DRAFT
FIRE MANAGEMENT PLAN

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICIES

CHAPTER 1.0 INTRODUCTION

Indiana Dunes National Lakeshore is a 15,000 acre unit of the National Park Service located on the southern tip of Lake Michigan. The terrain is relatively flat with elevation ranging from approximately 586 feet above sea level at Lake Michigan to 940 feet above sea level at Pinhook Bog. Dunes, moraines and ravines provide most of the topographic relief. The national lakeshore's exceptional biological diversity and outstanding floral richness make it one of the most floristically diverse lands within the National Park System. Another unique feature of the national lakeshore is the frequent transition from one vegetation community to another vegetation community occurring within a relatively small area. The frequency of wildland fires occurring within the national lakeshore has historically been very high. There is little doubt that wildland fire has played a major role in shaping the natural landscape of the area. The national lakeshore has an active prescribed fire program which dates to the early 1980's.

Management policies require that all National Park Service (NPS) areas with vegetation capable of sustaining fire develop a Fire Management Plan (DOI 1998). The purpose of this plan is to outline in as detailed a manner as possible, actions that will be taken by the national lakeshore in meeting the fire management goals established for the area.

Authority for carrying out a fire management program at the national lakeshore originates with the National Park Service Organic Act of 1897 (16 U.S.C.1). The Organic Act states the primary goal of the National Park Service is to preserve and protect the natural and cultural resources found on lands under its management in such manner as will leave them unimpaired for future generations.

The Organic Act was amended by the General Authorities Act of 1970 and further clarified by the Redwoods National Park Act, as amended in 1978, which required that within all NPS-administered areas the…

> "…authorization of activities shall be construed and the protection, management, and administration (of these areas) shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established…"

The statutes and policy directives cited below and others authorize and provide the means for prevention, preparedness, control, and suppression of wildland fire on lands under the jurisdiction of the Department of the Interior, or lands adjacent thereto.

- Protection Act of September 20, 1922 (42 Stat. 857; 16 U.S.C. Chapter 4. Sec. 594) authorizes the protection of timber owned by the United States upon national parks, national monuments, and other lands from fire.

- Economy Act of June 30, 1932 (41 U.S.C. 686) provides for procurement of materials, supplies, equipment, work or services from other federal agencies.

- Federal Property and Administrative Services Act of 1949 (40 U.S.C. 471 *et seg*.) provides the Government an economical and efficient system for procurement and supply of personal property and non-personal services.

- Reciprocal Fire Protection Act of May 27, 1955 (42 U.S.C. Chapter 15A Sec. 1856, 1856a, 1856b) 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 facilities in extinguishing fires when no agreement exists.

- Federal Fire Prevention and Control Act of October 29, 1974 (88 Stat. 1535; 15 U.S.C. 2201) authorizes reimbursement to State and local fire services for costs incurred in firefighting on federal property.

- Federal Grants and Cooperative Act of 1977 (Pub. L. 95-244, as amended by Pub. L. 97-258, September 13, 1982. 96 Stat. 1003 31 U.S.C. 6301-6308) directs federal agencies to provide uniformity in the use of business instruments under two basic categories, (a) acquisition and (b) financial assistance.

- Wildfire Assistance Act of 1989 (Pub. L. 100-428, as amended by Pub. L. 101-11, April 1989) allows the Secretary of Agriculture and other agency heads to enter into agreements with foreign fire organizations for assistance in wildland fire protection.

- Supplemental Appropriation Act of September 10, 1982 (96 Stat. 837) with additional funds, authorizes both Secretaries to enter into contracts with State and local governmental entities, including local fire districts, for procurement of services in the preparedness, detection, and suppression of fires on any units within their jurisdiction.

- Departmental Manual, Part 620, Wildfire Suppression and Management (April 10, 1998).

- Wildland and Prescribed Fire Management Policy and Program Review (1995, as amended 2001).

An Environmental Assessment that meets the requirements established by the National Environmental Policy Act (NEPA) has been completed for this plan. This plan implements the selected alternative for fire management actions at Indiana Dunes National Lakeshore (national lakeshore) and addresses the use of wildland fire to achieve resource management and fire protection goals and objectives. A copy is available at national lakeshore headquarters. The FONSI was approved and is available in Appendix C. Compliance with the National Historical Preservation Act (NHPA) is documented in Appendix D.

CHAPTER 2.0 COMPLIANCE WITH NPS POLICY & RELATIONSHIP TO OTHER PLANS

Wildland fire may contribute to or hinder the achievement of resource management objectives. Therefore, wildland fire management programs are to be designed to meet resource management objectives identified in various planning documents and to ensure that firefighter and public safety are not compromised. Each park with vegetation capable of sustaining wildland fire will prepare a fire management plan to guide a fire management program responsive to the park's natural and cultural resource objectives and to safety considerations for park visitors, employees, and developed facilities (DO-18, 1998). The Wildland and Prescribed Fire Management Policy (NWCG 1998) directs federal agencies to achieve a balance between suppression to protect life, property, and resources, and fire use to regulate fuel and maintain healthy ecosystems. This plan describes actions necessary to carry out fire management policies and objectives.

The national lakeshore was established in 1966 by Public Law 89-761 "…in order to preserve for the educational, inspirational, and recreational use of the public, certain portions of the Indiana dunes and other areas of scenic, scientific, and historical interest and recreational value." The NPS is required to protect resources at the national lakeshore, "In order that the national lakeshore shall be permanently preserved in its present state, no development or plan for the convenience of visitors shall be undertaken therein which would be incompatible with the preservation of the unique flora and fauna or physiographic conditions now prevailing…"

The Resource Management Plan for the national lakeshore was revised in 1999, and reflects the guidance outlined in the national lakeshore's Statement for Management and General Management Plan. This plan will help achieve resource management and fire protection goals as defined in the General Management Plan and the Resource Management Plan. Resource management objectives identified in the Resource Management Plan attributed to the Statement for Management (NPS 1999b) are:

- Natural resources, processes, and conditions are identified, inventoried, monitored, and protected for future generations to enjoy. Impairments or extirpation of these resources processes, or conditions are reversed by restoration, rehabilitation, mitigation or reintroduction as appropriate to national lakeshore's mission.

- Cultural resources, processes, and conditions are identified, inventoried, monitored, and protected for future generations to enjoy.

- Research in the natural sciences continues in the tradition of Dr. Henry Cowles such that the management needs of the national lakeshore and nearby NPS areas are addressed and natural resources management and research are advanced on a nationally significant scale.

- Restoration of expired reservation of use tracts will require…restoration of as near a natural plant regime as possible.

The General Management Plan further directs the national lakeshore to "…be certain it effectively carries out its responsibility to suppress fires before they pose harm to adjoining land interests" (NPS 1980), and that prescribed fire be used to "restore the role of fire in the ecosystems" (NPS 1997).

A Fire Management Plan is a detailed program of action to implement fire management policy and objectives. This fire management plan will incorporate relative National Park Service Policy and guidelines, the elements addressed under the preferred alternative in the associated Environmental Assessment, and the objectives outlined above to guide the fire management program at Indiana Dunes National Lakeshore. This plan will outline how wildland fires will be safely suppressed in an efficient, cost-effective manner; the role wildland fire management will play in the protection and management of natural and cultural resources; and how public and private property will be protected from the impacts of wildland fire.

CHAPTER 3.0 SCOPE OF WILDLAND FIRE MANAGEMENT PROGRAM

3.1 Fire Management Goals

The national lakeshore requires a fire management program for the following reasons:

- To ensure firefighter safety;
- To ensure the safety of local residents and the visiting public; the protection of natural and cultural resources and public and private property;
- To perpetuate, restore, replace, or replicate natural and historical fire disturbance processes to the greatest extent practicable; and
- To allow the use of fire to accomplish resource management objectives, including hazard fuel reduction and maintaining or restoring fire-adapted communities.

The fire management program goals with the strategies for accomplishment are outlined in Table 1.

Table 1: Fire Management Goals/Strategies and Mitigations

GOALS	STRATEGIES
Goal 1: Firefighter and public safety will receive the highest priority during every fire management activity.	▪ No fire management operation will be initiated until all personnel involved receive a safety briefing describing known hazards and mitigating actions (Gleason 1991), current fire season conditions, and current and predicted fire weather and behavior. ▪ Qualified individuals who are familiar with the fuels and expected fire behavior, and who promote the safe and skillful application of fire management strategies and techniques appropriate for the situation will carry out fire management operations. ▪ National lakeshore neighbors, visitors and local residents will be notified of all planned and unplanned fire management activities that have the potential to impact them. ▪ Impose temporary closures during prescribed fire and wildland fire suppression operations at the discretion of the Superintendent or his/her designated acting. ▪ Conduct post-fire critiques to evaluate firefighter safety.

