implementation for the refuge. Integrates biological objectives into all fire management planning and implementation.
- Solicits program input from the PL.
- Supervises preparedness project planning.
- Is responsible for implementation of this Plan.
- Is responsible for preparation of fire reports following the suppression of wildland fires and for preparedness projects requiring such.
- Prepares an annual report detailing fire occurrences and preparedness activities undertaken in each calendar year. This report will serve as a past year's fire management activities review, as well as provide documentation for development of a comprehensive fire history record for the refuge.

Zone Fire Management Officer (Zone FMO)

- Submits budget requests and monitors FIREBASE funds.
- Maintains records for all personnel involved in suppression and preparedness activities, detailing the individual's qualifications and certifications for such activities.
- Updates all fire qualifications for entry into the Fire Management Information System.
- Nominates personnel to receive fire related training, as appropriate.

Incident Commander

- Incident Commanders (of any level) use strategies and tactics as directed by the Project Leader and Wildland Fire Situation Analysis (WFSAs), where applicable, to implement selected objectives on a particular incident. A specific Limited Delegation of Authority (Appendix C) will

be provided to each Incident Commander prior to assuming responsibility for an incident. Major duties of the Incident Commander are given in the National Wildfire Coordinating Group (NWCG) Fireline Handbook, including:

- Brief subordinates, direct their actions, and provide work tools.
- Ensure that safety standards identified in the Fire Orders, the Watch Out Situations, and agency policies are followed at all times.
- Personally scout and communicate with others to be knowledgeable of fire conditions, fire weather, tactical progress, safety concerns and hazards, condition of personnel, and needs for additional resources.
- Order resources to implement the management objectives for the fire.
- Inform appropriate dispatch of current situation and expected needs.
- Coordinate mobilization and demobilization with dispatch and the Collateral FMO.
- Perform administrative duties, (i.e., approving work hours, completing fire reports for command period, maintaining property accountability, providing or obtaining medical treatment, and evaluating performance of subordinates).
- Assure aviation safety is maintained to the highest standards.

Initial attack modules

An initial attack module will be assembled from staff at Seney NWR due to low fire occurrence and lack of staff at Harbor Island.

Employees participating in any wildland fire activities on Fish and Wildlife Service or cooperators’ lands will meet fitness requirements established in PMS 310-1, except where Service-specific fitness requirements apply.

INTERAGENCY COORDINATION

The State of Michigan has primary responsibility for wildland fire suppression under state law. Refuge personnel will coordinate all suppression efforts with local MIDNR fire officers. A table of cooperators is found below. MIDNR personnel have informal agreements with the Drummond Island Fire Department which has a boat designated for fire use on the islands in Potagannissing Bay. A similar boat is available from the De Tour Village Fire Department, both are 18 foot Boston Whalers equipped with pumps and other structural firefighting equipment. An individual in De Tour Village has an old Coast Guard vessel that is equipped with pumps. He has expressed a willingness to be available to MIDNR if needed.

Table 1 – Cooperator List

| Cooperator | Agreement Type |
|--|-----------------------|
| MI Department of Natural Resources, De Tour Village Field Office | None, Statutory |
| Drummond Island Fire Department | None, through MIDNR |
| De Tour Village Fire Department | None, through MIDNR |

There are no structures on the island and no structural assistance is anticipated.

As needed, Seney NWR uses the Incident Command System (ICS) as a guide for fireline organization. Qualifications for individuals is per DOI Wildland Fire Qualifications and Certification System, part of

NIIMS and the National Wildland Fire Coordination Group (NWCG) Prescribed Fire Qualification Guide.

PROTECTION OF SENSITIVE RESOURCES

A critical consideration during suppression operations is the use of foams or other retardants near open water. Fish have been shown to be extremely sensitive to the presence of these agents and areas adjacent to the shore contain many areas of moderate to high quality fishery habitat. No foam or retardant will be used on the Refuge.

One known bald eagle nest exists on the shore of the harbor. An evaluation of existing and potential nest trees should be conducted to determine potential threat from wildland fire. This evaluation would then be used to support future hazardous fuels reduction projects.

All suppression actions on the Island will be conducted using Minimum Impact Suppression Techniques (MIST). There are no facilities on the island to allow mechanized equipment access.

It is unlikely that any wildlife resources will be affected more than temporarily by smoke and the flame front. Vegetation may be affected by fire; the effects will depend on fire intensity, rate of spread, condition of fuels and other factors (Mladenhoff et al, 1993). Under drought conditions, a fire in the cedar swamps would likely be considered a stand replacing event with a number of potential results. They range from natural reseeding of cedar to conversion to marsh or alder (*Alnus spp.*) swamp depending on extent, intensity, soil damage and other factors.

Preparation for prescribed fires (such as constructing fire lines) are subject to Section 106 of the National Historic Preservation Act. The procedures in the Notice dated December 8, 1999, "Historic Preservation Responsibilities," apply to the planning and preparation for conducting prescribed fires.

Efforts to control wildland fires (including prescribed fires that get out of control) are also subject to Section 106 of the National Historic Preservation Act. We will meet our obligations under this act in the following ways:

When the land covered by a wildfire has been inventoried to identify cultural resources, and the cultural resources have been evaluated for significance according to the criteria for the National Register of Historic Places, the Fire Management Officer will direct ground disturbing fire suppression efforts around (will avoid impacting) historic properties. Nevertheless, evidence of a previously undetected cultural resource may be encountered. The project leader shall immediately notify the Regional Historic Preservation Officer (RHPO). The RHPO will take immediate steps to have the cultural resource evaluated and protected, as appropriate, to the extent required by law and policy. This may require arranging for a qualified professional to visit and evaluate the site's importance and recommend a course of action. An evaluation and decision on the disposition of the cultural resource should be made within 48 hours of the discovery unless the project's schedule allows greater flexibility.

When the land covered by a wildfire has *not* been inventoried for cultural resources and wildfire suppression activities do result in ground disturbing activities, we will take the following action. Soon after fire control, the project leader will contact the RHPO to arrange for an archeologist to investigate the disturbed areas to determine if sites were affected.

Refuge operations and maintenance funds (sub-activity 1261) will pay the cost of these activities unless the action is an emergency archeological and historic property survey in unstable areas prone to further

degradation (i.e., erosion) following a wildland fire or in association with an emergency fire rehabilitation treatment. Emergency archeological and historic property surveys in unstable areas prone to further degradation (i.e., erosion) following a wildland fire or in association with an emergency fire rehabilitation treatment, and archeological, historic structure, cultural landscape, and traditional cultural property resource stabilization and rehabilitation can be funded with emergency rehabilitation funding.

Impacts by fire to archeological resources vary. The four basic sources of damage are (1) fire intensity, (2) duration of heat, (3) heat penetration into soil, and (4) suppression actions. Of the four, the most significant threat is from equipment during line construction for wildland fire holding actions.

The following actions will be taken to protect archeological and cultural resources:

Wildland Fires

- Minimum impact fire suppression tactics will be used to the fullest extent possible.
- Resource Advisors will inform Fire Suppression personnel of any areas with cultural resources and should contact the Regional Historic Preservation Officer and/or his/her staff for more detailed information.
- The location of any sites discovered as the result of fire management activities will be reported to the Regional Historic Preservation Officer.
- Rehabilitation plans will address cultural resources impacts and will be submitted to the Regional Historic Preservation Officer using the RCRC.

WILDLAND FIRE ACTIVITIES

Fire program management describes the operational procedures necessary to implement fire management at Harbor Island NWR. Program management includes: fire prevention, preparedness, emergency preparedness, fire behavior predictions, step-up staffing plan, fire detection, fire suppression, minimum impact suppression, minimum impact rehabilitation, and documentation.

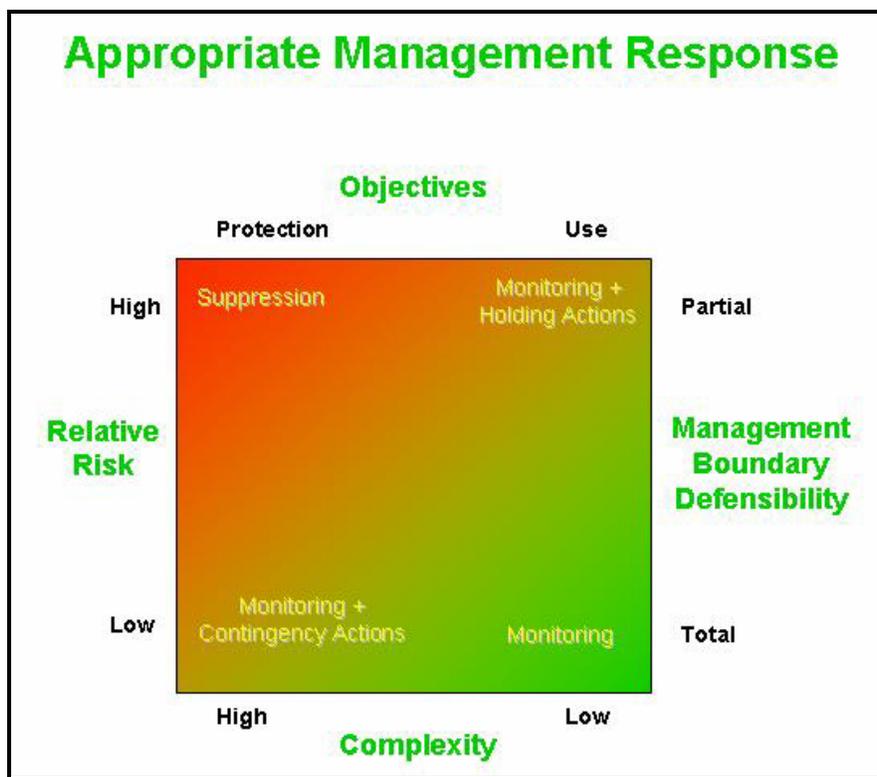
All fires will be appropriately suppressed. As this station has no fire history since acquisition, a full suppression response will be the usual practice.

Records from MIDNR show that fire season is typically from mid-April to late May or early June with a possible second season from mid-September to snowfall, usually mid-November. Depending on the specific weather of any particular year the seasons may be shorter or longer and, therefore, may start earlier or last longer.

FIRE MANAGEMENT STRATEGIES

Although resource impacts of suppression alternatives must always be considered in selecting a fire management strategy, managing fire for resource benefit will not be the primary consideration. Appropriate suppression action will be taken to ensure firefighter safety, public safety, and protection of unit resources. Figure 5 illustrates one way of determining the Appropriate Management Response.

Figure 5 – Appropriate Management Response



Critical protection areas will receive priority consideration in fire suppression planning efforts. In all cases, the primary concerns of fire suppression personnel shall be safety, and if needed, all individuals not involved in the suppression effort may be evacuated.

Suppression strategies should be applied so that the equipment and tools used to meet the desired objectives are those that inflict the least impacts upon the natural and cultural resources. Minimum Impact Suppression Tactics (MIST) will be employed to protect all resources. Natural and artificial barriers will be used as much as possible for containment. When necessary, fire line construction will be conducted in such a way as to minimize long-term impacts to resources. Sites impacted by fire suppression activities or by the fire will be rehabilitated as necessary, based on an approved course of action for each incident.

Specific fire management strategies for Harbor Island are:

- All wildland fires will be controlled using the appropriate suppression strategy which considers safety, natural resources, and economics.
- Known cultural resource areas will be excluded from all fire management activities including fire line location.
- Prescribed fire will be applied as necessary to maintain and protect existing habitats.
- Priority will be given to the protection of any known bald eagle nest trees.

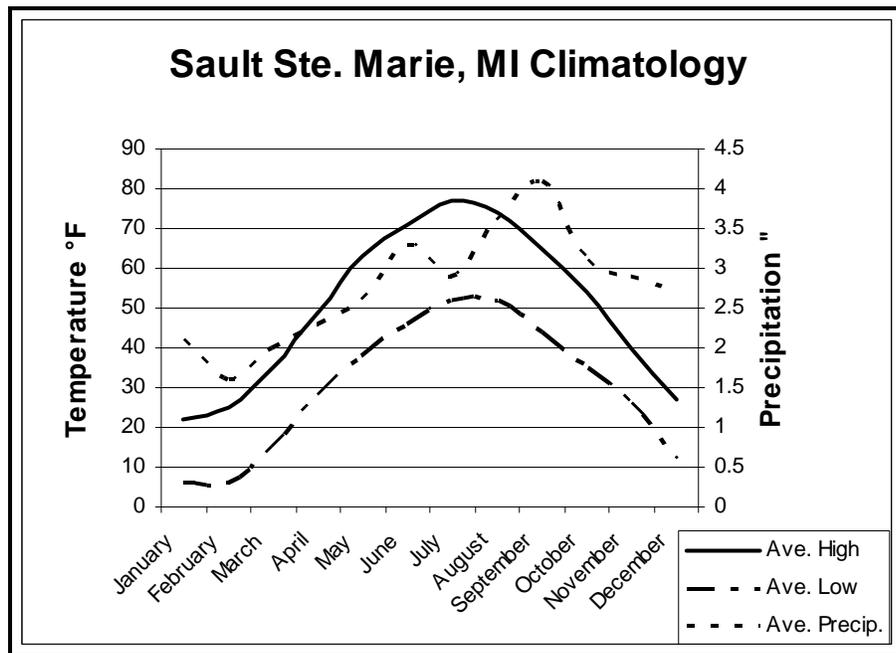
PREPAREDNESS

Preparedness is the work accomplished prior to fire occurrence to ensure that the appropriate response, as directed by the Fire Management Plan, can be carried out. Preparedness activities include: budget planning, equipment acquisition, equipment maintenance, dispatch (Initial attack, extended, and expanded), equipment inventory, personnel qualifications, and training. Activities related to preparedness are accomplished prior to normal fire season dates.

Historical Weather Analysis

The refuge has no weather station. Weather history (Figure 6) comes from National Oceanic and Atmospheric Administration (NOAA) records at Sault Ste. Marie, MI.