Goal 2: **Suppress all unwanted and undesirable wildland fires regardless of ignition source to protect the public, check fire spread onto private property and protect the natural and cultural resources of the national lakeshore with appropriate management response.**	▪ Suppress fires at minimum cost, considering the safety of firefighters and the public and values to be protected, consistent with resource objectives. ▪ Employ minimum impact suppression tactics. ▪ Avoid adverse impacts to the natural and cultural resources. ▪ Off-road use will be in accordance with National Park Service Midwest Region policy (NPS 2001b) and Indiana Dunes National Lakeshore guidelines (NPS 2002). ▪ Limit heavy equipment use for fireline construction unless approved by the Superintendent or his/her designee. ▪ Avoid adverse impact to water quality.
Goal 3: Use prescribed fire where and when appropriate as a tool to manage vegetation within the boundaries of the national lakeshore, and where acceptable, across NPS boundaries to attain resource management objectives.	▪ Conduct all fire management operations in accordance with approved plans. ▪ Achieve resource management goals such as creating habitat for state and federally listed threatened and endangered species or to restore the natural or historic scene. ▪ Restore native plant and animal communities and reduce exotic species. ▪ Employ hazard fuel reduction burns or burns in combination with mechanical or other means around suppression zones to reduce fire intensity and severity. ▪ Allow fire to assume its natural ecological role. ▪ Monitor the effects of fire on representative units. ▪ Improve prescriptions and other operational aspects based on monitoring data and observed fire behavior and fire effects. ▪ Base the use of wildland fire on ecological and economic factors and social values.
Goal 4: Modify fuel complexes around developed areas, along interface boundary areas and in proximity of cultural sites to reduce fire behavior and intensity to a manageable level in order to protect these areas.	▪ Use mechanical means to reduce hazard fuel accumulations in order to reduce fire severity and intensity. ▪ Use mechanical means, in combination with wildland fire to reduce hazard fuel accumulations around developed areas in order to reduce intensity and severity to aid in fire suppression activities.
Goal 5: Facilitate reciprocal fire management activities through the development and maintenance of	▪ Remain an active member of the interagency fire community. ▪ Maintain all existing fire agreements. ▪ Work cooperatively with local, state, and federal agencies to conduct prescribed burns. ▪ Conduct training on an interagency basis to the fullest possible

cooperative agreements and working relationships with local and regional fire management agencies.	extent.
Goal 6: Manage prescribed and wildland fires in concert with federal, state, and local air quality regulations to protect the air quality of the local and regional air sheds.	▪ Address air quality as a part of the Go/No-Go decision for all prescribed fire management activities. ▪ Address air quality as a part of the alternative development and selection decision process when developing the Wildland Fire Situation Analysis. ▪ Incorporate air quality objectives in each prescribed fire plan. ▪ Develop and implement smoke impact mitigation measures in prescribed fire plans and, to the extent possible, wildland fire management actions. ▪ Evaluate the use of tools other than fire (e.g., mechanical, chemical, biological, etc.) before selecting fire as the preferred treatment.
Goal 7: Reduce the frequency of unplanned human-caused ignitions by implementing an aggressive fire prevention program.	▪ Implement the fire prevention program that was developed for the national lakeshore. ▪ Work in conjunction with other agencies to reduce the frequency of human-caused ignitions. ▪ Use a combination of prevention patrols and public education during period of high fire danger.
Goal 8: Promote public understanding of fire management programs and objectives.	▪ Develop a series of formal and informal interpretive programs that explain the role of fire in a positive light and will convey the various aspects of the fire program to the public. ▪ Develop a public information program in a manner that the environmental message is not confused with the prevention message. ▪ Cooperate with other agencies to create a consistent fire management message and theme.

3.2 Range of Wildland Fire Management Elements

3.2.1 Wildland Fire

3.2.1.1 Wildland Fire Suppression

All wildland fires regardless of the source of ignition will be suppressed. Resource benefit will not be considered when selecting the suppression response (See Section 3.2.1.2).

3.2.1.2 Wildland Fire Use

Wildland Fire Use is a strategy that allows a naturally ignited wildland fire, under prescriptive management, to burn so long as the fire meets pre-stated resource management objectives in a predefined geographic area. A naturally ignited wildland fire allowed to burn under this strategy that did not meet the prescriptive elements or failed to meet resource management objectives would be declared an unwanted wildland fire and suppressed using the appropriate management response concept.

This management tool will not be utilized within the national lakeshore due to the low occurrence of natural ignitions, and a wide variety of safety and property concerns.

3.2.2 Fuels Management

Fuel loading in many areas of the national lakeshore exceeds historic conditions. Wildland fuels will be managed to the extent funding and staffing permit. Hazard fuel reduction will take place primarily in the wildland-urban interface, adjacent to NPS developed areas, and along roads, trails and property lines that can be expected to serve as control lines. The intent of the program is to reduce wildland fire hazards to levels that enable wildland fire suppression forces to control fires with minimum risk to firefighters, minimal impact to natural and cultural resources, and afford maximum protection for improvements and other public and private property (values to be protected). The use of prescribed fire will be guided by national lakeshore planning documents, in consultation with national lakeshore staff, and may be used in combination with mechanical and other means to accomplish the objectives established for hazard fuel reduction projects.

3.2.2.1 Prescribed Fire

Prescribed fire will be used in support of ecosystem management objectives to maintain and/or restore plant communities, cycle nutrients, reduce or remove exotic plants, manage habitat for wildlife, and protect and enhance cultural landscapes. Prescribed fire can also be used in combination with mechanical and chemical treatments to accomplish resource management goals.

3.2.2.2 Non-Fire Applications

The reduction of hazard fuel levels and to some extent the management of natural resources can be accomplished using mechanical means, either independently or in combination with prescribed burning. Prior to selecting prescribed burning as the preferred method, other management options will be considered. Other options include, but are not limited to mowing or the use of other mechanical means; cutting, scattering, and chipping; limited pile burning; and the application of chemicals in accordance with an exotic species control program. Specific actions to be taken will be included as part of the fire management planning process or in other planning documents.

3.3 Fire Management Units (FMU)

A Fire Management Unit is any land management area definable by objectives, topographic features, access, values-to-be-protected, fuel types, major fire regime groups, or other common elements that sets one area apart from management characteristics of an adjacent unit. The national lakeshore (Figure 1) is divided into two fire management units (Figure 2), which are different from the East and West Units into which the national lakeshore is divided for administrative purposes.

Table 2: Fire Management Units – Indiana Dunes National lakeshore

Unit	Acres
FMU1 – Prescribed/Suppression Fire Management Unit	12,142
FMU 2 – Suppression Only Fire Management Unit	1,521