Figure 6 – Sault Ste. Marie, MI Climatology



Only one fire has been noted since acquisition. Discussions with the local MIDNR fire officer indicate no fires reported to MIDNR at Harbor Island for the last five years.

Fire Prevention

An active fire prevention program will be conducted, as needed, in conjunction with other agencies to protect human life and prevent damage to cultural or natural resources.

A program of internal and external education regarding potential fire danger may be implemented. As the Refuge is not staffed, posting signs on the Island can be utilized to increase visitor awareness of fire hazards. Use of other local media and coordination of messages with MIDNR is also an option. Periodic law enforcement patrols should be conducted to reduce probabilities of unauthorized campfires becoming unwanted wildland fires.

During periods of extreme or prolonged fire danger, emergency restrictions or area closures may become necessary. Such restrictions, when imposed, will be consistent with those implemented by cooperators.

Hazard Reduction for Structure Protection

As there are no structures on the Island, hazard reduction for structural protection will not be necessary.

Staffing Priority Levels

As no weather station is present on the property and there is no staff present, a limited "Step-up Plan" (Appendix H) involving public information efforts has been developed.

It is expected that during periods of extreme fire danger (as determined by nearby agencies), visitors would be warned of the risk of fire in local media. Access to the island is virtually impossible to control without staff present at all times.

Training

Departmental policy requires that all personnel engaged in suppression and prescribed fire duties meet the standards set by the National Wildfire Coordinating Group (NWCG). Seney NWR has staff currently conforming to the requirements of the wildland fire management qualification and certification system and USFWS guidelines.

Basic wildland fire training refreshers are offered annually for red-carded firefighters and records are kept in a centralized database. Additional training is available from surrounding agencies in pump and engine operation, power saws, firefighter safety, fire weather and fire behavior, and helicopter safety. On-the-job training is encouraged and will be conducted at the field level. Whenever appropriate, the use of fire qualification task books will be used to document fire experience of trainees. The Zone FMO will coordinate fire training needs with those of other nearby FWS units, cooperating agencies, and the RO.

Fire suppression is an arduous duty. Poor physical condition of crew members can endanger safety and lives during critical situations. Personnel performing fire management duties will maintain a high level of physical fitness. This requires successful completion of a fitness pack test. Appendix K contains a brief explanation of the physical testing requirements.

Supplies and Equipment

Supplies and equipment would be brought by Seney staff when responding to a fire at Harbor Island. There is potential to borrow tools and other equipment from either Forest Service or MIDNR local offices, listed in Appendix E, Table 4. Refuge staff would be equipped with their assigned personal protective equipment.

DETECTION

Most fires would be detected by residents of neighboring islands who would generally report them to either MIDNR or to 911 for dispatch by Chippewa County. As necessary, MIDNR may have aerial detection flights that would include the Refuge area.

The Fire Management Plan does not discriminate between human-caused and lightning-caused fire. All wildland fires will be suppressed. However, human-caused fires will require an investigation and report by law enforcement personnel. For serious human-caused fires, including those involving loss of life, a qualified arson investigator will be requested. Qualified investigators are available from either MIDNR or the U.S. Forest Service.

COMMUNICATIONS

The Refuge has no local radio system. The base at Seney NWR is beyond radio range. Refuge fire personnel would be using cellular phones and possibly marine band radio for emergency communication with outside agencies. Communications would be expected to be provided by assisting agencies with appropriate frequency sharing agreements in place.

PRE-ATTACK PLAN

Upon discovery of a fire, all subsequent actions will be based on the following:

- The Incident Commander (IC) will:
 - Locate, size-up, and coordinate suppression actions.
 - Provide for public safety.
 - Considering the current and predicted fire conditions, assess the need for additional suppression resources and estimate the final size of the fire.
 - Assess the need for law enforcement personnel for boat traffic control, investigations, evacuations, etc. and make the request to the FMO.
 - Document decisions and complete the fire report (DI-1202).
- Should a wildland fire move into an extended attack, a Delegation of Authority will be invoked. Once a Delegation of Authority has been authorized the Incident Commander will make the final decisions pertaining to the fire. A copy of a sample Limited Delegation of Authority is in Appendix C.

FIRE MANAGEMENT UNITS

There is only one Fire Management Unit (FMU) on the Refuge. It is all encompassing.

Due to staff limitations, relatively small land area, long response times, and valuable resources, this plan does not recommend wildland fire managed for resource benefit as an option for the unit. All wildland fires will be suppressed using the appropriate suppression response.

Fire Effects

Fire effects are expected to be limited due to the mostly moist conditions found on the Refuge. Effects on hardwood forest vegetation are not expected to be severe unless significant drought conditions are present. The cedar stands, under drought conditions, could be seriously affected. Areas that are grass covered would recover within a growing season or less, depending on the time of fire occurrence.

Effects of fire on wildlife may be divided into two categories. Large mammals and birds are not likely to be affected as they are highly mobile and most fires in the area would be expected to be relatively slow moving. Nesting birds may re-nest depending on the season and severity of a fire.

Smaller mammals and reptiles may be more subject to fire because of limited mobility. Most reptiles would be in wetter areas or burrows where temperatures are cooler. Effects on small mammals would be more pronounced in the grass fuels and in the ecotone between grass and forest or brush fuels where escape is difficult (Kelleyhouse, 1979). Small mammals usually have high reproductive rates and with regeneration of their normal habitat, will usually recover within two or three years (Schramm et al, 1983).

Fuel Types

Northern Hardwoods - this type is best represented by Northern Forest Fire Laboratory (NFFL) fuel models 8 and 10. This fuel consists of litter, understory growth, and dead and down branchwood. Crown closure averages 65 to 90 %. Species found in this fuel complex include aspen, red maple, ash, red oak and others requiring mesic sites.

Northern white cedar/balsam fir - this type is best represented by NFFL fuel model 10. This is the major type found on the refuge. While northern white cedar is the predominant species, balsam fir and some shrub species are also found in this fuel complex. A considerable quantity of decadent cedar and balsam is found in this fuel complex. Much of this fuel type occurs on droughty, rock outcrops while the remainder is found in lower, wet areas.

Open Fields - represented by fuel model 3, the grass on the refuge is a remnant of some localized, small-scale agriculture. Species composition is unknown but the main components are timothy and Canada bluegrass.

Marsh - represented best by fuel model 3, the site is wet and mostly adjacent to open water. Species are those typically found in northern marshes; *Scirpus* spp., *Phragmites* spp., and others.

Table 2 – Fuel Type Acreages

| Habitat Type | Fuel Model | Acres | % of Total |
|--------------------|-------------|------------|------------|
| Cedar/Balsam Fir | NFFL – 10 | 410 | 59.0 |
| Northern Hardwoods | NFFL – 8/10 | 139 | 20.0 |
| Marsh | NFFL – 3 | 130 | 18.7 |
| Open Fields | NFFL – 3 | 16 | 2.3 |
| Totals | | 695 | 100 |

Fire Behavior

Normal fire behavior in the mixed hardwoods on the Refuge would be slow moving with minimal (1-2') flame lengths. The grass areas would see flame lengths of 1-3' with a rapid spread component depending on the stage of curing. Under normal conditions, the marsh areas would not be likely to burn due to the adjacent open water. Wet cedar areas would not be likely to support fire unless drought conditions exist; however, those cedar and balsam stands on rocky outcrops would burn under nearly all conditions..

Extreme fire behavior in the hardwood areas would see flame lengths of 2-4' with potentially rapid spread depending on the season and condition of the litter layer. During the fall with cured fuels, flame lengths could run to 6+' with rates of spread high enough to require indirect attack. Cedar stands under drought conditions could see flame lengths of 4-6' with the potential of crown fire development due to dead and

down fuels. There is some potential for fire in organic soils. Peat or muck fires can be slow burning but extremely difficult to extinguish potentially damaging soils sufficiently that habitats formerly on those soils could be hundreds of years in restoration.

SUPPRESSION TACTICS

Suppression involves a wide range of possible tactics, from the initial attack to final control. To this end, all wildland fires will be suppressed in a safe, aggressive, and cost-effective manner to produce efficient action with minimal resource damage and limit smoke impacts to local communities.

Typical initial attacks will involve resources that could be brought onto the island by boat. Generally no more than 2 or 3 firefighters would be involved. All fires will be assessed by the first on-scene incident commander and attacked using MIST for the refuge. Natural barriers will be used as much as possible to reduce fireline construction. Fireline and mop-up should consider long-term damage to water quality and vegetation. Unnecessary cutting and bucking should be replaced with alternative actions whenever possible. Back-fires and burnout operations should consider fire intensities and attempt to avoid heating the soil or running fire into the cedar swamps.

In the case of Refuge staff response from Seney NWR, one member of the crew will be assigned to document rehabilitation needs.

There will be only one Incident Commander responsible through the FMO to the project leader. The Incident Commander will designate all overhead positions on fires requiring extended attack. Reference should be made to a limited Delegation of Authority (Appendix C).

Suppression Conditions

A full suppression alternative was selected for the refuge which requires containment and control of all wildland fires. Foam/retardant use is not allowed due to cultural, wildlife, and water quality concerns. At the Annual Operating Plan Review, restriction on use of foam and retardants should be discussed with local cooperators including MIDNR, U.S. Forest Service, and local fire departments.

Wildland Fire Situation Analysis

For fires that cannot be contained in one burning period, a WFSA must be prepared. In the case of a wildland fire, the Project Leader, in conjunction with the FMO, will prepare the WFSA. Approval of the WFSA resides with the Project Leader.

The purpose of the WFSA is to allow consideration of alternatives by which a fire may be controlled. Damages from the fire, suppression costs, safety, and the probable character of suppression actions are all important considerations.

Public safety will require coordination between Refuge staff and the IC. Where wildland fires adjoin the shore, the burned area adjacent to the shore should be mopped up and dangerous snags felled. Every attempt will be made to utilize natural and pre-constructed barriers, including changing fuel complexes, in the control of wildland fire. Rehabilitation efforts will concentrate on the damages done by suppression activities rather than on the burned area itself.

Aircraft Operations

Aircraft may be used in all phases of fire management operations. All aircraft must be Office of Aircraft Services (OAS) or Forest Service approved. An OAS Aviation Policy Department Manual may be obtained from OAS.

Helicopters may be used for reconnaissance, bucket drops, and transportation of personnel and equipment. The two areas of old field may be cleaned up to be used as helispots. Clearing for new helispots will be avoided. Other areas that may be used include clear portions of the shore.

As in all fire management activities, safety is a primary consideration. Qualified aviation personnel will be assigned to all flight operations.

REHABILITATION AND RESTORATION

There are 3 types of fire rehabilitation: Suppression, Burn Area, and Emergency Stabilization. Suppression rehabilitation is to restore and repair property and resources from direct suppression activity damage, (i.e. cut fences, dozer lines, and campsites). Burn area rehabilitation and emergency stabilization is to restore resources and property damaged or otherwise impacted from the fire.

Suppression Rehabilitation

In the event of a wildland fire, rehabilitation of fire suppression damage should be accomplished immediately. An appropriate time is within 7 days after the fire is controlled unless the regional fire coordinator grants an extension. Funding for suppression rehabilitation is from the specific fire cost account as established by the FMO. The Incident Commander as agreed to by the Project Leader will initiate suppression rehabilitation. Rehabilitation will be directed toward minimizing or eliminating the effects of the suppression effort and reducing the potential hazards caused by the fire. These actions may include:

- Backfill control lines, scarify, and seed*.
- Install water bars and construct drain dips on control lines to prevent erosion.
- Restore natural ground contours, which were altered.
- Remove all flagging, equipment and litter.
- Completely restore camping areas and improved helispots.
- Re-vegetation to restore sensitive impacted areas due to suppression actions*.

*If re-vegetation or seeding is necessary, locally procured seeds of native plant species will be preferred.

A written suppression rehabilitation plan may be appropriate on larger incidents. Contractors or equipment may be hired to accomplish specialized work.

Emergency Stabilization Versus Rehabilitation

Emergency stabilization is the use of appropriate emergency stabilization techniques in order to protect public safety, stabilize and prevent further degradation of cultural and natural resources in the perimeter of the burned area, and protect downstream impact areas from erosion and invasion of undesirable species. Rehabilitation is the use of appropriate rehabilitation techniques to improve natural resources as stipulated in approved refuge management plans and the repair or replacement of minor facilities damaged by the fire.

Total "rehabilitation" of a burned area is not within the scope of the Emergency Rehabilitation funding. Emergency Rehabilitation funding can be used to begin the rehabilitation process if other funding is committed to continue the rehabilitation throughout the life of the project (beyond the initial 3 years of Emergency Rehabilitation funding). Major facilities are repaired or replaced through supplemental appropriations of other funding.

Burned Area Emergency Stabilization and Rehabilitation (ESR) Plan

The goal of the ESR Plan is to protect public safety and stabilize and prevent further degradation of natural and cultural resources, and to rehabilitate the stability, productivity, diversity, and ecological integrity of refuge lands after a wildland fire as described in approved refuge management plans. The ESR Plan is tiered to the Refuge Comprehensive Conservation Plan and Fire Management Plan (FMP). Development of ESR Plan objectives is guided by resource management objectives, general management practices, and constraints identified in approved plans.

If Burned Area Emergency Stabilization and Rehabilitation is required to reduce the effects of a wildland fire, then the Refuge should request appropriate funding through the Burned Area Emergency Stabilization and Rehabilitation (ESR) fund. The Service representative at the National Interagency Fire Center administers the ESR fund. A rehabilitation and restoration survey, plan, and request must be prepared and submitted according to agency guidelines. Smaller incidents may only need simple plans prepared by local staff. Larger incidents with extensive rehabilitation efforts should employ a ESR Team. A ESR Team is composed of personnel who specialize in key disciplines of resource management and are experts in ESR Plan preparation. A formal request for a ESR Team should be made in consultation with the Incident Management Team as soon as it appears damage may be significant. Instructions for ESR Team mobilization can be found in the National Wildfire Coordinating Group mobilization guide. Delays in making a request may hinder funding approval and magnify the damage. Once a ESR Team is employed, the Project Leader or their representative should provide guidance to the ESR team leader with expectations. The Project Leader and FMO will review all ESR Plans. The final plan will be submitted to the Region for review prior to submission to the WO. Direction on ESR guidelines can be found in the Interagency Burned Area Emergency Stabilization and Rehabilitation Handbook.