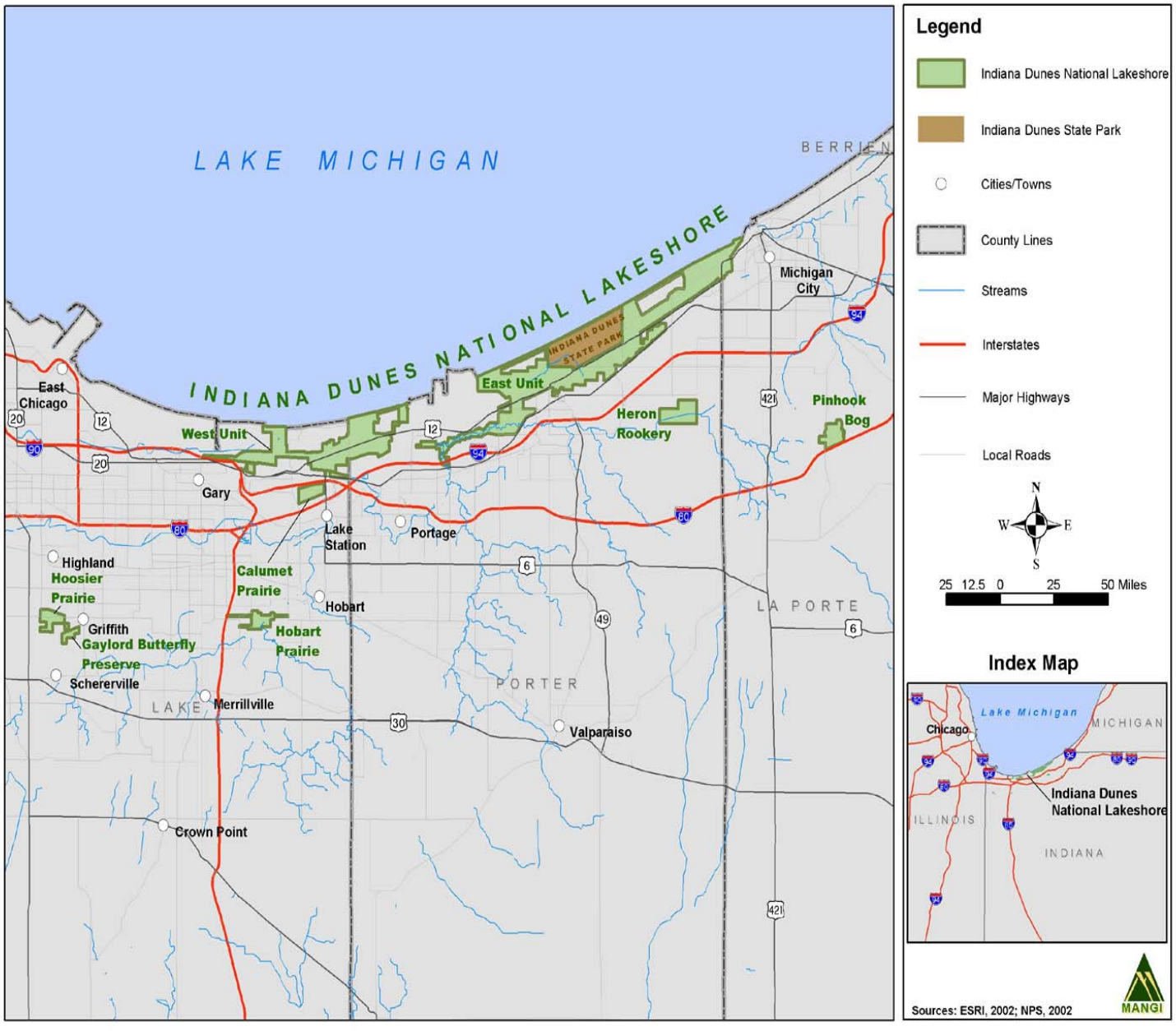
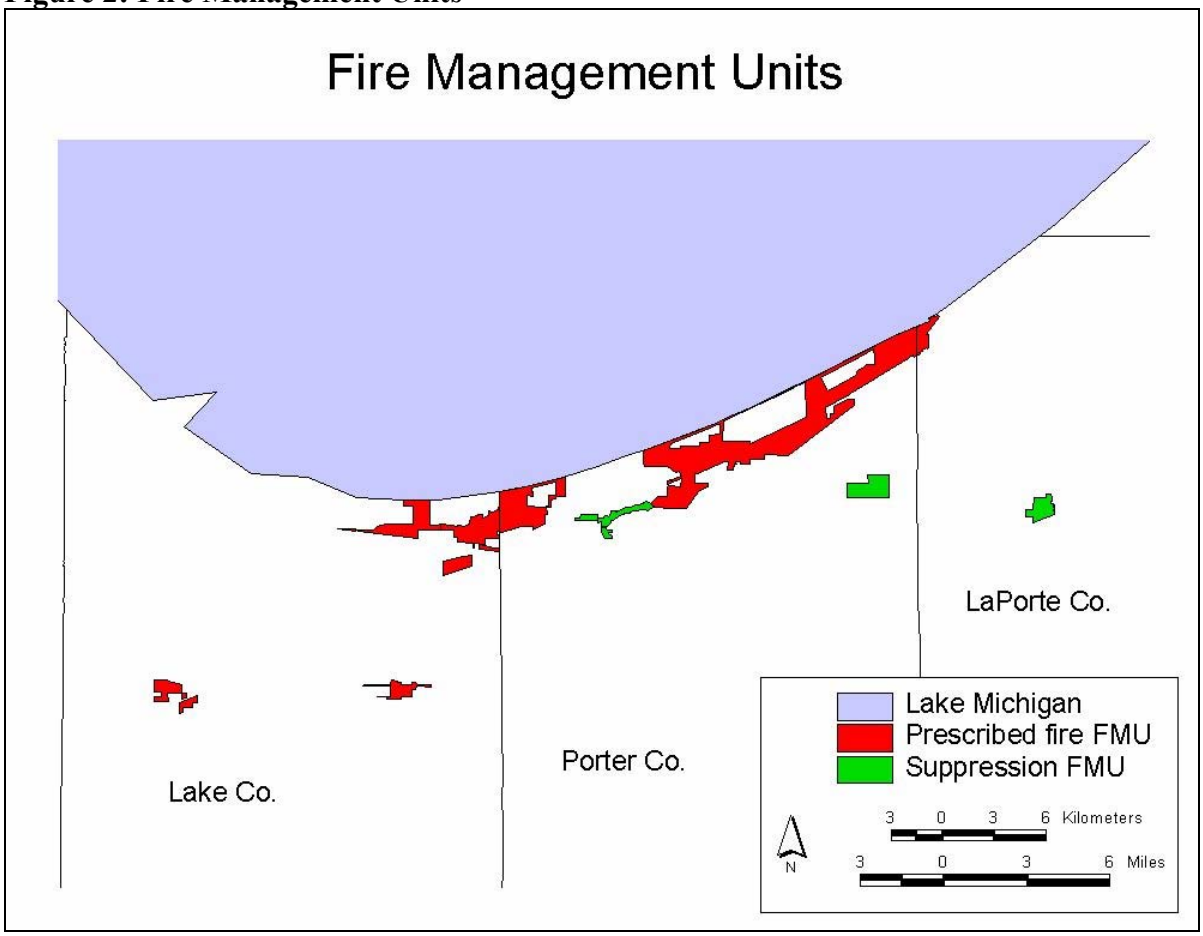


Figure 1: Map – Indiana Dunes National lakeshore and Vicinity

Figure 2: Fire Management Units



Source: National Park Service, Indiana Dunes National Lakeshore (2003)

3.3.1 FMU 1 - Prescribed/Suppression Fire Management Unit

FMU 1 encompasses the majority of the national lakeshore.

3.3.1.1 Physical and Biotic Characteristics

The forces of glaciers, wind, and water have created moraines, beaches, dunes, bogs, and Lake Michigan. The glacial drift deposits range up to 275 feet in thickness, and consist of till, clay, silt, sand, and gravel. These unconsolidated sediments overlay the approximately 4,000-foot thick section of much older, well-consolidated bedrock formations consisting of limestone, dolomite, sandstone, and shale resting on a Precambrian granitic basement.

When the first glacier retreated, it left a massive mixture of sand, gravel, and boulders to form a prominent row of ridges known as the Valparaiso Moraine. This massive "earthen dike" impounded the melt water of the receding ice front, creating Lake Michigan. Advancing and retreating beaches left a series of dunes that form the rolling topography

that is prominent in the national lakeshore and surrounding lands (National Park Service 1981).

Wetlands in the national lakeshore include ponds, marshes, swamps, peatlands, bogs and fens. Historically, wetlands were much more prominent. Canal and ditch construction has significantly modified the natural surface hydrology. Many natural wetlands have been drained; however the national lakeshore is working to restore the natural hydrology. Pinhook Bog and Cowles Bog are exemplary for their habitat composition for areas located in the Midwest. The interdunal ponds in the Miller Woods area are also noteworthy as excellent examples of aquatic community succession.

The Little Calumet River is the principal river flowing through the national lakeshore. The Little Calumet passes through the Heron Rookery and Bailly Homestead before entering Lake Michigan through Burns Ditch.

The aquifer system underlying much of the area consists of unconsolidated sands; sand and gravel; shallow limestone and shale; and deep bedrock consisting of sandstone, limestone, and shale. Recharge of the aquifer system is accomplished by infiltration of precipitation. Discharge of ground water is accomplished by pumping of wells, seepage or stream base flow, and evapo-transpiration.

The national lakeshore is located in an area of heavy industry. Air pollution is generated by a number of sources in the area, particularly the coal-fired power plants, integrated steel mills, and other industrial sources of air pollution from a vast array of smaller industries. In addition to industrial sources of air pollution, nearby transportation corridors result in pollutants from vehicle exhaust.

The cumulative impacts from these sources have produced areas of the southern Lake Michigan shoreline that are classed by the EPA as “non-attainment”. These areas are Lake and Porter Counties for ozone and Lake County for PM-10 and sulfur dioxide (EPA 2002).

Vegetation and fire frequency are affected by the proximity to Lake Michigan and gradually changes from west to east and from south to north. This gradient was created through the interaction of dune position, topography, soil development, and the influences of Lake Michigan.

*In the West Unit, north of Long Lake/Great Marsh, the vegetation represents a gradient from prairie/savanna to moist forested stabilized dune slopes and geologically active foredunes and blowouts where the winds off the lake slowly erode the sandy soil. In the East Unit, the Great Marsh has remnant sedge meadows surrounded by cattail-dominated marsh and ponds. In other areas extensive stands of cottonwood (*Populus

deltoides*), aspen (*Poplus tremuloides*), willow (*Salix *spp.), and blackberries (*Rubus *spp.) have resulted from drainage and past attempts at farming. Other significant associations include graminoid and forested fen, mesic sand prairie, and hydromesophytic forest. The dunes are predominantly black oak forest with remnant*

pockets of disturbed prairie throughout. The southerly to westerly aspects of high exposed dune tops still retain their black oak savanna character. Pockets of swamp forest occur south of U.S. 12 and hydromesophytic forest occurs north of U.S. 12. Interspersed within the major vegetation types are pockets of jack pine, marshes, and pannes.

The tallgrass prairie ecosystem once stretched from the Great Plains to the Midwest. A wedge shaped area known as the Prairie Peninsula extended into western Indiana (Illinois State Museum 2000, Benjamin et al. 1994). Edgar N. Transeau, as reported in Peterson (1990), proposed that climatic influences are considered the major causes of the protrusion of the grasslands into the eastern deciduous forests. Less rainfall and periods of drought, primarily in the late summer and early fall and in the spring, created conditions similar to those on the Great Plains (Peterson 1990). The drier conditions in combination with the extremely flammable cured prairie vegetation encouraged widespread wildland fires that slowed down invasion by forests (Illinois State Museum 2002).

Wildlife is also very diverse. Many different niches exist making the national lakeshore an important refuge for a variety of migratory and resident wildlife species. The Heron Rookery was set aside to protect a nesting area for the Great blue heron. Due to its strategic location on the southern tip of Lake Michigan, the national lakeshore is also an important stopover for many migratory species of birds and waterfowl. A complete listing of wildlife species is on file at the national lakeshore headquarters.

Twenty-six percent of the State of Indiana's listed rare, threatened and/or endangered plant species are represented in the national lakeshore (Pavlovic and Bowels 1994). In addition, the national lakeshore provides habitat for one federally listed plant species, Pitcher's thistle (*Cirsium pitcheri*), and supports seven other plant species currently identified as Category II candidate species for federal listing (Appendix E).

The federally endangered Karner blue butterfly (*Lycaeides Melissa samuelis*) is both a fire sensitive and fire dependent species present at the national lakeshore. Guidelines have been developed to protect and enhance the Karner blue butterfly populations at the national lakeshore
(Appendix E). A listing of federal and state listed species has been included in Appendix E.

The national lakeshore has a broad range of cultural resources ranging from archeological sites and the Bailly Homestead to the Chellberg Farm and the World's Fair Houses. Archeological sites, List of Classified Structures data, and cultural landscape are being entered into the national lakeshore's GIS database. There are 240+ archeological sites on record within the boundaries of the national lakeshore.