REQUIRED REPORTING

The IC will be responsible for documenting decisions and providing information to the Project Leader to complete the fire report (DI-1202). The FMO will be responsible for any additional required reports.

FIRE INVESTIGATION

Fire management personnel will attempt to locate and protect the probable point of origin and record pertinent information required to determine fire cause. They will be alert for possible evidence, protect the scene and report findings to the fireline supervisor.

Prompt and efficient investigation of all suspicious fires will be carried out. However, fire management personnel should not question suspects or pursue the fire investigation unless they meet state requirements for MIDNR investigators or federal standards for federal investigators. All fire investigations should follow the guidelines outlined in 4.1-2 of the Fire Management Handbook (2000).

PRESCRIBED FIRE ACTIVITIES

Prescribed fire can be used to restore and/or maintain existing natural conditions and processes at Harbor Island as well as reduce fuel accumulations that may be a threat to sensitive species/habitats.

Prescribed fire involves the use of fire as a tool to achieve management objectives. Research burning may also be conducted when determined to be necessary for accomplishment of research project objectives. Actions included in the prescribed fire program include: selection and prioritization of prescribed fire treatments to be carried out during the year, prescribed fire plans, preparation of fire prescriptions, conducting fire operations, documentation and reporting, and project critiques. Measures to ensure the successful implementation of the prescribed fire program include:

- Conduct a safe and vigorous prescribed fire program with the highest professional and technological standards;
- Efficiently accomplish resource management objectives through the application of prescribed fire;
- Continually evaluate the prescribed fire program to better meet program goals by refining prescriptions, treatments, and monitoring methods, and by integrating applicable technical and scientific advancements;
- Prepare prescribed burn plans with a review by a qualified Prescribed Burn Boss, and approval by the Project Leader.
- Conduct prescribed fire operations with an adequate number of qualified personnel to complete all operations including mop-up.

PRESCRIBED BURN PROGRAM OBJECTIVES

The objectives of prescribed fire are:

- Maintain diversity of habitats.
- Prevent wildland fire from adversely affecting bald eagle nest trees.

Specific management needs for the Refuge as a whole and for specific areas will be determined annually. Specific burn objectives, fire frequency, firing methodology, and prescriptions will vary from year to year. The Project Leader, after plan review, must approve prescribed fire plans.

There has been no prescribed fire applied to Island habitats since acquisition in 1983. Fire application can be used to maintain the grassland areas on the island. A number of the birds reported on the island are users of the edge between forest and field. Maintenance of the open field habitat should maintain songbird diversity.

Fire applied to areas of hardwood forest would be useful in reducing ground fuel accumulations and maintaining small openings containing grasses and forbs.

The Refuge may utilize an interagency team approach for complex burns of large acreage. The most highly qualified and experienced personnel in the regional interagency community would be requested to serve on this team.

FIRE MANAGEMENT STRATEGIES

Prescribed fire will be used to reduce hazard fuel accumulation, restore fire to fire-dependent ecological communities, improve wildlife habitat, and maintain cultural/ historic scenes where appropriate. All prescribed fire activity will comply with applicable Federal, state, and local air quality laws and regulations.

All prescribed fire projects will have a prescribed fire plan approved by the Project Leader. Each plan will be prepared using a systematic decision-making process, and contain measurable objectives, predetermined prescriptions, and contain an approved environmental compliance document. Appropriate NEPA documentation (Appendix D) exists for this Fire Management Plan. Therefore, additional NEPA documentation will be necessary only for prescribed fire projects not meeting the criteria outlined in this Plan.

Prescribed Fire Plans must include components such as a GO/NO-GO Checklist, contingency actions to be taken in the event the prescription is exceeded, and the need for alerting neighbors and appropriate public officials to the timing and the planning of the burn. A prescribed fire plan format meeting all required needs is located in Appendix L.

Fire monitoring will be used to evaluate the degree to which burn objectives are accomplished. Monitoring can assist managers in documenting success in achieving overall programmatic objectives and limiting occurrence of undesired effects. A prescribed fire monitoring plan (also useful for documenting results of wildland fire) is found in Appendix L.

PRESCRIBED FIRE PLANNING

Annual Activities

The FMO will be responsible for completing an annual fire summary report. The report will contain the number of fires by type, acres burned by fuel type, cost summary, personnel utilized, and fire effects.

Prescribed Fire activities will be reviewed annually. Necessary updates or changes to the Fire Management Plan will be accomplished prior to the next fire season. Any additions, deletions, or changes will be reviewed by the Project Leader to determine if such alterations warrant a re-approval of the plan.

Planning for each burn season begin the year prior to that season. Prescribed fire projects will be planned by the biologist with assistance from the Zone FMO based on the goals and objectives in this plan. Budget requests will be prepared and submitted, by assigned deadlines, into FIREBASE.

Prescribed Burn Plan

The Prescribed Burn Boss will conduct a field reconnaissance of the proposed burn location with the FMO, and appropriate Refuge staff to discuss objectives, special concerns, and gather all necessary information to write the burn plan. After completing the reconnaissance, a Prescribed Burn Boss qualified at the expected level of complexity will write the prescribed burn plan.

All prescribed fires will have prescribed fire plans. The prescribed fire plan is a site specific action plan describing the purpose, objectives, prescription, and operational procedures needed to prepare and safely conduct the burn. The treatment area, objectives, constraints, and alternatives will be clearly outlined. No burn will be ignited unless all prescription parameters of the plan are met. Fires not within those parameters will be suppressed. As part of the plan, minimum contingency resources will be listed. Prescribed Fire Plans will follow the format contained in the FWS Fire Management Handbook (Appendix L). Each burn plan will be reviewed by the Biologist, and Zone FMO, and Burn Boss. The Project Leader has the final authority to approve the burn plan. The term burn unit refers to a specific tract of land to which a prescribed burn plan applies. Smoke management will be addressed in accordance with the section on Air Quality/Smoke Management Guidelines.

Strategies

Execution of prescribed burns will only be done by qualified personnel. The Prescribed Burn Boss will fill all required positions to conduct the burn with qualified personnel. All personnel listed in the burn plan must be available for the duration of the burn, or the burn will not be initiated.

Weather and fuel moisture conditions must be monitored closely in planned burn units to determine when the prescription criteria are met. When all prescription criteria are within the acceptable range, the Prescribed Burn Boss will select an ignition time based on current and predicted weather forecasts. A thorough briefing will be given by the Prescribed Burn Boss and specific assignments and placement of personnel will be discussed. An updated spot weather forecast will be obtained on the day of ignition and all prescription elements will be rechecked to determine if all elements are still within the approved ranges. If all prescription elements are met, a test fire will be ignited to determine on-site fire behavior conditions as affected by current weather. If conditions are not satisfactory, the test fire will be suppressed and the burn will be rescheduled. If conditions are satisfactory the burn will continue as planned.

If the prescribed burn escapes the predetermined burn area, all further ignition will be halted except as needed for suppression efforts. Suppression efforts will be initiated, as discussed in the pre-burn briefing. The FMO will be notified immediately of any control actions on a prescribed burn. If the burn exceeds initial suppression efforts, it will be declared a wildland fire and suppressed using guidelines established in this plan. A WFSA will be completed and additional personnel and resources ordered as determined by the Incident Commander. If the fire continues to exceed resource capability, additional resources will be called from the local cooperating agencies via the servicing dispatch office. A management overhead team may be requested to assume command of the fire.

Personnel

Currently there are not enough qualified staff available at Seney NWR to conduct a prescribed fire program. Table 3 indicates minimum needs. Prescribed fires are not expected to be complex, thus a minimal prescribed fire staff should be adequate.

Table 3 – Prescribed Fire Positions Needed

| Position | Number Required | Physical Demands |
|---|------------------------|-------------------------|
| Prescribed Fire Burn Boss Type 3 (RXB3) | 1 | Arduous |
| Fire Fighter Type 2 (FFT2) | 4 | Arduous |

Monitoring and Evaluation

Monitoring of prescribed fires is intended to provide information for quantifying and predicting fire behavior and its ecological effects on Refuge resources while building a historical record. Monitoring measures the parameters common to all fires: fuels, topography, weather and observed fire behavior. In addition, ecological changes such as species composition and structural changes will be monitored after a fire. This information will be very useful in fine-tuning the prescribed burn program. During prescribed burning, monitoring should include mapping, weather, site and fuel measurements and direct observation of fire characteristics such as flame length, rate of spread and fire intensity. Operational monitoring provides a check to insure that the fire remains in prescription and serves as a basis for evaluation and comparison of management actions in response to measured, changing fire conditions, and changes such as fuel conditions and species composition.

Currently, there is no organized biological monitoring taking place on the refuge. Because there appears to be a reduction in plant diversity between 1978 and 1999 (Scharf and Chamberlin, 1978 and Selzer, 2000) it is essential that pre-treatment monitoring take place. Prescribed fire is not expected to have significant effects on animal species. Plant species, conversely, could suffer significant impacts from ill-timed or extreme fire behavior conditions.

According to the list produced by Scharf and Chamberlin in 1978, two plant species present, northern or limestone oak fern (*Gymnocarpium robertianum*) and Lake Huron tansy (*Tanacetum huronense*) are listed as threatened or endangered species in Michigan. In addition, four orchid species found in 1978 and listed as protected at that time, were not noted in 1999. These orchids are sensitive to fire and studies (Sidhu, 1973) have shown that they are very slow to recover if they ever do.

Required Reports

All prescribed fire forms will be completed as outlined by the Prescribed Burn Boss. A monitor will be assigned to collect all predetermined information and complete all necessary forms prior to, during, and after the burn. All records will be archived in the Refuge's fire records for future use and reference.

The Prescribed Burn Boss will prepare a final report on the prescribed fire. Information will include a narrative of the operation, a determination of whether objectives were met, weather and fire behavior data, map of the burn area, photographs of the burn, number of work hours, and final cost of the burn.

Prescribed Burn Critique

A report detailing actual fire operations will accompany any recommendations or changes deemed necessary in the program. This report will be submitted to the Refuge Project Leader. A post-season critique of the fire management program, including the prescribed fire program, will be held each year at the conclusion of the fall fire season.

AIR QUALITY/SMOKE MANAGEMENT GUIDELINES

As this is an island unit, the nearest stationary targets are about one-half mile away, the St. Lawrence - Great Lakes Seaway passes within five miles of the island. Boat traffic in the bay area can be very heavy, especially during the summer season, potential effects of smoke on travel may be significant without adequate smoke management planning..

Most of the stationary targets within 2 miles are summer homes and likely to be occupied during the season when prescribed fire is most generally applied. In a broader circle of 10 mile radius, several small communities are potentially affected with an estimated population of over 6,000.

Smoke management is part of the planning process when developing prescribed fire plans. As burn units are quite small, most potential units would be less than 20 acres, smoke is not expected to be a significant problem. Unexpected wind shifts due to the effects of Lake Huron are the main concern.

The Refuge will comply with all applicable Federal, state and local air pollution control requirements as specified under Section 118 of the Clean Air Act, as amended (42 USC 7418). In addition Michigan regulations authorized by the Natural Resources and Environmental Protection Act, Part 55, Public Act 451 of 1994, and administered by the Department of Environmental Quality, Air Quality Division will be followed. Presently, a phone call to the local MIDNR Field Office in De Tour Village is all that is necessary to acquire a burning permit.

All prescribed fires will follow these guidelines:

- Obtain any required State open burning permit.
- The operation will be conducted according to the terms and conditions of permits and the prescription in the plan.
- Prescriptions will be written to achieve mixing heights that will disperse smoke at sufficient altitude to minimize smoke impacts at ground level.
- No burning will occur if the state air quality agency or other government agency has issued an air pollution health advisory, alert, warning or emergency. This is expected to be an extremely rare occurrence.

During wildland fires, smoke conditions will be monitored and if necessary, local law enforcement agencies or the U.S. Coast Guard will be asked to monitor or control land or boat traffic as applicable. They may also be asked to assist with evacuations if needed.

FIRE RESEARCH

No fire related research has occurred on the Refuge. However, some research needs related to fire on the Island include:

- Fire return interval determination and seasonality study.
- Effects of fire on plant species of concern, both state and federally listed found on the island.
- Management methods of preventing wildland fires from entering sensitive habitats or reducing adverse effects on those habitats because of the distance and time involved for suppression forces to reach the island.
- Effects of deer herbivory on fire severity, intensity and frequency.

PUBLIC SAFETY

Harbor Island National Wildlife Refuge is dedicated to ensuring the safety of each visitor, employee and all residents on surrounding islands. The Refuge is open for day use under normal conditions. If necessary, signs restricting access could be posted at the mouth of the bay on the Island, on other shoreline areas and at access points on the mainland and nearby islands. Closure without on-site staff is not a viable option.

Interior access on the Island is restricted somewhat by the difficulty of travel through the cedar areas.

Local law enforcement, fire, and emergency medical services will be notified of any wildland fires on the island.

PUBLIC INFORMATION AND EDUCATION

The public information program related to fire management will be developed as follows:

- News releases will be distributed to media, local boating groups, associations of homeowners or other potential users.
- The public information outlets of neighboring and cooperating agencies and the regional office will be provided with all fire management information.
- The fire management program will be discussed in informal contacts with employees, volunteers, and neighbors.

During unwanted wildland fire events, on-site information will be provided to the extent possible to alleviate visitor concern about the apparent destruction of resources by fire or the impairment of views due to temporary smoke.

As outlined in the prevention section, emergency closures or restrictions may become necessary during periods of very high or extreme fire danger.

FIRE CRITIQUES AND ANNUAL PLAN REVIEW

FIRE CRITIQUES

Fire reviews will be documented and filed with the final fire report. The FMO will retain a copy for the refuge files.

ANNUAL FIRE SUMMARY REPORT

The FMO will be responsible for completing an annual fire summary report. The report will contain the number of fires by type, acres burned by fuel type, cost summary, personnel utilized, and fire effects.

ANNUAL FIRE MANAGEMENT PLAN REVIEW

The Fire Management Plan will be reviewed annually. Necessary updates or changes will be accomplished prior to the next fire season. Any additions, deletions, or changes will be reviewed by the Project Leader to determine if such alterations warrant a re-approval of the plan.

CONSULTATION AND COORDINATION

The following agencies, organizations and/or individuals were consulted in preparing this plan.

Corace, Greg, Forester, Seney National Wildlife Refuge

Gale, Cal, Fire Program Analyst, RS Staffing, Inc.

Tansy, Mike, Biologist, Seney National Wildlife Refuge

APPENDICES

APPENDIX A: REFERENCES CITED

- Kelleyhouse, David G. 1979. Fire/wildlife relationships in Alaska. In: Hoefs, M.; Russell, D., eds. *Wildlife and wildfire: Proceedings of workshop; 1979 November 27-28; Whitehorse, YT.* Whitehorse, YT: Yukon Wildlife Branch: 1-36.
- Mladenoff, D. I., and I. Pastor. 1993. Sustainable forest ecosystems in the northern hardwood and conifer forest region: concepts and management. Pages 145-180 in H.A. Aplet, et al. eds. *Defining sustainable forestry.* The Wilderness Society, Island Press, Washington D.C.
- Scharf, W.C. and Chamberlin, M.L. 1978. *Ecological inventory of Harbor Island.* The Nature Conservancy, Midwest Regional Office, Minneapolis, MN. 17 pp.
- Schramm, Peter; Willcutts, Brian J. 1983. Habitat selection of small mammals in burned and unburned tallgrass prairie. In: Brewer, Richard, ed. *Proceedings, 8th North American prairie conference; 1982 August 1-4; Kalamazoo, MI.* Kalamazoo, MI: Western Michigan University, Department of Biology: 49-55.
- Selzer, Michelle D.. 2000. *A plant community survey of Harbor Island National Wildlife Refuge, Chippewa County, Michigan.* Unpublished manuscript. Lake Superior State University, Sault Ste. Marie, MI. 24 pp.
- Sidhu, S. S. 1973. Early effects of burning and logging in pine-mixedwoods. II. Recovery in numbers of species and ground cover of minor vegetation. Inf. Rep. PS-X-47. Chalk River, ON: Canadian Forestry Service, Petawawa Forest Experiment Station. 23 p.
- USDA-USDI. 2001. *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment – 10-Year Comprehensive Strategy Implementation Plan.* 27 pp.
- USDA-USDI. 2002. *Interagency Burned Area Emergency Stabilization and Rehabilitation Handbook.* 151 pp.
- USFWS. 2002. *Fire Management Handbook.* 402 pp.

APPENDIX B: DEFINITIONS

Agency Administrator. The appropriate level manager having organizational responsibility for management of an administrative unit. This person may include Director, State Director, District Manager or Field Manager (BLM); Director, Regional Director, Complex Manager or Project Leader (FWS); Director, Regional Director, Park Superintendent, or Unit Manager (NPS), or Director, Office of Trust Responsibility, Area Director, or Superintendent (BIA).

Appropriate Management Action. Specific actions taken to implement a management strategy.

Appropriate Management Response. Specific actions taken in response to a wildland fire to implement protection and fire use objectives.

Appropriate Management Strategy. A plan or direction selected by an agency administrator which guide wildland fire management actions intended to meet protection and fire use objectives.

Appropriate Suppression. Selecting and implementing a prudent suppression option to avoid unacceptable impacts and provide for cost-effective action.

Bureau. Bureaus, offices or services of the Department.

Class of Fire (as to size of wildland fires):

- Class A - 3 acre or less.
- Class B - more than 3 but less than 10 acres.
- Class C - 11 acres to 100 acres.
- Class D - 101 to 300 acres.
- Class E - 301 to 1,000 acres.
- Class F - 1,001 to 5,000 acres.
- Class G - 5,001 acres or more.

Emergency Fire Rehabilitation/Burned Area Emergency Rehabilitation (EFR/BAER). Emergency actions taken during or after wildland fire to stabilize and prevent unacceptable resource degradation or to minimize threats to life or property resulting from the fire. The scope of EFR/BAER projects are unplanned and unpredictable requiring funding on short notice.

Energy Release Component (ERC) A number related to the available energy (BTU) per unit area (square foot) within the flaming front at the head of a fire. It is generated by the National Fire Danger Rating System, a computer model of fire weather and its effect on fuels. The ERC incorporates thousand hour dead fuel moistures and live fuel moistures; day to day variations are caused by changes in the moisture content of the various fuel classes. The ERC is derived from predictions of (1) the rate of heat release per unit area during flaming combustion and (2) the duration of flaming.

Extended attack. A fire on which initial attack forces are reinforced by additional forces.

Fire Suppression Activity Damage. The damage to lands, resources and facilities directly attributable to the fire suppression effort or activities, including: dozer lines, camps and staging areas, facilities (fences, buildings, bridges, etc.), handlines, and roads.

Fire effects. Any consequences to the vegetation or the environment resulting from fire, whether neutral, detrimental, or beneficial.

Fire intensity. The amount of heat produced by a fire. Usually compared by reference to the length of the flames.

Fire management. All activities related to the prudent management of people and equipment to prevent or suppress wildland fire and to use fire under prescribed conditions to achieve land and resource management objectives.

Fire Management Plan. A strategic plan that defines a program to manage wildland and prescribed fires and documents the Fire Management Program in the approved land use plan. The plan is supplemented by operational procedures such as preparedness plans, preplanned dispatch plans, prescribed fire plans and prevention plans.

Fire prescription. A written direction for the use of fire to treat a specific piece of land, including limits and conditions of temperature, humidity, wind direction and speed, fuel moisture, soil moisture, etc., under which a fire will be allowed to burn, generally expressed as acceptable range of the various fire-related indices, and the limit of the area to be burned.

Fuels. Materials that are burned in a fire; primarily grass, surface litter, duff, logs, stumps, brush, foliage, and live trees.

Fuel loadings. Amount of burnable fuel on a site, usually given as tons/acre.

Hazard fuels. Those vegetative fuels which, when ignited, threaten public safety, structures and facilities, cultural resources, natural resources, natural processes, or to permit the spread of wildland fires across administrative boundaries except as authorized by agreement.

Initial Attack. An aggressive suppression action consistent with firefighter and public safety and values to be protected.

Maintenance burn. A fire set by agency personnel to remove debris; i.e., leaves from drainage ditches or cuttings from tree pruning. Such a fire does not have a resource management objective.

Natural fire. A fire of natural origin, caused by lightning or volcanic activity.

NFDRS Fuel Model. One of 20 mathematical models used by the National Fire Danger Rating System to predict fire danger. The models were developed by the US Forest Service and are general in nature rather than site specific.

NFFL Fuel Model. One of 13 mathematical models used to predict fire behavior within the conditions of their validity. The models were developed by US Forest Service personnel at the Northern Forest Fire Laboratory, Missoula, Montana.

Prescription. Measurable criteria which guide selection of appropriate management response and actions. Prescription criteria may include safety, public health, environmental, geographic, administrative, social, or legal considerations.

Prescribed Fire. A fire ignited by agency personnel in accord with an approved plan and under prescribed conditions, designed to achieve measurable resource management objectives. Such a fire is designed

to produce the intensities and rates of spread needed to achieve one or more planned benefits to natural resources as defined in objectives. Its purpose is to employ fire scientifically to realize maximize net benefits at minimum impact and acceptable cost. A written, approved prescribed fire plan must exist and NEPA requirements must be met prior to ignition. NEPA requirements can be met at the land use or fire management planning level.

Preparedness. Actions taken seasonally in preparation to suppress wildland fires, consisting of hiring and training personnel, making ready vehicles, equipment, and facilities, acquiring supplies, and updating agreements and contracts.

Prevention Activities directed at reducing the number or the intensity of fires that occur, primarily by reducing the risk of human-caused fires.

Rehabilitation (1) Actions to limit the adverse effects of suppression on soils, watershed, or other values, or (2) actions to mitigate adverse effects of a wildland fire on the vegetation-soil complex, watershed, and other damages.

Suppression. A management action intended to protect identified values from a fire, extinguish a fire, or alter a fire's direction of spread.

Unplanned ignition. A natural fire that is permitted to burn under specific conditions, in certain locations, to achieve defined resource objectives.

Wildfire. An unwanted wildland fire.

Wildland Fire. Any non-structure fire, other than prescribed fire, that occurs in the wildland.

Wildland Fire Situation Analysis (WFSA). A decision-making process that evaluates alternative management strategies against selected safety, environmental, social, economical, political, and resource management objectives as selection criteria.

Wildland/urban interface fire A wildland fire that threatens or involves structures.

APPENDIX C: SAMPLE DELEGATION OF AUTHORITY

Harbor Island National Wildlife Refuge Seney, MI

Limited Delegation of Authority

As of 1800, May 20, 2001, I have delegated authority to manage the Harbor East fire, number 3102, Harbor Island National Wildlife Refuge, to Incident Commander, John Doe and his Incident Management Team.

The fire which originated as an arson fire on May 18, 2001, is burning in critical habitat near the east shore. My considerations for management of this fire are:

1. Provide for firefighter safety.
2. I would like the fire managed in such a manner that suppression actions will cause little environmental damage as possible.
3. Key features requiring priority protection are: the cedar swamp and offshore fisheries.
4. Key resource considerations are: orchid species of concern in the swamp that are adversely affected by fire.
5. Restrictions for suppression actions are no foam or retardant use within 200 feet of the shoreline, minimum constructed line.
6. Minimum tools for use are Type II/III helicopters, and chainsaws.
7. My agency advisor will be the Refuge Biologist.
8. Managing the fire cost-effectively for the values at risk is a significant concern.

Tracy Casselman
Project Leader Seney National Wildlife Refuge
May 20, 2001

APPENDIX D: NEPA DOCUMENTATION

This plan does not support any activities that would constitute a new Federal action. It only documents the current situation which has been in existence since 1983. Only limited application of prescribed fire is planned. As prescribed fire would be used only for habitat management, according to Fire Management Handbook Section 1.4.1, Fire Management Planning, this plan is eligible for Categorical Exclusion status and this is reflected in the Finding of No Significant Impact.

APPENDIX E: ANNUAL UPDATE DOCUMENTS

Cache Equipment Inventory

No cache or fire equipment is located on the Island, cache is listed and maintained under the Seney NWR FMP.

Appendix E: Continued

Cooperator Contacts

Table 4 – Cooperator Contact List

| Name | Phone Number |
|--|---------------------|
| Michigan Department of Natural Resources De Tour Village Field Office | (906) 297-2581 |
| Hiawatha National Forest St. Ignace Ranger District | (906) 643-7900 |
| Drummond Fire Department | (906) |
| De Tour Village Fire Department | (906) 297-5471 |

APPENDIX E: CONTINUED

Cooperative Agreements

No cooperative agreements are currently in force.

APPENDIX E: CONTINUED

Wildland Fire Dispatch Plan

*Harbor Island National Wildlife Refuge
Dispatch Plan*

When report of smoke or fire is received get as much information as possible from the caller. The following list should be filled in.

Location of smoke or fire:

Location of caller:

Name and telephone number of caller:

Color of smoke:

Size of fire:

Type of Fuel:

Character of fire (running, creeping, etc.):

Anyone on the fire:

See anyone in the area or vessels leaving the area:

- 1. Notify Project Leader*
- 2. Maintain log of all telephone communications.*
- 3. Remain on duty and notify:*

Michigan Department of Natural Resources

| | | |
|------------------------------------|--------------------|-----------------------|
| <i>De Tour Field Office</i> | <i>De Tour, MI</i> | <i>(906) 297-2581</i> |
| <i>After hours pager</i> | | <i>(906) 222-1088</i> |
| <i>Chuck Lanning – after hours</i> | | <i>(906) 2973033</i> |

Hiawatha National Forest

| | | |
|-----------------------------------|-----------------------|-----------------------|
| <i>St. Ignace Ranger District</i> | <i>St. Ignace, MI</i> | <i>(906) 643-7900</i> |
|-----------------------------------|-----------------------|-----------------------|

DIRECTORY

Regional Office

| | | | |
|----------------------|------------------------------|---------------|-----------------------|
| <i>Brian McManus</i> | <i>Fire Mgt. Coordinator</i> | <i>Office</i> | <i>(612) 713-5366</i> |
| | | <i>Home</i> | <i>(507) 263-8878</i> |

| | | | |
|--|--|---------------|-----------------------|
| <i>Nita Fuller</i> | <i>Chief, Division of Refuges</i> | <i>Office</i> | <i>(612) 713-5401</i> |
| <i>NIFC</i> | | | |
| <i>Phil Street</i> | <i>FWS Coordinator</i> | <i>Office</i> | <i>(208) 387-2595</i> |
| <i>MIDNR, De Tour Village Field Office</i> | | | |
| | | <i>Office</i> | <i>(906) 297-2581</i> |
| <i>UP Duty Officer</i> | | | <i>(906) 249-1497</i> |
| <i>UP Duty Officer pager</i> | | | <i>(906) 222-2624</i> |
| <i>Hiawatha National Forest</i> | | | |
| <i>St. Ignace Ranger District</i> | | <i>Office</i> | <i>(906) 643-7900</i> |
| <i>Other Services</i> | | | |
| <i>Hospitals</i> | | | |
| <i>Mackinaw Straits Hospital</i> | | | |
| | <i>220 Burdette St., #2, St. Ignace, MI 49781-1792</i> | | <i>(906) 643-8585</i> |
| <i>War Memorial Hospital</i> | | | |
| | <i>500 Osborn Blvd., Sault Ste. Marie, MI 49783-1884</i> | | <i>(906) 635-4460</i> |
| <i>Ambulance</i> | | | |
| <i>Ambulance of Cedarville/Hessel</i> | | | |
| | <i>P.O. Box 232R, Cedarville, MI 49719-0232</i> | | <i>(906) 484-2600</i> |
| <i>Community Ambulance Service</i> | | | |
| | <i>Municipal Building, St. Ignace, MI 49781</i> | | <i>(906) 643-8811</i> |
| <i>Law Enforcement</i> | | | |
| <i>Chippewa County Sheriff (911 on site)</i> | | | |
| | <i>331 Court St., Sault Ste. Marie, MI 49783-2110</i> | | <i>(906) 635-6355</i> |
| <i>Mackinac County Sheriff (911 on-site)</i> | | | |
| | <i>100 North Marley St., St. Ignace, MI 49781-1457</i> | | <i>(906) 643-1911</i> |
| <i>Michigan State Police (911 on-site)</i> | | | |
| | <i>901 Graham Ave., St. Ignace, MI 49781-9655</i> | | <i>(906) 643-8383</i> |

APPENDIX F: RESOURCES OF CONCERN

Federally listed species are those listed as present in Michigan.