Chellberg Farm is managed and interpreted as an active typical northwest Indiana turn-of-the-century farm with period agricultural and domestic living history demonstrations. The Bailly Homestead traces its roots back to the late fur-trading period. Other cultural landscapes include the Good Fellow Club Youth Camp and the Century of Progress Architectural District.

Improvements (real property) at the national lakeshore range from wooden bridges, signs, and other trail improvements; visitor use developments at Mount Baldy, Beverly Shores, West Beach, and elsewhere; Dunewood Campground and scattered day-use picnic areas; the national lakeshore headquarters complex; maintenance facilities; Paul H. Douglas Center; the Good Fellow Camp and other facilities. The value of the real property, including Reservation of Use and Occupancy residences, is estimated to exceed 22.3 million dollars.

Reservation of Use Residences are scattered primarily through the East Unit. Countless homes and businesses share common boundaries with the national lakeshore, and entire communities are sited in a classic wildland-urban interface within the boundaries of the national lakeshore. In addition, one of the key parks in the Indiana State Park System lies within the boundaries of the national lakeshore.

A complete listing of NPS owned improvements and real property is on file at the

national lakeshore headquarters.

3.3.1.2 Strategic and Measurable Fire Management Objectives

3.3.1.2.1 Strategic Objectives

- Provide intensive protection for human life and property within and outside national lakeshore boundaries.

- All wildland fire will be suppressed (managed) with the appropriate management response as directed by this fire management plan and assessment of the specific situation.

- Mechanical fuel treatment methods, including powered hand tools, walk-behind mowers, and deck mowers, will be used in place of, or in combination with, prescribed fire in areas where prescribed fire alone is not the safest or most effective treatment or is otherwise unfeasible.

- Prescribed fires will be used to accomplish resource management objectives, such as restoring and maintaining oak savannas or creating wildlife habitat, and achieving fuel hazard reduction objectives, such as reducing fuel ladders and downed wood debris. To the maximum extent possible, this program will try to simulate the effects of the historical fire regime on the plant and animal communities with unit boundaries. The goals of this program are to reduce the risk from unwanted wildland fire to values such as structures and private property, and to stimulate the severity and intensity of historical fires, at times and in places when safety and control can be assured.

- Prescribed fire will be used according to a pre-determined set of parameters. Prescribed fires can be ignited in designated prescribed fire units under specific prescriptions. The required prescriptions are described in the burn unit's prescribed fire plan. Prescribed fires may be carried out at any time of the year when conditions are within prescription and operations will not conflict with wildland fire suppression activities.

- Priorities for use of prescribed fires will be determined by the length of time since previous burns, vegetative conditions, topographic advantages, current fuel loading, and personnel and logistical requirements. To the extent feasible, prescribed fires are conducted with the direct aid and cooperation of any agency or agencies whose lands are contiguous with the burn unit.

3.3.1.2.2 Measurable Objectives

- Firefighter and public safety receives the highest priority during all fire management activities.

- The initial appropriate management response strategy for wildland fires is successful 95% of the time.

- Ensure fire does not destroy any administrative structure, nor result in costly restoration of any cultural or historical site.

- Annually review, and modify as necessary, agreements with cooperating agencies and fire departments.

- Treat 3408 acres (or 28% of the FMU) with prescribed fire in the next five years to work toward achieving vegetation and resource management objectives.

- Use prescribed fire, non-fire treatments, or a combination of the two to treat 3493 acres (or 29% of the FMU) in the next five years to reduce the risk from unwanted wildland fire to values at risk by modifying fuels arrangement, reducing ladder fuels, reducing fuel loads, and/or reducing fuel availability. Mitigation of hazardous fuels conditions may or may not be the primary objective of treatment, and the area counted toward this hazardous fuels treatment objective may also be counted toward other resource management objectives.

3.3.1.2.3 Fire-Related Vegetation Management Objectives

- Mnoké Tallgrass Prairie

  - Treat 167 ac (67 ha, or 100% of the area in Mnoké Tallgrass Prairie) with prescribed fire at least twice during a five-year period.
  - Use prescribed fire, in combination with other treatment methods, to achieve a 90% reduction in the initial cover of turf grass in designated intensive treatment areas within ten years of the first treatment.
  - Use prescribed fire, in combination with other treatment methods, to achieve a ratio of 5:1 of desired-to-problem species in designated intensive treatment areas within ten years of first treatment.

- Mesic Sand Prairie

  - Identify stands of Mesic Sand Prairie and include them as part of larger prescribed burn units.
  - Treat no more than 5 acres of Mesic Sand Prairie with prescribed fire within five years.
  - Top-kill 75% of pre-burn woody stems less than two inches dbh within one year post-burn.

- Black Oak Savanna / Woodland / Forest Complex

  - Use prescribed fire, in combination with other treatments, as appropriate, to restore and maintain these complexes primarily by top-killing at least 50% of shrubs and woody stems ≤ 2" dbh within one year post-burn; reducing competition by top-killing at least 50% of fire-sensitive herbs within one year post-burn; and reducing the litter layer to less than two inches within one year post-burn, as appropriate.
  - Treat at least 500 acres (or 4.1% of the FMU) with prescribed fire over the next five years.

- Mesic Dune Forest

  - Identify stands of Mesic Dune Forest and include them as part of larger prescribed burn units.
  - Treat 5 acres (or no more than 25% of the area in Mesic Dune Forest contained within planned prescribed burn units) with prescribed fire over the next five years.
  - Top-kill less than 10% of pre-burn woody stems greater than two inches dbh of red oak, tulip-tree, and black cherry (combined) one year post-burn.

- Herb-dominated Wetlands

  - Use prescribed fire, in combination with other treatment methods, to support restoration efforts in degraded wetlands to reduce the occurrence of cattails and restore the dominance of native herbs.
  - Use prescribed fire, in a single or in multiple treatment(s), to achieve a minimum of an 80% reduction of litter.
  - Use prescribed fire to prevent an increase in shrub cover, or to reduce shrub cover, as appropriate, by top-killing 50% of shrubs within one year post-burn with each application of prescribed fire.

3.3.1.2.4 Vegetation Management Objectives

The prescribed fire related management objectives above are intended to achieve overall vegetation management objectives, outlined below, which were identified in a Landscape Strategies Workshop held at national lakeshore in December 2002. Table 3 provides a comparison of the various communities.

Table 3: Characteristics and Comparison of Mesic Sand Prairie (Prairie), Black Oak Savanna (Savanna), Black Oak Woodland (Woodland), and Black Oak Forest (Forest) at Indiana Dunes National Lakeshore.

Key Element	Prairie	Savanna	Woodland	Forest
Canopy Closure	< 15%	≥15% and < 40%	≥ 40% and ≤ 80%	> 80%
Overstory	All but absent	Single layer	Bi-layer	Multi-layer
Important Species	High herb richness	*Aster sericeus* *Aralia hispida* *Corydalis semp.* *Geranium bick.*	PA sedge Solomon's seal Trailing arbutus *Lactuca hirsute*	Witch hazel *Lycopodium* spp.

		Fame flower	*Chimaphila pyrola* bearberry	
Other	grass:forb > 1	grass:forb < 1	litter ≥ 2”	

- Mnoké Tallgrass Prairie

  - Achieve a 90% reduction in the initial cover of turf grass in designated intensive treatment areas within ten years of the first treatment.
  - Reduce the percentage of cover of tall goldenrod (*Solidago altissima*) in designated intensive treatment areas to 20% of pre-treatment cover within five years of first treatment.
  - Achieve a ratio of 5:1 of desired-to-problem species in designated intensive treatment areas within ten years of first treatment.
  - Initiate treatment on at least 5 ac (2 ha, or 3% of the area in Mnoke Tallgrass Prairie) of designated intensive treatment area within five years.

- Mesic Sand Prairie

  - Inventory stands of Mesic Sand Prairie as part of the vegetation mapping project, and identify those stands of Mesic Sand Prairie that rarely burn.
  - Prevent 100% of woody recruitment into Mesic Sand Prairie stands.
  - Introduce a Mesic Sand Prairie monitoring protocol and install at least two monitoring plots in this type within five years.
  - Monitor rare plant plots pre- and post-treatment in stands that are treated or disturbed by management actions.

- Black Oak Savanna / Woodland / Forest Complex

  - Inventory of stands of Black Oak Savanna, Black Oak Woodland, and Black Oak Forest as part of the vegetation mapping project.
  - Within five years, initiate a monitoring protocol for assessing the mosaic of the Savanna / Woodland / Forest Complex.
  - Use prescribed fire, in combination with other treatment methods, to maintain and restore fire-adapted species and communities.
  - Monitor Karner blue butterfly populations, using established methods, as an indicator of the quality and health of the Savanna/Woodland/Forest Complex mosaic.

- Mesic Dune Forest

  - Look for, and make note of, any appearance of rice grass (*Oryzopsis*).
  - Introduce a Mesic Dune Forest monitoring protocol and install at least two monitoring plots in this type within five years.

- Achieve a fire regime in Mesic Dune Forest characterized by a rotation of at least four times the rotation in surrounding stands of Oak Savanna and/or Oak Woodland (resulting fire rotation approximately 12 to 20 years), and by low-severity, usually low-intensity, fire.

- Herb-dominated Wetlands

  - Restore Cattail Communities to Sedge Meadow / Wet Prairie.
  - Reduce the combined percentage of cover of cattails and other invasive species to as close to zero as possible, as soon as possible.
  - Increase the cover of sedges until they are the dominant cover, and maintain high diversity in the assemblage of sedge species.
  - Maintain the density of shrubs at less than 5% total cover.