Table 5 – Federally Listed Threatened or Endangered Species

| Common Name | Accepted Scientific Name | Status |
|---|--|--------|
| BIRDS | | |
| Bald Eagle | <i>Haliaeetus leucocephalus</i> | T |
| Kirtland's Warbler | <i>Dendroica kirtlandii</i> | E |
| Piping Plover | <i>Charadrius melodus</i> | E |
| MAMMALS | | |
| Canada Lynx | <i>Lynx canadensis</i> | T |
| Eastern Puma | <i>Puma concolor cougar</i> | E |
| Indiana Bat | <i>Myotis sodalis</i> | E |
| Gray Wolf | <i>Canis lupis</i> | E |
| INSECTS: BUTTERFLIES & MOTHS | | |
| Karner Blue Butterfly | <i>Lycaeides melissa samuelis</i> | E |
| Mitchell's Satyr Butterfly | <i>Neonympha mitchellii mitchellii</i> | E |
| PLANTS | | |
| American hart's-tongue fern | <i>Asplenium scolopendrium var. americanum</i> | T |
| Dwarf lake iris | <i>Iris lacustris</i> | T |
| Eastern prairie fringed orchid | <i>Platanthera leucophaea</i> | T |
| Fassett's locoweed | <i>Oxytropis campestris</i> | T |
| Houghton's goldenrod | <i>Solidago houghtonii</i> | T |
| Lakeside daisy | <i>Hymenoxys herbacea</i> | T |
| Michigan monkey-flower | <i>Mimulus glabratus var. michiganensis</i> | E |
| Pitcher's thistle | <i>Cirsium pitcheri</i> | T |
| Small whorled pogonia | <i>Isotria medeoloides</i> | T |

Michigan State Threatened or Endangered Species

The table below is derived from the Michigan Natural Features Inventory and includes those state T&E species reported in, or reasonably expected to be found in, Chippewa County.

Table 6 – State Listed Threatened or Endangered Species – Chippewa County

| Common Name | Scientific Name | Status |
|---------------------------|------------------------------------|--------|
| BIRDS | | |
| Bald eagle | <i>Haliaeetus leucocephalus</i> | T |
| Common loon | <i>Gavia immer</i> | T |
| Common tern | <i>Sterna hirundo</i> | T |
| Merlin | <i>Falco columbarius</i> | T |
| Migrant loggerhead shrike | <i>Lanius ludovicianus migrans</i> | E |
| Osprey | <i>Pandion haliaetus</i> | T |
| Piping plover | <i>Charadrius melodus</i> | E |
| Red-shouldered hawk | <i>Buteo lineatus</i> | T |
| Short-eared owl | <i>Asio flammeus</i> | E |
| Yellow rail | <i>Coturnicops noveboracensis</i> | T |

| Common Name | Scientific Name | Status |
|--------------------------|--|--------|
| INSECTS | | |
| Lake Huron locust | <i>Trimerotropis huroniana</i> | T |
| MAMMALS | | |
| Gray wolf | <i>Canis lupus</i> | E |
| PLANTS | | |
| Alpine bluegrass | <i>Poa alpina</i> | T |
| Ashy whitlow-grass | <i>Draba cana</i> | T |
| Auricled twayblade | <i>Listera auriculata</i> | SC |
| Awlwort | <i>Subularia aquatica</i> | E |
| Bedstraw | <i>Galium kamschaticum</i> | T |
| Blunt-lobed woodsia | <i>Woodsia obtusa</i> | T |
| Bulrush sedge | <i>Carex scirpoidea</i> | T |
| Calypso or fairy-slipper | <i>Calypso bulbosa</i> | T |
| Canada rice-grass | <i>Oryzopsis canadensis</i> | T |
| Dwarf lake iris | <i>Iris lacustris</i> | T |
| False pennyroyal | <i>Trichostema brachiatum</i> | T |
| Farwell's water-milfoil | <i>Myriophyllum farwellii</i> | T |
| Flattened spike-rush | <i>Eleocharis compressa</i> | T |
| Goblin moonwort | <i>Botrychium mormo</i> | T |
| Green spleenwort | <i>Asplenium trichomanes-ramosum</i> | T |
| Hart's-tongue fern | <i>Asplenium scolopendrium var. americanum</i> | E |
| Houghton's goldenrod | <i>Solidago houghtonii</i> | T |
| Lake Huron tansy | <i>Tanacetum huronense</i> | T |
| Lapland buttercup | <i>Ranunculus lapponicus</i> | T |
| Limestone oak fern | <i>Gymnocarpium robertianum</i> | T |
| New England sedge | <i>Carex novae-angliae</i> | T |
| Panicled screw-stem | <i>Bartonia paniculata</i> | T |
| Pine-drops | <i>Pterospora andromedea</i> | T |
| Pitcher's thistle | <i>Cirsium pitcheri</i> | T |
| Prairie-smoke | <i>Geum triflorum</i> | T |
| Purple cliff-brake | <i>Pellaea atropurpurea</i> | T |
| Round-leaved orchis | <i>Amerorchis rotundifolia</i> | E |
| Small skullcap | <i>Scutellaria parvula</i> | T |
| Sweet coltsfoot | <i>Petasites sagittatus</i> | T |
| Vasey's rush | <i>Juncus vaseyi</i> | T |
| Walking fern | <i>Asplenium rhizophyllum</i> | T |
| Wall-rue | <i>Asplenium ruta-muraria</i> | E |
| Western moonwort | <i>Botrychium hesperium</i> | T |
| Wiegand's sedge | <i>Carex wiegandii</i> | T |

The data in the following tables are derived from the Ecological Inventory of Harbor Island by Scharf & Chamberlin, 1978. Table 8, contains a composite list from Scharf & Chamberlin, 1978 and the information developed by Selzer, 2000.

Table 7 – Birds Found on Harbor Island

| Common Name | Scientific Name |
|---------------------|------------------------------|
| American Bittern | <i>Botaurus lentiginosus</i> |
| American Black Duck | <i>Anas rubripes</i> |
| American Coot | <i>Fulica americana</i> |
| American Crow | <i>Corvus brachyrhynchos</i> |
| American Redstart | <i>Setophaga ruticilla</i> |
| American Robin | <i>Turdus migratorius</i> |

| Common Name | Scientific Name |
|------------------------------|-----------------------------------|
| American Tree Sparrow | <i>Spizella arborea</i> |
| Bald Eagle | <i>Haliaeetus leucocephalus</i> |
| Barn Swallow | <i>Hirundo rustica</i> |
| Barred Owl | <i>Strix varia</i> |
| Bay-breasted Warbler | <i>Dendroica castanea</i> |
| Belted Kingfisher | <i>Megaceryle alcyon</i> |
| Black Tern | <i>Chlidonias niger</i> |
| Black-and-White Warbler | <i>Mniotilta varia</i> |
| Black-billed Cuckoo | <i>Coccyzus erythrophthalmus</i> |
| Blackburnian Warbler | <i>Dendroica fusca</i> |
| Black-capped Chickadee | <i>Poecile atricapillus</i> |
| Black-crowned Night-Heron | <i>Nycticorax nycticorax</i> |
| Blackpoll Warbler | <i>Dendroica striata</i> |
| Black-throated Blue Warbler | <i>Dendroica caerulescens</i> |
| Black-throated Green Warbler | <i>Dendroica virens</i> |
| Blue Jay | <i>Cyanocitta cristata</i> |
| Blue-winged Teal | <i>Anas discors</i> |
| Bonaparte's Gull | <i>Larus philadelphia</i> |
| Broad-winged Hawk | <i>Buteo platypterus</i> |
| Brown Creeper | <i>Certhia familiaris</i> |
| Brown-headed Cowbird | <i>Molothrus ater</i> |
| Bufflehead | <i>Glaucionetta albeola</i> |
| Canada Goose | <i>Branta canadensis</i> |
| Caspian Tern | <i>Sterna caspia</i> |
| Cedar Waxwing | <i>Bombycilla cedrorum</i> |
| Chestnut-sided Warbler | <i>Dendroica pensylvanica</i> |
| Chipping Sparrow | <i>Spizella passerina</i> |
| Cliff Swallow | <i>Hirundo pyrrhonota</i> |
| Common Goldeneye | <i>Bucephala clangula</i> |
| Common Loon | <i>Gavia immer</i> |
| Common Merganser | <i>Mergus merganser</i> |
| Common Nighthawk | <i>Chordeiles minor</i> |
| Common Raven | <i>Corvus corax</i> |
| Common Tern | <i>Sterna hirundo</i> |
| Common Yellowthroat | <i>Geothlypis trichas</i> |
| Cooper's Hawk | <i>Accipiter cooperii</i> |
| Dark-eyed Junco | <i>Junco hyemalis</i> |
| Downy Woodpecker | <i>Picoides pubescens</i> |
| Dunlin | <i>Calidris alpina</i> |
| Eastern Wood-Pewee | <i>Contopus virens</i> |
| European Starling | <i>Sturnus vulgaris</i> |
| Evening Grosbeak | <i>Coccothraustes vespertinus</i> |
| Fox Sparrow | <i>Passerella iliaca</i> |
| Gray-cheeked Thrush | <i>Catharus minimus</i> |
| Great Blue Heron | <i>Ardea herodias</i> |
| Great crested Flycatcher | <i>Myiarchus crinitus</i> |
| Great Horned Owl | <i>Bubo virginianus</i> |
| Greater Scaup | <i>Aythya marila</i> |
| Greater Yellowlegs | <i>Tringa melanoleuca</i> |
| Green-winged Teal | <i>Anas crecca</i> |
| Hairy Woodpecker | <i>Picoides villosus</i> |
| Hawk-owl | <i>Surnia ulula</i> |
| Hermit Thrush | <i>Catharus guttatus</i> |
| Herring Gull | <i>Larus argentatus</i> |
| Hooded Merganser | <i>Lophodytes cucullatus</i> |
| Horned Grebe | <i>Podiceps auritus</i> |

| Common Name | Scientific Name |
|--------------------------------|--------------------------------|
| House Wren | <i>Troglodytes aedon</i> |
| Least Sandpiper | <i>Calidris minutilla</i> |
| Lesser Scaup | <i>Aythya affinis</i> |
| Long-billed Marsh Wren | <i>Cistothorus palustris</i> |
| Magnolia Warbler | <i>Dendroica magnolia</i> |
| Mallard | <i>Anas platyrhynchos</i> |
| Nashville Warbler | <i>Vermivora ruficapilla</i> |
| Northern Flicker | <i>Colaptes auratus</i> |
| Northern Goshawk | <i>Accipiter gentilis</i> |
| Northern Harrier | <i>Circus cyaneus</i> |
| Northern Parula | <i>Parula americana</i> |
| Northern Three-toed Woodpecker | <i>Picoides tridactylus</i> |
| Oldsquaw | <i>Clangula hyemalis</i> |
| Osprey | <i>Pandion haliaetus</i> |
| Ovenbird | <i>Seiurus aurocapillus</i> |
| Pied-billed Grebe | <i>Podilymbus podiceps</i> |
| Pileated Woodpecker | <i>Dryocopus pileatus</i> |
| Pine Grosbeak | <i>Pinicola enucleator</i> |
| Purple Finch | <i>Carpodacus purpureus</i> |
| Purple Martin | <i>Progne subis</i> |
| Red-bellied Woodpecker | <i>Melanerpes carolinus</i> |
| Red-breasted Merganser | <i>Mergus serrator</i> |
| Red-breasted Nuthatch | <i>Sitta canadensis</i> |
| Red-eyed Vireo | <i>Vireo olivaceus</i> |
| Red-necked Grebe | <i>Podiceps grisegena</i> |
| Red-winged Blackbird | <i>Agelaius phoeniceus</i> |
| Ring-billed Gull | <i>Larus delawarensis</i> |
| Rose-breasted Grosbeak | <i>Pheucticus ludovicianus</i> |
| Ruby-throated Hummingbird | <i>Archilochus colubris</i> |
| Ruddy Turnstone | <i>Arenaria interpres</i> |
| Ruffed Grouse | <i>Bonasa umbellus</i> |
| Sanderling | <i>Calidris alba</i> |
| Sandhill Crane | <i>Grus canadensis</i> |
| Scarlet Tanager | <i>Piranga olivacea</i> |
| Semipalmated Sandpiper | <i>Calidris pusilla</i> |
| Sharp-shinned Hawk | <i>Accipiter striatus</i> |
| Short-billed Dowitcher | <i>Limnodromus griseus</i> |
| Solitary Vireo | <i>Vireo solitarius</i> |
| Song Sparrow | <i>Melospiza melodia</i> |
| Sora | <i>Porzana Carolina</i> |
| Spotted Sandpiper | <i>Actitis macularia</i> |
| Surf Scoter | <i>Melanitta perspicillata</i> |
| Swainson's Thrush | <i>Catharus ustulatus</i> |
| Swamp Sparrow | <i>Melospiza Georgiana</i> |
| Tennessee Warbler | <i>Vermivora peregrine</i> |
| Tree Swallow | <i>Tachycineta bicolor</i> |
| Veery | <i>Catharus fuscescens</i> |
| Vesper Sparrow | <i>Pooecetes gramineus</i> |
| Whimbrel | <i>Numenius phaeopus</i> |
| Whip-Poor-Will | <i>Caprimulgus vociferous</i> |
| White-crowned Sparrow | <i>Zonotrichia leucophrys</i> |
| White-rumped Sandpiper | <i>Calidris fuscicollis</i> |
| White-throated Sparrow | <i>Zonotrichia albicollis</i> |
| White-winged Scoter | <i>Melanitta deglandi</i> |
| Wilson's Warbler | <i>Wilsonia pusilla</i> |
| Winter Wren | <i>Troglodytes troglodytes</i> |

| Common Name | Scientific Name |
|--------------------------|---------------------------|
| Wood Duck | <i>Aix sponsa</i> |
| Woodcock | <i>Philohela minor</i> |
| Yellow Warbler | <i>Dendroica petechia</i> |
| Yellow-bellied Sapsucker | <i>Sphyrapicus varius</i> |
| Yellow-rumped Warbler | <i>Dendroica coronata</i> |