3.3.1.3 Management Considerations

- The suppression response selected to manage a wildland fire will consider public safety and air quality standards.

- Aerial retardants and foams will not be used within 300 feet of any waterway as described in the Guidelines for Aerial Delivery of Retardant or Foam Near Waterways.

- No off-road heavy equipment or vehicle use will be permitted unless human life or private or public property are threatened. Off-road use by ATVs will be in accordance with Guidelines for ATV Operations, Indiana Dunes National Lakeshore, Approved September 13, 2002.

- The safety of highway users and the health of nearby residents will be a primary consideration during the development of prescribed fire plans, and will be addressed in the smoke management section of each prescribed fire plan.

- Smoke management reporting procedures for conducting prescribed fires will be followed for all prescribed fire operations.

- Protective measures for historic and cultural resource must be ensured and potential impacts mitigated, if necessary, before a prescribed burn project is initiated.

- Prescribed burn operations will be conducted in accordance with the established guidelines for the management of the Karner blue butterfly.

3.3.1.4 Historic Role of Fire

The frequency of fires prior to settlement is not certain but the area burned often, perhaps every four to eight years (Henderson and Long 1984). Fires occurred most

frequently in the western end of the national lakeshore (Henderson 1988) where their spread from the west was not blocked by Lake Michigan, and lake effect humidity is the lowest. A fire frequency higher than four to eight years would have prevented reproduction of the abundant pine trees recorded in this unit by the General Land Office Survey (GLO) in 1837, while a lower frequency would have caused the "scrub" vegetation recorded in the GLO survey to have become forest (NPS 1992).

Where black oak is structurally dominant, leaf fall contributes abundant litter to the surface fuel load. The prevalence of graminoid species (grasses and sedges) and blueberries in the understory produces a great deal of flammable material. Fires are typically surface fires, although crowns can be scorched from summer fires in infrequent years of extreme summer drought (NPS 1992). This vegetative complex experiences the majority of the wildland fires reported to the national lakeshore, and has been the scene of the largest fires reported since the establishment of the national lakeshore. Multiple fire starts on a given day are not unusual.

Although upland oak-hickory forests originated after fires, they are more fire sensitive than the black oak forests found on the dunes. Where the forest composition contains more mesic species, such as dogwood, tulip-tree, ash, black cherry, basswood, and red oak, fire occurrence is less than where black oak is dominant.

Pockets of cattail and other marsh grasses have contributed to large fires in the past. Frequent fires sweeping from the Great Marsh would advance into the dunes along south to west facing slopes and would eventually be slowed or stopped by the steep north and northeast facing slopes. Cooler and moister conditions present near the lake could also have impeded fires. Fires infrequently reached the active dunes where the spread was slowed or halted by bare sand. This pattern also occurred in the East Unit.

The existing large blocks of unfragmented natural areas in the Dune Acres area may have allowed historic fires to cover larger areas and limited the negative effects of fire suppression. Numerous interdunal sloughs (e.g. Little Lane and Howes Prairie) probably aided fire penetration into the dunes. Mesophytic pockets and slopes on the high dunes above Lake Michigan probably had a lower fire frequency (NPS 1992).

South of U.S. 12, the presence of black oak forest and pockets of dry and dry-mesic sand prairie suggest relatively frequent fires. Closer to the Lake Border Moraine, the forests become taller and have more hickory, suggesting a diminution of fire frequency (NPS 1992).

NPS fire report records for the most recent ten year period (1992-2001) indicate that the national lakeshore staff responds to an average of thirty-five wildland fires annually on NPS lands within the national lakeshore. Wildland fires burned an average of 263 acres a year during the ten year period on NPS lands within the national Lakeshore. The majority of these fires are less than one acre (0.4 ha) in size and are human caused (NPS 2001). However, the potential for larger fires does exist. A summary of the number of reported fire starts at the national lakeshore and their causes can be found in Appendix F

3.3.1.5 Wildland Fire Management Situation

- Historical weather analysis. A weather data set are generated by the Bailly Weather Station (Number 120201) located at national lakeshore headquarters and is used to determine fire weather trends at the national lakeshore. The program FIREFAMILY PLUS processed this weather data set to generate the Burning Indices found in Table 7, which are used for planning purposes. The Burning Index (BI) is an index for describing fire danger. The 90th Percentile for NFDRS Fuel Model E is a Burning Index of 26. The 97th Percentile is 35. The Burning Index can fluctuate throughout the year, but the highest BI readings generally occur in late August.

  Typical of the central portions of the Midwest, the area is subject to extremes of weather as the jet stream moves north and south in response to the seasons or becomes established due to weather phenomena such as El Niño and La Niña. Fast moving storm fronts passing through the area have produced 100 mph straight-line winds. Thunderstorms and ice storms are also common occurrences. The area is subject to drying trends as weather patterns feed warm southwest temperatures into the region. It is not unusual to have 70-degree days in February and March. Periods of drought are not uncommon. Based on 50 years of weather data, the normal range of temperatures is from 16 degrees Fahrenheit in January to 82 degrees Fahrenheit in July (NPS 2003). The highest temperature recorded at the national lakeshore was 104 degrees on July 19, 1980 and June 24, 1988, while the lowest was –23 degrees Fahrenheit on January 20, 1985 (NPS 2003). Precipitation ranges from 1.70 inches in February to 4.23 inches in June. The average annual precipitation amount is 37.25 inches. The annual snowfall is 46.1 inches (NPS 2003).

  The close proximity of the national lakeshore to Lake Michigan makes it susceptible to the "lake effect" phenomenon that can produce up to two feet of snow in a localized area from a particular storm. The lake can also influence local weather by increasing humidity, moderating the ambient air temperature, and affecting the winds.

- Fire season. The fire season in the national lakeshore as determined by the FIREPRO Base Analysis (April 23, 2001) runs from March 2 through December 6. This represents a composite season including wildland fires and prescribed fires.

- Fuel characteristics. Fire behavior is basically a function of fuel type, fuel load, fuel moisture content, topography, and local weather conditions. The differences in fire

behavior are basically related to the fuel load and its distribution among fuel particle size classes (Anderson 1982).

Fire in NFFL Fuel Models 1, which is short grass, and NFFL Fuel Model 2, which is timber with an herbaceous understory, is spread primarily through the fine herbaceous fuels (Anderson 1982). Herbaceous material, litter, and dead-down woody material contribute to the fire intensity. With a wind speed of five miles/hour and moisture content of 8%, the rate of spread is 35ch/hr and the flame length is six feet. Fuel continuity ranges from fair to good, depending on location. The fine fuels, which will carry the fire, may be continuous for large areas, or roads, railroad rights-of-way, trails and open areas of sand may frequently break them. Watercourses, open bodies of water and changes in vegetation also create fuel breaks, but it is important to note that, under certain conditions, a wildland fire will burn across bodies of water that have heavy accumulation of cattails, represented by NFFL Fuel Model 3, tall grass.

Black oak savannas and forests have mixtures of graminoid and leaf litter fuels represented by NFFL Fuel Models 8, hardwood and short-needled conifer litter, in the spring and NFFL Fuel Model 9, hardwood and long-needled conifer litter, in the fall. In some areas fuel loading may be high due to fire suppression. The ratio of graminoid to leaf litter fuels is lower in the dunes due to fire suppression, canopy closure and a reduction of graminoid species. Highly flammable blueberries are abundant. Mesophytic forests lack much graminoid litter and have a more rapidly decomposing leaf litter, and thus exhibit a more moderate fire behavior with shorter flame lengths and slower rates of spread.

Expected fire behavior by fuel model will be covered in depth in Section 4.3.2 Potential Fire Behavior.

- *Fire regime alteration. The activities of humans have had a profound effect on the vegetative composition of the area.*

Charcoal records at Howes Prairie indicate that during the last half of the nineteenth century there was an increase in fire frequency from pre-settlement times, perhaps as a result of ignitions caused by the newly introduced steam locomotives passing by recently drained wetlands (Cole et al. 1990).

Throughout the twentieth century, particularly in the last half of the century, there has been a general trend of a decrease in fire frequency from presettlement values. Since the early 1990s, an aggressive suppression and prevention program has been in place at the national lakeshore. The increased fire prevention patrols have been very effective, and as a result, wildland fires have been attacked in early stages and been held to small sizes. Prior to that time, fire suppression was more reactionary and the primary control strategy was to use indirect attack. As a result, the average fire size was larger.

This decrease in fire frequency has resulted in black oak (*Quercus velutina*) increasing in density to the detriment of savanna/prairie species in some areas such as Tolleston Dunes and Inland Marsh. Oaks are much more dense on the dunes now than in 1837 when they were surveyed as bearing trees for the General Land Office survey (Henderson and Long 1984). This trend is verified by the persistent increase in oak pollen seen in the sediments (Taylor 1990). Road construction in the 1930's fragmented the landscape in the area of the younger dunes north of U.S. 12 and east of Indiana Dunes State Park. As a result, fires in this area have been rare. The last fire in the area occurred in the early 1950's, and was quite destructive.

However, contrary to this trend, some areas of the national lakeshore have shown similar or increased values from pre-settlement fire frequency. Between 1900 and 1972, the fire frequency at Howes Prairie approximated pre-settlement values (Taylor 1990). Miller Woods shows more frequent fires than pre-settlement values; with the original pine scrub of Miller Woods being replaced by oak savanna (Cole 1988).