Table 8 – Plants Found on Harbor Island

| Common Name | Scientific Name |
|--------------------------------|----------------------------------|
| 3-square Rush | <i>Scirpus fluviatilis</i> |
| American Elm | <i>Ulmus americana</i> |
| Balsam Fir | <i>Abies balsamea</i> |
| Balsam Poplar | <i>Populus balsamifera</i> |
| Black Ash | <i>Fraxinus nigra</i> |
| Black Spruce | <i>Picea mariana</i> |
| Blue Vervain | <i>Verbena hastata</i> |
| Boneset | <i>Eupatorium perfoliatum</i> |
| Bracken Fern | <i>Ptredium aquilinum</i> |
| Broadleaf Pondweed | <i>Potamogeton natans</i> |
| Broadleaf Spring Beauty | <i>Claytonia caroliniana</i> |
| Brook Lobelia | <i>Lobelia kalmii</i> |
| Buffalo-berry | <i>Shepherdia canadensis</i> |
| Bulb Waterhemlock | <i>Cicuta bulbifera</i> |
| Bulrush | <i>Scirpus spp.</i> |
| Bull Thistle | <i>Cirsium vulgare</i> |
| Bunchberry | <i>Cornus canadensis</i> |
| Canada Bluegrass | <i>Poa compressa</i> |
| Canada Thistle | <i>Cirsium arvense</i> |
| Catnip | <i>Nepeta cataria</i> |
| Cat's Ear | <i>Hypochoeris radicata</i> |
| Checkered Rattlesnake Plantain | <i>Goodyera tessellata</i> |
| Chokecherry | <i>Prunus virginiana</i> |
| Clearweed | <i>Pilea fontana</i> |
| Climbing Bittersweet | <i>Celastrus scandens</i> |
| Clubmoss | <i>Lycopodium companulatum</i> |
| Common Apple | <i>Malus pumila</i> |
| Common Burdock | <i>Arctium minus</i> |
| Common Dandelion | <i>Taraxacum officinale</i> |
| Common Fleabane | <i>Erigeron philadelphicus</i> |
| Common Juniper | <i>Juniperus communis</i> |
| Common Milkweed | <i>Asciepias syriaca</i> |
| Cut-leaved Rattlesnake Fern | <i>Botrichium virginianum</i> |
| Dog Violet | <i>Viola conspersa</i> |
| Downy Yellow Violet | <i>Viola pubescens</i> |
| Dry Spinulosa | <i>Dryopteris spinulosa</i> |
| Dwarf Scouring Rush | <i>Equisetum scirpoides</i> |
| Early Meadow Rue | <i>Thallictrum dioicum</i> |
| Elderberry | <i>Sambucus pubens</i> |
| Elm-leaved Goldenrod | <i>Solidago ulmifolia</i> |
| Evening Primrose | <i>Oenothera biennis</i> |
| Figwort | <i>Scrophularia lanceolata</i> |
| Flat-stem Pondweed | <i>Potamogeton zosteriformis</i> |
| Flowering Trillium | <i>Trillium grandiflorum</i> |
| Fringed Gentian | <i>Gentiana crinita</i> |
| Giant Rattlesnake plantain | <i>Goodyera oblongifolia</i> |
| Giant Reed | <i>Phragmites corninunis</i> |

| Common Name | Scientific Name |
|---------------------------|----------------------------------|
| Gold Thread | <i>Coptis groenlandica</i> |
| Goldenrod | <i>Solidago erecta</i> |
| Gooseberry | <i>Ribes spp.</i> |
| Great Lobelia | <i>Lobelia siphilitica</i> |
| Great Water Dock | <i>Rumex orbiculatus</i> |
| Ground Cherry | <i>Physalis heterophylla</i> |
| Hardstem Bulrush | <i>Scirpus acutus</i> |
| Heal-all | <i>Prunella vulgaris</i> |
| Hemlock | <i>Tsuga canadensis</i> |
| Herb-Robert | <i>Geranium robertianum</i> |
| Horizontal Juniper | <i>Juniperus horizontalis</i> |
| Hound's Tongue | <i>Cynoglossum officinale</i> |
| Ironwood | <i>Ostrya virginiana</i> |
| Small-flowered Crowfoot | <i>Ranunculus abortivus</i> |
| King Devil | <i>Hieracium florentinum</i> |
| Lake Huron Tansy | <i>Tanacetum huronense</i> |
| Long Beech Fern | <i>Dryopteris phegopteris</i> |
| Long-fruited Anemone | <i>Anemone cylindrica</i> |
| Marsh Grass | <i>Glyceria grandis</i> |
| Mullein | <i>Verbascum thapsus</i> |
| Naked Miterwort | <i>Mitella nuda</i> |
| New England Aster | <i>Aster novae-angliae</i> |
| Nodding Beggar-ticks | <i>Bidens cernua</i> |
| Northern Bedstraw | <i>Galium boreale</i> |
| Northern Oak Fern | <i>Dryopteris robertiana</i> |
| Northern White Violet | <i>Viola palens</i> |
| Oak Bracken | <i>Pteridium aquilinum</i> |
| Oak Fern | <i>Dryopteris disjuncta</i> |
| Orange Hawkweed | <i>Hieracium aurantiacum</i> |
| Ox-eye Daisy | <i>Heliopsis helianthoides</i> |
| Paper Birch | <i>Betula papyrifera</i> |
| Pearly Everlasting | <i>Anaphalis margaritacea</i> |
| Pickernelweed | <i>Pontedaria cordata</i> |
| Poison Ivy | <i>Rhus radicans</i> |
| Quack Grass | <i>Agropyron repens</i> |
| Ram's Head Lady's Slipper | <i>Cypripedium arietinum</i> |
| Raspberry | <i>Rubus idaeus</i> |
| Red Maple | <i>Acer rubrum</i> |
| Red Oak | <i>Quercus rubra</i> |
| Red Pine | <i>Pinus resinosa</i> |
| Red-seeded Dandelion | <i>Taraxacum etrythrospermum</i> |
| Reed | <i>Phragmites australis</i> |
| River-bank Grape | <i>Vitis riparia</i> |
| Rock Elm | <i>Ulmus thomasi</i> |
| Rock Polypody | <i>Polypodium virginianum</i> |
| Rosy Twisted-stalk | <i>Streptopus roseus</i> |
| Rough Bedstraw | <i>Galium asperellum</i> |
| Rough-Fruited Cinquefoil | <i>Potentilla erecta</i> |
| Sago Pondweed | <i>Potamogeton pectinatus</i> |
| Sheep Sorrel | <i>Rumex acetosella</i> |
| Silver Maple | <i>Acer saccharinum</i> |
| Silverweed | <i>Potentilla anserina</i> |
| Small-flowered Gerardia | <i>Gerardia paupercula</i> |
| Speckled Alder | <i>Alnus rugosa</i> |
| Spiked Lobelia | <i>Lobelia spicata</i> |
| Spotted Knapweed | <i>Centaurea maculosa</i> |

| Common Name | Scientific Name |
|-------------------------|------------------------------|
| Spotted St. Johnswort | <i>Hypericum punctatum</i> |
| Squaw Root | <i>Conophilis americana</i> |
| Staghorn Sumac | <i>Rhus typhina</i> |
| Starflower | <i>Trientalis borealis</i> |
| Stinging Nettle | <i>Urtica dioica</i> |
| Strawberry | <i>Fragaria virginiana</i> |
| Striped Coral Root | <i>Corallorhiza striata</i> |
| Striped Maple | <i>Acer pensylvanicum</i> |
| Sugar Maple | <i>Acer saccharum</i> |
| Swamp Milkweed | <i>Asclepias incarnata</i> |
| Swamp Rose | <i>Rosa palustris</i> |
| Sweet Cicely | <i>Osmorhiza claytoni</i> |
| Sweet Gale | <i>Myrica gale</i> |
| Sweet Scented Bedstraw | <i>Galium triflorum</i> |
| Sweetflag | <i>Acorus calamus</i> |
| Tamarack | <i>Larix laricina</i> |
| Timothy | <i>Phleum pratense</i> |
| Trembling Aspen | <i>Populus tremuloides</i> |
| Twin Flower | <i>Linnea borealis</i> |
| Virginia Bugleweed | <i>Lycopus virginicus</i> |
| White Ash | <i>Fraxinus americana</i> |
| White Cedar | <i>Thuja occidentalis</i> |
| White Pine | <i>Pinus strobus</i> |
| White Spruce | <i>Picea glauca</i> |
| White Violet | <i>Viola incognita</i> |
| Wide Cattail | <i>Typha latifolia</i> |
| Wild Basil | <i>Satureja vulgaris</i> |
| Wild Lily-of-the-Valley | <i>Maianthemum canadense</i> |
| Willow Aster | <i>Aster prealtus</i> |
| Wood Fern | <i>Dryopteris marginalis</i> |
| Wood Strawberry | <i>Fragaria vesca</i> |
| Yellow Goat's Beard | <i>Tragopogon major</i> |

Table 9 – Mammals Found on Harbor Island

| Common Name | Scientific Name |
|---------------------|--|
| Beaver | <i>Castor canadensis</i> |
| Black Bear | <i>Ursus americanus</i> |
| Bobcat | <i>Lynx rufus</i> |
| Coyote | <i>Canis latrans</i> |
| Little Brown Bat | <i>Myotis lucifugus</i> |
| Lynx | <i>Lynx canadensis</i> |
| Mink | <i>Mustela vison</i> |
| Raccoon | <i>Procyon lotor</i> |
| Red Bat | <i>Lasiurus borealis</i> |
| Red Fox | <i>Vulpes vulpes</i> |
| Red Squirrel | <i>Tamiasciurus hudsonicus</i> |
| Red-backed Vole | <i>Clethrionomys gapperi</i> |
| River Otter | <i>Lutra canadensis</i> |
| Snowshoe Hare | <i>Lepus americanus</i> |
| White Tailed Deer | <i>Odocoileus virginianus</i> |
| Woodland Deer Mouse | <i>Peromyscus maniculatus gracilis</i> |

Table 10 – Reptiles/Amphibians Found on Harbor Island

| Common Name | Scientific Name |
|--------------------|-----------------------------------|
| American Toad | <i>Bufo terrestris americanus</i> |
| Garter Snake | <i>Thamnophis sirtalis</i> |
| Ring-necked Snake | <i>Diadophis punctatus</i> |
| Spotted Salamander | <i>Ambystoma maculatum</i> |
| Spring Peeper | <i>Hyla crucifer</i> |
| Water Snake | <i>Natrix sipedon</i> |
| Wood Frog | <i>Rana sylvatica</i> |

APPENDIX G: HISTORIC FIRE SEASON ANALYSIS

One unwanted wildland fire has been noted on the Refuge since acquisition. An analysis may be completed in future plan revisions if sufficient fire activity occurs.

APPENDIX H: STEP-UP PLAN

As there is no staff on the refuge, the “Step-up Plan” only addresses public and visitor information needs. Adjective class will be obtained from MIDNR at the De Tour Village Field Office as needed.

| Adjective Class | Step up Actions |
|------------------------|---|
| Low | No special public information efforts |
| Moderate | No special public information efforts |
| High | No special public information efforts |
| Very High | Broadcast information and coordination with MIDNR will be utilized to increase visitor awareness of fire hazards. |
| Extreme | During periods of extreme or prolonged fire danger emergency restrictions or area closures may become necessary. Such restrictions, when imposed, will be consistent with those implemented by MIDNR. |

APPENDIX I: COMMUNICATION PLAN

As the Refuge has no radio system on site and the base station at Seney NWR is too distant to be of use, a communication plan is not necessary. Cellular phones and marine radio bands will be used as necessary. Cooperators will use their own systems with appropriate frequency sharing agreements in place.

APPENDIX J: SAMPLE WILDLAND FIRE SITUATION ANALYSIS

Wildland Fire Situation Analysis

WFSA Information

WFSA Number: 1

Jurisdiction(s): USFWS

Fire Name: Harbor 1

Geographic Area: EACC

Incident Number: 3385

Unit: Harbor Island (Seney NWR)

Date/Time Prepared: 07/16/02 0859

Management Code: 31510-9261-3385

Fire Situation

Start Date/Time: 7/3/02 1000

Current Fire Size: 10 acres

Fuel Conditions:

1 hr = 10%

10 hr = 12%

100 hr = 16%

Fire Behavior -Current and Forecast:

Currently creeping into cedar swamp from open field.

Forecast to continue into swamp with potential for ground fire.

Weather- Current and Forecast:

Current- dry, sunny, 76F, RH 26%, wind WNW @ 7

Forecast. more of same for 48 hours

Suppression Resource Availability:

Lack of boat transport limits number of firefighters that can be sent to island to 4 w/gear at a time.

WFSA No.1

Harbor 1

Page 2

Objectives

| Objective | Priority | Weight | Contribution |
|--|-----------------|---------------|---------------------|
| Safety | 10 | 0.50 | |
| Firefighter Safety | 10 | 0.67 | 0.333 |
| Provide safe transport for crew personnel, maintain clear access to safety zones on shore. | | | |
| Public Safety | 5 | 0.33 | 0.167 |
| Maintain lookout to ask public to leave as island is closed to use until fire is declared contained | | | |
| Economic | 1 | 0.05 | |
| There are no significant economic losses other than suppression costs with this fire. | | | |
| Environmental | 7 | 0.35 | |
| Air | 5 | 0.24 | 0.083 |
| Monitor smoke patterns to allow warning to sensitive targets downwind. | | | |
| Visual | 7 | 0.33 | 0.117 |
| Avoid "tunnel" effect of fireline appearance. Keep visible impacts at a minimum along shore areas. | | | |
| Fuels | 2 | 0.10 | 0.033 |
| Fuels should not be piled up along fireline, scatter as much as possible | | | |
| T & E Species | 7 | 0.33 | 0.117 |
| Be careful of rare plants-in and along the edge of the cedar swamp. | | | |
| Social | 2 | 0.10 | |
| Employment | 0 | 0.33 | 0.033 |
| Public Concern | 0 | 0.33 | 0.033 |
| As much as possible, keep residents of nearby islands informed as to status of fire and degree of threat to their property | | | |
| Cultural | 0 | 0.33 | 0.033 |

Alternatives

Alternative A Minimize Suppression Costs

Keep crew size to minimum required, use pumps located on shore to wetline fire. Construct fireline with handtools as necessary

Target Outcome

Fire would be contained at about 20 acres. Staffing required would be 10 firefighters, boat and 1 pump.

Fallback Outcome

Avoiding swamp and working more fireline. Same crew requirement (10, boat and pump).

Worst Case Outcome

Ground fire occurrence with long run in flammable cedar swamp. Added personnel boat and pumps and associated equipment needed.

Probability: 75%
Final Fire Size: 20 acres
Time to Contain: 2 days
Time to Control: 2 days

Probability: 21%
Final Fire Size: 30 acres
Time to Contain: 2 days
Time to Control: 3 days

Probability: 4%
Final Fire Size: 200 acres
Time to Contain: 10 days
Time to Control: 12 days

Alternative-B Minimize Firefighter Exposure

Work fire edge totally with water from pumps on shore working wetline around fire. Utilize sprinkler setup for mop-up

Target Outcome

Utilize crew of 5, boat and 2 pumps with associated equipment to wetline the fire.

Fallback Outcome

Utilize same resources, added time to accomplish containment

Worst Case Outcome

Ground fire occurrence with long run in flammable cedar swamp. Added personnel boat and pumps and associated equipment needed.

Probability: 75%
Final Fire Size: 30 acres
Time to Contain: 2 days
Time to Control: 2 days

Probability: 20%
Final Fire Size: 35 acres
Time to Contain: 3 days
Time to Control: 3 days

Probability: 5%
Final Fire Size: 200 acres
Time to Contain: 10 days
Time to Control: 12 days

WFSA No.1

Harbor 1

Page 4

Suppression Costs

Alternative A Minimize Suppression Costs

Target Outcome

1 Local Crew 2 day
1 Boat, 18' 22 hour
Suppression cost: \$4,300

Fallback Outcome

2 Local Crew 3 day.
1 Boat, 18' 33 hour
Suppression cost: \$7,950

Worst Case Outcome

Suppression cost: \$55,000

Alternative B Minimize Suppression Costs

Target Outcome

1 Local Crew 2 day
1 Boat, 18' 22 hour
Suppression cost: \$4,300

Fallback Outcome

1 Local Crew 3 day.
1 Boat, 18' 33 hour
Suppression cost: \$6,450

Worst Case Outcome

Suppression cost: \$55,000

Impact on Resource Values

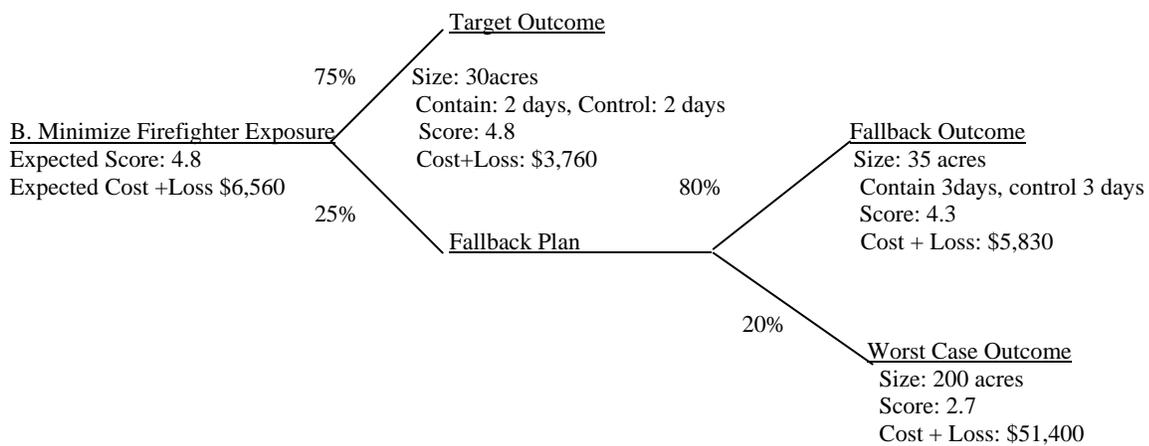
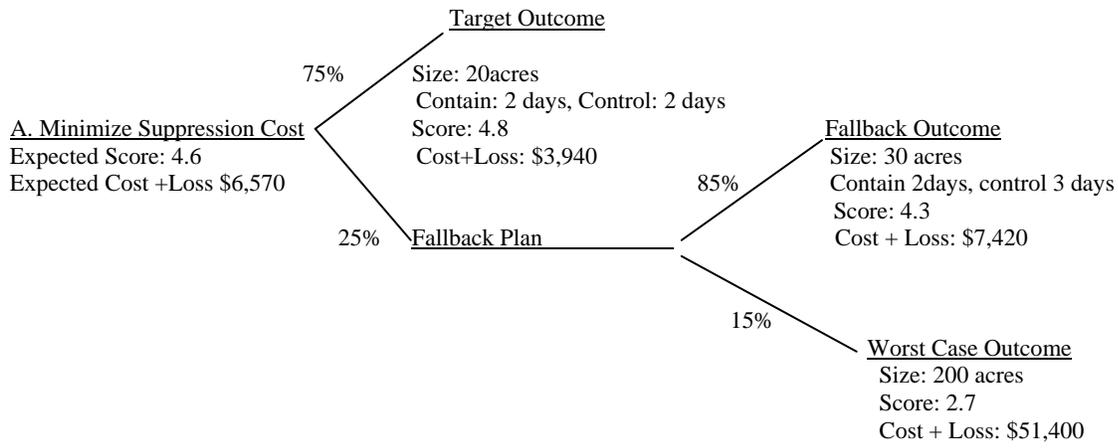
Alternative A Minimize Suppression Costs

| Item | Target Outcome | Fallback Outcome | Worst Case Outcome | Expected Impact |
|---------------------|-----------------------|-------------------------|---------------------------|------------------------|
| Wildlife – Big Game | 178 | 268 | 1,780 | |
| Wildlife – Other | 178 | 268 | 1,780 | |
| Total | \$357 | \$535 | \$3,570 | \$523 |

Alternative B Minimize Firefighter Exposure

| Item | Target Outcome | Fallback Outcome | Worst Case Outcome | Expected Impact |
|---------------------|-----------------------|-------------------------|---------------------------|------------------------|
| Wildlife – Big Game | 268 | 312 | 1,780 | |
| Wildlife – Other | 268 | 312 | 1,780 | |
| Total | \$535 | \$624 | \$3,570 | \$705 |

Decision Tree



WFSA No.1

Harbor 1

Page 7

Decision Summary

Strategy:

Minimize Firefighter Exposure

Description

Work fire edge totally with water from pumps on shore working wetline around fire. Utilize sprinkler setup for mop-up. Utilize crew of 5, boat and 2 pumps with associated equipment to wetline the fire.

Rationale

Expected effects on natural resources are similar in Alternative A & B. Cost difference is not significant once crew is on site and crew is safer working from shoreline.

Special Considerations

Firefighter safety on the line is of primary importance and resources at risk are not of high or controversial value.

Information Policy

Information will be handled locally by the refuge utilizing local media outlets and homeowner groups.

Agency Administrator Signature

Date/Time

Incident Complexity Analysis

Incident Complexity Rating: Type 4

Rationale: Predicted conditions will not worsen and crew will be protected by water handling equipment, additional day should see containment.

NO YES FACTOR

A. Fire Behavior

Burning index predicted to be above the 90% level.
Potential exists for "blowup" conditions (fuel moisture, winds, etc.).
Crowning, profuse or long range spotting.

X Weather forecast indicating no significant relief or worsening conditions.

B. Resources Committed

200 or more personnel assigned.
Three or more divisions.
Wide variety of special support personnel.
Substantial air operation which is not properly staffed.
Majority of initial attack resources committed.

C. Resources Threatened

Urban interface.
Developments and facilities.
Restricted, threatened or endangered species habitat.
Cultural sites.
Unique natural resources, special designated zones or wilderness.
Other special resources.

D. Safety

Unusually hazardous fire line conditions-
Serious accidents or fatalities.
Threat to safety of visitors from fire and related operations.
Restrictions and/or closures in effect or being considered.

X No night operations in place for safety reasons.

E. Ownership

Fire burning or threatening more than one jurisdiction.
Potential for claims (damages).
Different or conflicting management objectives.
Disputes over suppression responsibility.
Potential for unified command.

F. External Influences

Controversial wildland fire management policy.
Pre-existing controversies/relationships.
Sensitive media relationships.
Smoke management problems.
Sensitive political interests.
Other external influences.

G. Change in Strategy

Change to a more aggressive suppression strategy.
Large amounts of unburned fuel within planned perimeter.
WFSA invalid or requires updating.

WFSA No.1

Harbor 1

Page 10

H. Existing Overhead

Worked two operational periods without achieving initial objectives.
Existing management organization ineffective.
Overhead overextended themselves mentally and/or physically.
Incident action plans, briefings, etc. missing or poorly prepared.

APPENDIX K: PACK TEST BACKGROUND

WHAT IS THE "PACK TEST?"

Work capacity tests are used to qualify individuals for the three levels of wildland firefighting duty:

- **ARDUOUS**
- **MODERATE**
- **LIGHT**

The work capacity tests measure:

- Aerobic capacity
- Muscular strength
- Muscular endurance

All wildland firefighters must meet minimum levels of fitness requirements for the type of duties they are assigned:

Arduous: involves field work calling for above-average endurance and superior conditioning. All firefighters are required to perform arduous duty.

Moderate: involves field work requiring complete control of physical faculties and may include considerable walking, standing, and lifting 25-50 lbs. Safety officers and fire behavior analysts are examples of moderate duty positions.

Light: involves mainly office-type work with occasional field activity. Examples include staging area and helibase managers.

Testing wildland firefighters for work capacity is important for several reasons:

- Personal safety and health
- Co-worker safety
- Improved operations

ABOUT ARDUOUS WORK

Wildland firefighting demands a high level of fitness to safely perform physically demanding work in difficult environments.

Firefighters, strike team leaders, line scouts, and others assigned arduous duty must be prepared to work in steep terrain and in extreme temperatures, altitude, and smoke, while maintaining reserve work capacity to meet unforeseen emergencies.

Prior to reporting for work, applicants are **strongly encouraged** to train for arduous-level work capacity.

WORK CAPACITY TEST TRAINING

Training for the test is important. Start training at least four to six weeks before you are scheduled to take the test. To be in shape for work duty, you may want to train in the footwear or boots you will wear during the test. Footwear should be ankle-high and protect the ankles.

Begin training before you report for work. Start by walking. Train for the test level you will need to pass for the duties you will be required to perform.

Start training without a pack. Gradually increase distance and - for arduous and moderate duty - begin carrying appropriate weight. Increase the weight until you can meet the requirement for arduous or moderate duty.

Table 11, below, provides test criteria for arduous, moderate, and light duty performance:

Table 11 – Physical Testing Criteria

| Physical Level | Test Name | Distance Covered | Weight Required | Maximum Time |
|-----------------|------------|------------------|-----------------|--------------|
| ARDUOUS | Pack Test | 3-miles | 45 lb. | 45 min. |
| MODERATE | Field Test | 2-miles | 25 lb. | 30 min. |
| LIGHT | Walk Test | 1-mile | no pack | 16 min. |

MORE ON TRAINING:

Before you begin to train for testing or substantially increase your level of activity, consult your physician. This is especially important if you are over 40 and have been inactive, have a history of a heart condition or chest pain or loss of balance, or have a joint or bone problem that could be made worse by a change in physical activity.

Once you are cleared to begin training, here's what you'll need:

- Adequate footwear that will cover and protect feet and ankles while testing
- Comfortable clothing
- A pack. The type of pack is a personal choice, but it must weigh either 45 or 25 lbs., depending on whether you are testing for arduous or moderate duty
- An accurately measured, safe, and level course

TAKING THE TEST:

Testing will be monitored and any problems should be brought to the attention of the test monitors.