Ignition patterns of prescribed fires have also allowed areas that historically seldom burned to burn more frequently. North slopes in the mesic dune forests are typically characterized by fire intolerant species. Efforts to burn entire burn units may have impacted these areas more often than they would have been historically.

- *<u>Control problems</u>. Based on local fire records, generally wildland fires occurring in the national lakeshore are relatively small and are easy to control (SACS 2002). However, dry, windy conditions in the late winter and early spring can contribute to extreme fire behavior. The largest wildland fire since the creation of the national lakeshore occurred in the early spring of 1986 under dry, windy conditions. The fire jumped a two-lane highway and the South Shore and Conrail tracks before it was contained at Ogden Dunes.*

During the past ten years, wildland fires have been aggressively suppressed. As a result, in some areas trees, especially oak, have become established. Now ten to fifteen feet tall, they can contribute to fire intensity.

Perhaps the one single factor that can have the greatest impact on the ability of suppression forces to control a fire is drought. Due to the natural cycling of weather patterns, periods of drought can occur at various times during the year or may persist for several years. It is important to be aware of periods of drought because of the effect drought can have on fire behavior and fire effects.

Of the two frequently used drought indices, the Keetch-Byram Drought Index (KBDI) (Keetch and Byram 1968) is the most appropriate drought index for the national lakeshore. The KBDI is a mathematically calculated drought indicator relating to the amount of moisture in the top seven inches of soil or duff/soil, and is an output of the National Fire Danger Rating System (NFDRS) when calculated by the Weather Information Management System (WIMS). The KBDI is based on the ambient air temperature and recent precipitation in relation to the mean annual rainfall for a specific weather station. The range of the KBDI is 0-800, with 0 being saturated and 800 being maximum drought. A KBDI reading at the national lakeshore above 250 generally indicates wildland fire management problems, but this threshold varies based on location. The national lakeshore uses the KBDI generated by the Bailly Weather Station (number 120201) located at national lakeshore headquarters.

During periods of extreme drought, wetlands can dry up, exposing peat, which allows for the possibility of organic fires that are very difficult to completely extinguish. In November of 1952, the Chesterton Tribune newspaper reported on a fire that burned "20 square miles of land and continues to burn in isolated places, especially where there are peat beds." The Great Marsh, which is dominated by cattails, intermixed with dead and living cottonwood, aspen, willow, and ash stands, poses unique control problems. Fires in the Great Marsh have the potential to be intense during dry conditions and can be hard to control in high winds. Even a moderate drought as determined by the Keetch-Byram Drought Index reading of 250 can significantly affect fire intensity and resistance to control.

- Values at risk. Unique biological features and important cultural resources are scattered throughout the national lakeshore and include Cowles Bog, Pinhook Bog, the Heron Rookery, Bailly Homestead, Chellberg Farm, and World's Fair Houses, to name but a few. Other resources include air and water quality, biological processes, archeological sites, and visitor enjoyment. See Section 3.3.1.1 for a more detailed listing.

3.3.2 FMU 2 - Suppression Only Fire Management Unit

3.3.2.1 Physical and Biotic Characteristics

On the Lake Border Moraine, the vegetation is predominately oak-hickory forest with mesic forest and hydric forest respectively in the ravines and floodplain of the Little Calumet River. Much of the former oak-hickory forest is now old fields that are reverting to brush and forest. Remnant mesic silt loam prairies occur south of the old fields and oak-hickory forests on the south side of the Little Calumet River. Similarly, at Pinhook Bog the uplands are oak-hickory forests with bog vegetation in the depression.

See Section 3.3.1.1 for information relating to soil, aquatic resources, air quality, wildlife, cultural and historical resources, state and federally listed T&E species, and real property.

3.3.2.2 Strategic and Measurable Fire Management Objectives

3.3.2.2.1 Strategic Objectives

- Provide for the protection of human life and property within and outside the national lakeshore boundaries.
- All wildland fires regardless of origin will be suppressed (managed) with the appropriate management response as directed by this fire management plan and analysis of the specific situation.
- Mechanical fuel treatment methods, including powered tools, walk-behind mowers and deck mowers will be used to achieve fuel hazard reduction objectives such as reducing fuel ladders and downed woody debris. The goal of this program is to reduce the risk from unwanted wildland fire to values such as structures and private property at times and in places when safety and control can be assured.

3.3.2.2.2 Measurable Objectives

- Ensure firefighter and public safety receives the highest priority during all fire management activities.

- The initial appropriate management response strategy for wildland fires is successful ninety-five percent of the time.

- Ensure fire does not destroy any administrative structure, nor result in costly restoration of any cultural or historical site.

- Annually review, and modify as necessary, agreements with cooperating agencies and fire departments.

3.3.2.3 Management Considerations

- The suppression response selected to manage a wildland fire will consider public safety and air quality standards.

- Aerial retardants and foams will not be used within 300 feet of any waterway as described in the Guidelines for Aerial Delivery of Retardant or Foam Near Waterways.

- No off-road heavy equipment or vehicle use will be permitted unless human life or private or public property are threatened. Off-road use by ATVs will be in accordance with National Park Service Midwest Region policy (NPS 2001b).

- Due to the intolerance of the mesophytic vegetation found at the Heron Rookery, prescribed burns will not be conducted and wildland fires will be aggressively suppressed.

- No prescribed fires will be conducted at Pinhook Bog until the effects of wildland fire on bog vegetation are more fully understood and an environmental assessment has been completed addressing the issue.

3.3.2.4 Historic Role of Fire

Areas to the north of the Little Calumet River experience less frequent fires than much of the national lakeshore but were frequent enough to restrict mesic forest to ravines. Fires would have been more frequent south of the Little Calumet River and would have occasionally burned into fens on the south bank. Mesic forests such as those at the Heron Rookery rarely burned, and such an event would have catastrophic effects on the canopy. Wildland fires occurring on the uplands surrounding Pinhook Bog were rare, but fossil charcoal found in the bog indicated that there were occasional fires in the area (Futyma 1985).

3.3.2.5 Wildland Fire Management Situation

- Historical weather analysis. See Section 3.3.1.5 FMU 1.

- Fire Season. See Section 3.3.1.5 FMU 1.
- Fuel characteristics. See Section 3.3.1.5 FMU 1.
- Fire regime alteration. See Section 3.3.1.5 FMU 1.
- Control problems. See Section 3.3.1.5 FMU 1.
- Values at risk. See Section 3.3.1.5 FMU 1.

4.0 WILDLAND FIRE MANAGEMENT

4.1 General Management Considerations

The national lakeshore's General Management Plan and the Resource Management Plan are current and provide guidance for fire management activities. Over the years, wildland fire related research studies have been completed and are available for fire managers. The programmatic Environmental Assessment completed for this plan addresses the overall impacts of the program.

All wildland fires regardless of the source of ignition will be suppressed using the appropriate management response concept. The appropriate management response will vary from fire to fire and even in some cases along the perimeter of a fire. The selected response will be made after considering firefighter and public safety, values at risk, fuels, environmental concerns, expected fire behavior, estimated costs, and similar factors, but will not include resource benefits as a consideration. The full range of management responses runs the spectrum from aggressive suppression of the fire to a combination of strategies to achieve confinement.

A Wildland Fire Implementation Plan (WFIP) will be initiated by the FMO or his/her designee (Appendix G). Because the national lakeshore will not be using Wildland Fire Use, it will only be necessary to complete the Stage I assessment. Based on the assessment, the Fire Management Officer or Incident Commander will select the appropriate strategy and tactics to be used to manage the wildland fire. An overview of possible situations and responses can be found in Table 4.

Table 4: Possible Management Responses

SITUATION	STRATEGY	TACTIC
1. Wildland fire that does not threaten life, natural or cultural resources, or public or private property	Restrict the fire within defined boundaries established either prior to the fire or during the fire	1. Holding at natural or man-made barriers 2. Burn out 3. Observe and patrol
1. Wildland fires on NPS property with low values to be protected 2. Wildland fires burning onto NPS lands 3. Escaped prescribed fire entering another unit	Take suppression action, as needed, which can reasonably be expected to check the spread of the fire under prevailing conditions	1. Direct and indirect line construction 2. Use of natural and man-made barriers 3. Burn out 4. Patrol and mop-up of fire perimeter
1. Wildland fire that threatens life, property or sensitive resources 2. Wildland fire on NPS property with high values to be protected 3. Observed and/or forecasted extreme fire behavior 4. Escaped prescribed fire	Aggressively suppress the fire using direct or indirect attack methods, holding the fire to the fewest acres burned as possible	1. Direct line and indirect construction 2. Engine and water use 3. Aerial retardant 4. Burn out and back fires 5. Mop-up of all or part of the fire area

Additional guidelines and a more complete listing of minimum impact suppression techniques can be found in NPS Reference Manual 18 (RM-18).

4.2 Wildland Use Fires

Wildland Fire Use will not be utilized within the national lakeshore due to the low occurrence of natural ignitions and a wide variety of safety and property concerns. This topic is discussed in more depth in Section 3.2.1.2.

4.3 Wildland Fire Suppression

4.3.1 Firefighter Safety

The 1995 Federal Wildland Fire Management Policy, as revised (2001), mandates that "public and firefighter safety is the first priority in every fire management activity." This important element of policy will be emphasized during all fire management operations and continuously addressed.

The safety of NPS firefighters and cooperators involved in fire management activities is of primary concern. **Only trained and qualified personnel holding current Incident Qualification Cards (commonly referred to as "red cards"), that meet the minimum qualifications established in PMS 310-1, will be assigned to fire suppression or prescribed fire duties**. Fire management personnel will be issued personal protective equipment and will be trained in its proper use. No NPS employee, contractor or cooperator will be purposely exposed to life threatening conditions.

The primary threat to firefighter safety is from fast moving wildland fires that can quickly overtake and trap firefighters. **Fireline supervisors will identify escape routes and safety zones and designate lookouts. All fire suppression personnel will maintain open lines of communication and know where escape routes and safety zones are located.** Spot weather forecasts should be requested early-on during initial attack to gain insight into the possibility of shifting winds from approaching fronts and other weather related phenomena.

The following threats at the national lakeshore specific to firefighter safety have been identified.

- Snags and dead trees with weak root systems.
- Heavy concentrations of fuels that can block escape routes.
- Soft, sandy soil and wet areas that can restrict vehicle movement.
- High-tension power lines.
- Railroad traffic and unguarded crossings.
- Hazardous materials.
- High chain-link fences with limited openings.
- Heavy vehicle traffic.
- Narrow roads and streets with limited ingress and egress and blind intersections.
- Stinging insects.
- Dehydration, heat exhaustion and heat stroke.

Smoke from wildland fires and prescribed fires is a recognized health concern for firefighters. Prescribed burn bosses and wildland fire incident commanders must plan to minimize exposure to heavy smoke by incorporating the recommendations outlined in the publication Health Hazards of Smoke (Sharkey 1997), which is available from PMS or the Missoula Technology and Development Center.

NPS policy does not permit wildland firefighters from the national lakeshore to fight structure fires and other fires routinely fought by structural fire brigades, such as fires

involving hazardous materials and vehicle fires. NPS policy permits NPS wildland firefighters to assist in the suppression of structure and other non-wildland fires by suppressing a wildland fire associated with the incident. Additional guidance can be found in the Indiana Dunes National Lakeshore Emergency Operations Plan on file at national lakeshore headquarters.

4.3.2 Potential Fire Behavior

For fire prediction purposes, the dominant vegetation type in the national lakeshore is mixed hardwood forest. The primary carrier of a fire in this vegetation type is litter beneath the timber stand. Depending on the time of year, this fuel type is broken down into two National Fire Danger Rating System (NFDRS) fuel models that can be used to predict a fire's resistance to control and fire danger. Northern Forest Fire Lab (NFFL) models can be used to predict fire behavior.

- NFDRS Fuel Model R (NFFL Fire Behavior Fuel Model 8) describes a deciduous broadleaf forest with an overstory in full leaf and a compact litter layer. The litter layer is primarily compressed leaves and twigs. Little undergrowth is present in the stand. This fuel model best describes fuel conditions found in the summer.

- During the fall and early winter this vegetative type is best described as NFDRS Fuel Model E (NFFL Fire Behavior Fuel Model 9). Long-needle pine stands and hardwood stands with loosely compacted needle and leaf litter are typical. This is the primary fuel model present during the fall and spring fire season and during periods of late summer drought.

Other fuel models are present and are described below. Only the fire behavior prediction model will be identified because these particular fuel models will not be used to predict fire danger.

- Perennial grasses which are about a foot tall and associated with scattered prairies, old field sites, and pasturelands. This fuel type is best described as NFFL Fire Behavior Fuel Model 1.

- Savanna areas – forested areas with a grass understory – are described as NFFL Fire Behavior Fuel Model 2.

- Vast expanses of wetlands, in some cases choked with cattail and rushes. Fire behavior can be estimated using NFFL Fire Behavior Fuel Model 3. Fire behavior in wetlands primarily composed of sedges and other aquatic plants less than one foot in height can be computed using NFFL Fire Behavior Fuel Model 1.

- Areas with low brush, blueberries, and other low bushes where the fire is generally carried in the surface fuels that are made up of litter cast by the shrubs and grasses or forbs in the understory are described as NFFL Fire Behavior Fuel Model 5.

- Areas where fires carry through the shrub layer such as hardwood shrub is described as NFFL Fire Behavior Fuel Model 6.

With the exception of marsh fires that can burn extremely hot, fires are typically of low intensity, especially in NFFL Fuel Models 8 and 9. Winds play a large role in overall fire behavior. Dead and down fuel can contribute to an increase in expected fire behavior and intensity, which can lead to torching and spotting. This also holds true for periods of drought, which are fairly common in the region, especially during late summer and early fall. (The impacts of drought are discussed in Section 3.3.1.5).

The expected fire spread and behavior characteristics for selected fuel models under normal and extreme conditions are outlined in Table 5.

Table 5: Expected Fire Behavior

Fire Behavior	Factors	Fuel Model	Flame Length *feet*	Rate of Spread *Ch/hr*	Characteristics
Normal	WS:5 mph FM:8%	1	4.0	78	Even under conditions of light winds and reduced slopes, flames can move quickly through this fuel type
Intense to Extreme	WS:8 mph FM:3%	1	8.0	307	Under windy conditions when fuel moistures and humidity are low, rapid rates of spread can be expected.
Normal	WS:5 mph FM:8%	2	6.0	35	May include clumps of fuel that generate higher intensities and may produce firebrands. Fire intensities can lead to short-range spotting and torching of individual trees that can make control difficult.
Intense to Extreme	WS:12mph FM:3% LFM:90%	2	15	213	Fires exceed the upper limit of control by direct attack. Torching and long-range spotting are very likely.
Normal	WS:5 mph FM:8%	3	12	104	Fires in this fuel are the most intense of the grass group and are influenced by the wind.
Intense to Extreme	WS:12mph FM:3%	3	28	490	Under the influence of wind. the wind will drive the fire into the upper heights of the grass and across standing water.
Normal	WS:5 mph FM: 8% LFM:100	5	4.0	18	Fires occurring under normal conditions are not very intense because the highly flammable foliage does not contribute to fire intensity and they tend to remain surface fires.
Intense to Extreme	WS:10mph FM:3% LFM:90%	5	11	79	Fuels with flammable foliage such as mature laurel will exhibit torching and increase intensities that may make direct attack difficult, if not impossible.
Normal	WS:5 mph FM: 8% LFM:100	6	6.0	32	Fires being pushed by moderate winds (8mph) carry through the shrub layer where the foliage is more flammable than Fuel Model 5. Will drop to the ground at low wind speeds or at openings in the stands.
Intense to Extreme	WS:10mph FM:3%	6	11	112	Fires exceed the ability to control by direct attack. Under windy, dry conditions, spotting can lead to escaped fires.
Normal	WS:5 mph FM: 8%	8	1.0	1.6	Fires in this fuel type tend to be slow moving ground fires with low flame lengths. Heavy concentrations of fuels may flare up.
Intense to Extreme	WS:10mph FM:3%	8	2.0	7.0	Under periods of severe weather involving high temperatures, low humidity, and high winds, fires can exhibit fire behavior including rapid moving ground fire, total duff consumption, and possible torching and crown fires.
Normal	WS:5 mph FM: 8%	9	2.6	7.5	Fires occurring in this fuel type tend to exhibit a moderate rate of spread. Intensities will increase as fire enters brushy areas that support leaves or pine needles.
Intense to Extreme	WS:10mph FM:3%	9	6.0	36	Rates of spread often increase when winds are higher due to spotting caused by rolling and blowing leaves. Torching out, spotting, and crowning may be encountered during drought conditions.

Source: Aids to Determining Fuel Models for Estimating Fire Behavior (Anderson 1982), and BEHAVE (Andrews 1986)

4.3.3 Preparedness Actions

4.3.3.1 Prevention and Wildland and Prescribed Fire Education Activities

Fire prevention includes all activities designed to reduce the number of human-caused wildland fires that occur in or adjacent to the national lakeshore. The overall objective of the fire prevention program will be to minimize preventable fires. A prevention analysis for the national lakeshore is included in Appendix H.

Interpreters, Rangers, Resource Management staff, and Fire Management personnel will implement prevention activities for the national lakeshore. Part of the prevention program will be the development and presentation of prevention messages concerning wildland-urban interface awareness, and educational messages tailored for adjacent landowners and visitors. Fire prevention and education will be discussed at selected staff safety meetings throughout the year to ensure all staff are aware of prevention concerns as well as the procedures regarding response to wildland fires and actions related to prescribed fire.

The staff will undertake the following prevention activities:

- Post appropriate signing during periods of high fire danger.
- Participate in fire prevention and safety programs at public schools.
- Public contact will be made through environmental education, outreach, and interpretive programs to explain the fire management program and to emphasize prevention of human-caused wildland fires and activities that landowners can take to minimize the risk of wildland fire on their property.
- The assigned national lakeshore's dispatcher will announce the fire danger adjective staffing classes each morning during fire season along with the weather report.
- Conduct prevention patrols during periods of high fire danger. As part of these patrols, Fire Management personnel will contact local residents to inform them of the situation.
- Campground staff and hosts will contact visitors to emphasize fire safety and prevention.
- Issue press releases and distribute materials at the visitor center informing the public about the benefits of prescribed fire as opposed to the adverse impacts of wildland fire.
- Staff will participate in local parades and fairs and include a prevention message.

- The Fire Management Officer will attend annual meetings with cooperators to develop prevention strategies.

- National lakeshore staff will attend citizens' group meetings to address wildland fire prevention, structure protection strategies and fire management practices, as requested.

- Investigations will be conducted on wildland fires to determine specific causes.

- Reduce accumulated fuels in visitor use developed areas, such as the campground, and in wildland-urban interface areas to lower the likelihood of wildland fire.

- Establish and maintain open lines of communications with railroads and local landowners in order to enhance wildland fire prevention awareness.