- No jogging or running is permitted
- The test is Pass/Fail only
- Bring your own pack, or a standard firefighter backpack pump will be provided

- Packs will be weighed before and after testing

FOR MORE INFORMATION:

Personal health, physical fitness, and work capacity all work toward making conditions safer for firefighters and the people they protect. Ask your local fire management office for more information.

APPENDIX L: PRESCRIBED FIRE DOCUMENTS

Prescribed Fire Plan Format

COVER PAGE

| | |
|--|-------|
| Refuge or Station: | |
| Unit: | |
| Prepared By: Prescribed Fire Planner | Date: |
| Reviewed By: Refuge Manager | Date: |
| Reviewed By: Prescribed Burn Boss | Date: |
| Reviewed By: Regional Fire Management Coordinator | Date: |
| Reviewed By: (Others) | Date: |

The approved Prescribed Fire Plan constitutes the authority to burn, pending approval of Section 7 Consultations, Environmental Assessments or other required documents. No one has the authority to burn without an approved plan or in a manner not in compliance with the approved plan. Prescribed burning conditions established in the plan are firm limits. Actions taken in compliance with the approved Prescribed Fire Plan will be fully supported, but personnel will be held accountable for actions taken which are not in compliance with the approved plan.

| | |
|--------------|-------|
| Approved By: | Date: |
|--------------|-------|

PRESCRIBED FIRE PLAN

| | | | | | |
|---------------------|-------|--------|---------------------|---|---|
| Refuge: | | | Refuge Burn Number: | | |
| Sub Station: | | | Fire Number: | | |
| Name of Area: | | | Unit Number: | | |
| Acres to be Burned: | | | Perimeter of Burn: | | |
| Legal Description: | Lat.: | Long.: | T | R | S |

| |
|---------|
| County: |
|---------|

Is a Section 7 Consultation being forwarded to Fish and Wildlife Enhancement for review ?
 Yes No (circle).

(Page 2 of this PFP should be a refuge base map showing the location of the burn on Fish and Wildlife Service land)

The Prescribed Fire Burn Boss/Specialist must participate in the development of this plan.

I. GENERAL DESCRIPTION OF BURN UNIT

Physical Features and Vegetation Cover Types (Species, height, density, etc.):

Primary Resource Objectives of Unit (Be specific. These are management goals):

- 1.
- 2.
- 3.

Objectives of Fire (Be specific. These are different than management goals):

- 1.
- 2.
- 3.

Acceptable Range of Results (Area burned vs. unburned, scorch height, percent kill of a species, range of litter removed, etc.):

- 1.
- 2.
- 3.

II. PRE-BURN MONITORING

| Vegetation Type | Acres | % | FBPS Fuel Model |
|-----------------|-------|---|-----------------|
| | | | |
| | | | |
| | | | |
| | | | |

Habitat Conditions (Identify with transect numbers if more than one in burn unit.):

Type of Transects:

Photo Documentation (Add enough spaces here to put a preburn photo showing the habitat condition or problem you are using fire to change/correct. A photo along your transect may reflect your transect data.):

Other:

III. PLANNING AND ACTIONS

Complexity Analysis Results:

Site preparation (What, when, who & how. Should be done with Burn Boss):

Weather information required (who, what, when, where, how, and how much):

Safety considerations and protection of sensitive features (Adjacent lands, visitors, facilities, terrain, etc., and needed actions. Include buffer and safety zones. Be specific, indicate on a burn unit map. Map should be a USGS quadrangle if possible, so ridges, washes, water, trails, etc. can be identified.)

Special Safety Precautions Needing Attention (Aerial ignition, aircraft, ignition from boat, etc.):

Media Contacts (Radio stations, newspaper, etc., list with telephone numbers):

Special Constraints and Considerations (Should be discussed with Burn Boss):

Communication and Coordination on the Burn (Who will have radios, frequencies to be used, who will coordinate various activities.):

IV. IGNITION, BURNING AND CONTROL

| Scheduling | Planned or Proposed | Actual |
|-----------------|---------------------|--------|
| Approx. Date(s) | | |
| Time of Day | | |

Acceptable Range of Prescription Elements - Complete for Each Applicable Fuel Model

| BEHAVE Fuel Model: | Low | High | Actual |
|--------------------------------|----------|------|--------|
| Temperature | | | |
| Relative Humidity | | | |
| Wind Speed (20' forecast) | | | |
| Wind Speed (mid-flame) | | | |
| Cloud Cover % | | | |
| Wind Direction | Between: | | |
| ENVIRONMENTAL CONDITONS | | | |
| Soil Moisture | | | |
| 1 hr. Fuel Moisture | | | |
| 10 hr. Fuel Moisture | | | |
| 100 hr. Fuel Moisture | | | |
| Woody Live Fuel Moisture | | | |
| Herb. Live Fuel Moisture | | | |
| Litter/Duff Moisture | | | |
| FIRE BEHAVIOR | | | |
| Type of Fire (H, B, F) | | | |
| Rate of Spread | | | |
| Fireline Intensity | | | |
| Flame Length | | | |
| Energy Release Component | | | |
| NFDRS Fuel Model Used: | | | |

Cumulative effects of weather and drought on fire behavior:

Ignition Technique (Explain and include on map of burn unit. Use of aerial ignition must be identified in this plan. Last minute changes to use aircraft will not be allowed and will be considered a major change to the plan. This will require a resubmission):

Prescribed Fire Organization (See Section VII, Crew and Equipment Assignments. All personnel and their assignments must be listed. All personnel must be qualified for the positions they will fill.)

Other (If portions of the burn unit must be burnt under conditions slightly different than stated above, i.e., a different wind direction to keep smoke off of a highway or off of the neighbors wash, detail here.)

Prescription monitoring (Discuss monitoring procedure and frequency to determine if conditions for the burn are within prescription):

V. SMOKE MANAGEMENT

- Make any Smoke Management Plan an attachment.
- Permits required (who, when):
- Distance and Direction from Smoke Sensitive Area(s):
- Necessary Transport Wind Direction, Speed and Mixing
- Height (Explain how this information will be obtained and used):
- Visibility Hazard(s) (Roads, airports, etc.):
- Actions to Reduce Visibility Hazard(s):
- Residual Smoke Problems (Measures to reduce problem, i.e., rapid and complete mop-up, mop-up of certain fuels, specific fuel moistures, time of day, etc.):
- Particulate emissions in Tons/Acre and how calculated
 - Estimated before the burn:
 - Actual after the burn:

VI. FUNDING AND PERSONNEL

Activity Code:

Costs

| | Equipment & Supplies | Labor | Overtime | Staff Days |
|--|---------------------------------|--------------|-----------------|-------------------|
| Administration (planning, permits, etc.) | | | | |
| Site Preparation Ignition & Control | | | | |
| Travel, Per Diem | | | | |
| Total | 0 | 0 | 0 | 0 |

VII. BURN-DAY ACTIVITIES

Public/Media Contacts on Burn Day (List with telephone numbers):

Crew & Equipment Assignments (List all personnel, equipment needed, and assignments. The following is not an all inclusive list for what you may need.)

- Burn Boss/Manager -
- Ignition Specialist -
- Ignition Crew -
- Holding Specialist -
- Holding Crew -
- Aircraft Manager -
- FWBS -
- Dispatcher-
- Other -

Crew Briefing Points (Communications, hazards, equipment, water sources, escape fire actions, etc. To be done by Burn Boss. Refer to Safety Considerations in Planning Actions and points listed below):

Ignition Technique (Methods, how, where, who, and sequence. Go over what was submitted in Section IV and any changes needed for the present conditions.) Attach ignition sequencing map if necessary:

Personnel Escape Plan:

Special Safety Requirements:

Go-No-Go Checklist:

Holding and Control:

- Critical Control Problems:
- Water Refill Points:
- Other:

Contingency Plan:

- Holding Plan Failure (Are there dedicated crews standing by to initial attack or will people doing other jobs be called upon to do initial attack, who must be called in case of an escape, what radio frequencies will be used, etc.)
 - Initial Escape
 - Escape Exceeding 1 Burning Period:
- Smoke Management Plan Failure
- Fire Behavior Outside Prescription
- Other

Mop Up and Patrol:

- Resources needed
- Duration

Rehabilitation Needs:

DI 1202 Submission Date:

Special Problems:

VIII. CRITIQUE OF BURN

Were burn objectives within acceptable range of results? (Refer to Section I):

What would be done differently to obtain results or get better results?

Was there any deviation from plan? If so, why?

Problems and general comments:

IX. POST-BURN MONITORING

Date: Refuge Burn Number:

Length of Time after Burn:

Vegetative Transects:

Comments on Habitat Conditions, etc.:

Photo Documentation:

Other:

X. FOLLOW-UP EVALUATION

Date: Refuge Burn Number:

Length of Time after Burn:

Vegetative Transects:

Comments on Habitat Conditions, etc.:

Photo Documentation:

Other:

Monitoring Plan

Critique of Burn

Were burn objectives within acceptable range of results?

What would be done differently to obtain results or get better results?

Was there any deviation from approved plan? If yes, why?

Problems and general comments:

POST-BURN MONITORING

Date: _____ Refuge FIREBASE Project Number: _____

Length of time since burn: _____

Vegetative Transect:

Comments on Habitat conditions, etc.:

Photo Documentation:

Other:

FOLLOW-UP EVALUATION

Date: _____ Refuge FIREBASE Project Number: _____

Length of time since burn: _____

Vegetative Transect:

Comments on Habitat conditions, etc.:

Photo Documentation:

Other:

Burn Severity Data Matrix

| | Unburned (5) | Scorched (4) | Lightly Burned (3) | Moderately Burned (2) | Heavily Burned (1) | Not Applicable (0) |
|--|--------------|--|--|---|---|--|
| Substrate (litter/duff) (S) | Not burned | Litter partially blackened; duff nearly unchanged; wood/leaf structures unchanged | Litter charred to partially consumed: upper duff layer burned; wood/leaf structures charred but recognizable. | Litter mostly to entirely consumed leaving light colored ash; duff deeply burned; wood/leaf structures unrecognizable | Litter and duff consumed leaving fine white ash; mineral soil visibly altered, often reddish. | Inorganic This may be used in grasslands where there is only sand as a substrate and no organic material or where litter/duff layer is lost due to disturbance (as in a gopher mound, badger/fox den, ant hill, etc.) |
| Vegetation (understory /brush/herbs) (V) | Not burned | Foliage scorched and attached to supporting twigs. Bases of stems of brush lightly browned with blisters visible, but stems still standing. In grasslands, most cured grasses/forbs still left standing after the burn. Green plants are essentially unaffected. | Foliage and smaller twigs partially consumed. Stems of brush burned at bases with heavy blistering. Many stems burned through and fallen over, but not consumed. Most cured forbs, grasses and sedges are burned but may not all be consumed. In grasslands, cured grasses burned off and fallen over. Most are consumed, but some may lay on the ash unburned. There may still be a small percentage of stems left standing. Green plants are discolored. | Foliage, twigs and small stems consumed. Stems of brush burned off and consumed. There will still be charred "stubs" sticking out of the ground where the brush was growing from. All cured forbs, grasses, sedges are consumed. In grasslands, cured grasses are all consumed. Any plants are brown and shriveled. | All plant parts consumed leaving some or no major stems/trunks. Stems of brush burned off and consumed. "Stubs" where shrubs once grew are burned off the ground line. Cured and green grasses, forbs & sedges are completely consumed. | None present |

GO/NO-GO Checklist

**NWCG
 PRESCRIBED
 FIRE
 GO/NO-GO
 CHECKLIST**

| Yes | No | Questions |
|------------|-----------|--|
| | | Are ALL fire prescription Elements Met? |
| | | Are ALL smoke management specifications met |
| | | Has ALL required current and projected fire weather forecast been obtained and are they favorable? |
| | | Are ALL planned operations personnel on-site, available and operational? |
| | | Has the availability of ALL contingency resources been checked, and are they available? |
| | | Have ALL personnel been briefed on the project objectives, their assignments, safety hazards, escape routes, and safety zones? |
| | | Have ALL pre-burn considerations identified in the prescribed fire plan been completed or addressed? |
| | | Have ALL the required notifications been made? |
| | | Are ALL permits and clearances obtained? |
| | | In your opinion, can the burn be carried out according to the prescribed fire plan and will it meet the planned objective? |

If all questions were answered "YES" proceed with a test fire. Document the current conditions, location, and results.

Prescribed Fire Burn Boss

Date

Refuge Manager

Date

APPENDIX M: ENVIRONMENTAL GUIDELINES FOR FOAM/RETARDANT USE

The following guidelines should be followed to minimize the likelihood of retardant chemicals entering a stream or other body of water.

- During training or briefings, inform field personnel of the potential danger of fire chemicals, especially foam concentrates, in streams or lakes.
- Locate mixing and loading points where contamination of natural water, especially with the foam concentrate, is minimal.
- Maintain all equipment and use check valves where appropriate to prevent release of foam concentrate into any body of water.
- Exercise particular caution when using any fire chemical in watersheds where fish hatcheries are located.
- Locate dip operations to avoid run-off of contaminated water back into the stream.
- Dip from a tank rather than directly from a body of water, to avoid releasing any foam into these especially sensitive areas.
- Use a pump system equipped with check valves to prevent flow of any contaminated water back into the main body of water.
- Avoid direct drops of retardant or foam into rivers, streams, lakes, or along shores. Use alternative methods of fire line building in sensitive areas.
- Notify proper authorities promptly if any fire chemical is used in an area where there is likelihood of negative impacts.
- While it is preferable that drops into or along any body of water not occur, it is possible that the fire location and surrounding terrain make it probable that some retardant may enter the water. The person requesting the retardant (such as the incident commander) must balance the impacts on the environment, i.e., potential fish kill, with the resources and values to be protected from the fire.