4.3.3.2 Annual Training

All persons involved in fire management activities are required to participate in at least 8-hours of annual safety refresher training annually in order to be qualified for fire management activities in that calendar year. Refresher training must address entrapments, local conditions and current issues, fire shelter use and deployment, and firefighter safety related issues. Efforts should be made to vary the training from year to year. Fire shelter use and deployment, under adverse conditions, **will** be included as part of the annual refresher. The training can be given in an eight-hour block or presented in increments. Once completed, the training should be documented in the Shared Application Computer System (SACS), or its replacement, for each firefighter and will have a 12-month currency.

Individual development plans should be created for each firefighter. There is a need to develop prescribed burn bosses, for example, to adequately manage the prescribed fire program at the national lakeshore. Emphasis should be placed on sending interested personnel to the appropriate training, including the Prescribed Fire Training Academy, and details such as a crewmember assignment with a fire use module or as a burn boss or engine boss at an area with an active wildland or prescribed fire program. It may be necessary to arrange for outside evaluators to assess progress towards taskbook completion in order to gain qualified staff members.

As part of the annual FIREPRO analysis and budget allocation, FIREPRO funds may be authorized to cover the cost of 100 and 200 level wildland fire skills courses sponsored by the national lakeshore and for courses held outside the area. In order to participate in fire management training, firefighters must submit requests for specific training courses to the Fire Management Officer for approval. Firefighters receiving approval to attend training outside the area are provided the FIREPRO account number. Travel documents are to be prepared and travel arrangements are to be made by the Fire Program Assistant.

4.3.3.3 Annual Preparedness Activities

Table 6: Annual Preparedness Activities and Month(s) To Be Preformed

ACTIVITY	1	2	3	4	5	6	7	8	9	10	11	12
Inventory Cache		X										
Inventory Fire Engines and Test Hose							X					
Order Needed Supplies		X										
Initiate Bi-weekly Engine Preparation Checks	X	X	X	X	X	X	X	X	X	X	X	X
Weigh Engines to verify GVW Compliance		X										
Complete Training Analysis								X				
Annual Refresher Training		X										
Fire Physical Exams (see NPS Policy)		X										
Annual Fitness Testing			X									
Prescribed Fire Plan Preparation			X					X	X			
Review and Update Fire Mgt. Plan												X
Review Pre-Attack Plans and Update as Needed	X											
Clear Fire Lanes and Fire Trails			X									
Douglas Center Defensible Space Clearance			X							X		
Prepare Fire Management Budget Request						X						
Submit Fire Management Budget Request						X						
Live Fuel Moisture Sampling					X	X	X	X	X	X		
Dead Fuel Moisture Sampling			X	X								
Update Interagency Agreements/AAP's												X
Update Firefighter Qualifications	X											
Meal Agreements Reviewed		X										

Activity should be completed prior to the end of the month indicated

The Cache Manager is responsible for ensuring that all qualified firefighters are issued a full complement of personal protective equipment (PPE). FIREPRO Firefighters are responsible for the maintenance of issued equipment and will have PPE with them at all times while on duty.

4.3.3.4 Fire Weather Stations and NFDRS

The national lakeshore operates the Bailly weather station at national lakeshore headquarters (Number 120201) that supplies year-round daily weather readings. The observations are automatically catalogued into the Weather Information Management System (WIMS). The Cache Manager is responsible for reviewing the fire weather readings and providing the staffing levels to the national lakeshore dispatch center for broadcast. The Fire Management Officer will be notified when Staffing Class IV and V are reached.

For fire prediction purposes, the dominant vegetation type in the national lakeshore is mixed hardwood forest. The primary carrier of a fire in this vegetation type is litter beneath the timber stand. Depending on the time of year, this fuel type is broken down

into two National Fire Danger Rating System (NFDRS) fuel models that can be used to predict a fire's resistance to control and fire danger.

- NFDRS Fuel Model R best describes fuel conditions found in the summer.

- During the spring and fall this vegetative type is best described as NFDRS Fuel Model E. This is the primary fuel model present during the spring and fall fire seasons and during periods of late summer drought (The impacts of drought are discussed in Section 3.3.1.5 - Control Problems).

4.3.4 Step-up Plan

Preparedness activities throughout the year are based on the National Fire Danger Rating System (NFDRS). Fire days are broadly divided into five staffing classes according to the expected fire behavior as indicated by the Burning Index (BI). The BI integrates the effects of weather, fuel, and topography to estimate potential fire behavior and the corresponding amount of effort required to contain a fire. The staffing classes relate to the expected severity of fire conditions.

Preparedness actions are those actions taken to provide extra protection during periods of extreme or unusual fire danger, and using WIMS, are based on the actual fire weather recorded on that day for all staffing classes. Preparedness actions are based on the predicted fire weather before 1400 hours (2 p.m.) and on actual fire weather after 1400 hours for all staffing classes.

Table 7: Staffing Classes – Indiana Dunes National Lakeshore

Staffing Class Fuel Model R Hwd. Litter - Summer	Staffing Class Fuel Model E Hwd. Litter - Fall	Description of Conditions
I BI 1 - 3	I BI 3 - 6	Surface fuels and duff generally moist. Fires will present a low level of control difficulty.
II BI 4 - 6	II BI 7 – 12	Surface fuels are drying and fuels will burn at mid-day. Slow rate of spread but fires on south aspects may exhibit increased fire behavior.
III BI 7 - 11	III BI 13 – 25	Fine fuels are dry. Heavy fuels are drying. Fire may spread more rapidly, especially with increased winds and on southern aspects.
IV BI 12 - 16	IV BI 26 - 34	All fuels are dry. Fires ignite easily, spread quickly, and are difficult to control. Fires on southern aspects may exhibit extreme fire behavior. Duff fires are difficult to extinguish.
V BI 17+	V BI 35+	All fuels dry. Multiple fires may be reported in zone. Chance of torching and spot fires high. Duff fires resist control.

Staffing Classes are determined by Burning Indices. A Fire Family Run using data from the Bailly Fire Weather Station determined the break points.

The FMO can increase the Staffing Class one class during period of high visitation or holidays such as the 4th of July when the likelihood of "human caused" fires has been

shown to be higher than expected, or in the spring when above average temperatures and winds are forecast in anticipation of the possibility of human caused fires.

The national lakeshore's authority to spend emergency preparedness funds is tied to the BI. Emergency funds are available when the 90th percentile of the BI (Staffing Level IV) is reached. The funds can be used for hiring emergency temporary firefighters, placing existing staff on extended tours of duty, pre-positioning resources, increasing or initiating special detection operations, and leasing initial attack aircraft. All of these actions are aimed at ensuring prompt responses should a wildland fire occur.

Severity funding is different from emergency preparedness funding. Emergency preparedness funds are used to fund activities during short-term weather events and increased human activity that increases the fire danger beyond what is normal. Severity funding is requested to prepare for abnormally extreme fire potential caused by an unusual climate or weather event such as extended drought or widespread frost kill. When the national lakeshore is expecting to experience long-term extreme fire danger due to drought or other situations which may not adequately be met with routine daily Staffing Classes IV or V preparedness funding, a severity assessment and funding request should be submitted (See RM-18, Chapter 10 for guidance).

Table 8 summarizes preparedness actions to be taken based upon the day's staffing class.

Table 8: Step-up Plan – Preparedness Actions

PREPAREDNESS ACTIONS	STAFFING CLASS				
	I	II	III	IV	V
Staff					
• Firefighters have PPE readily available while on duty	X	X	X	X	X
• Firefighters may be assigned to an engine at the station or to patrol. Two-minute response status.			X	X	X
• Extend Firefighters work weeks and/or tours of duty				X	X
• Extend Dispatcher work weeks and/or tours of duty				X	X
• One Fire Prevention Patrol in East and West Units each day				X	
• Two Fire Prevention Patrols in East and West Units each day					X
• ICT3 should be on duty or readily available, if possible					X
Equipment					
• Conduct daily checks of all engines and equipment	X	X	X	X	X
• Staff an engine with an Engine Boss (ENGB) and a firefighter (FFT2) from 1000 hrs until 1800 hrs				X	X
• Consider patrols after 1800 hrs					X
Prevention Activities					
• Post appropriate signs at campgrounds and public use areas	X	X	X	X	X
• Interpretive staff include fire message in programs & contacts			X	X	X
• Consider news release and/or Public Service Announcements				X	X
• Consider trail closures to public use					X
• Consider open fire restrictions (except stoves) at the campground					X
Administrative					
• Monitor fire weather forecasts and NFDRS indices	X	X	X	X	X
• Increase one staffing class if 3-day holiday			X	X	X
• Increase one staffing class when significant NPS or cooperator resources are committed to an uncontained wildland fire in the vicinity of the national lakeshore	X	X	X	X	X
• Increase one staffing class if special events significantly increases man-caused risk	X	X	X	X	X
• Submit situation reports to Indiana Interagency Coordination Center and NPS Shared Applications Computer System			X	X	X
• Notify Regional Fire Management Officer (RFMO) and open emergency preparedness account				X	X
Note: • Cooperators may be notified of Staffing Class daily during fire season, or any other time when in SC IV or V					

4.3.5 Pre-Attack Plan

The national lakeshore is in the process of updating its Pre Attack plans, as they are completed they will be added to this document (Appendix I). The value of a written pre-attack plan, or a checklist is recognized. Other Pre-Attack plans will be prepared as time permits for the following areas:

- *Indiana Dunes State Park*
- *Inland Marsh and Ogden Dunes*
- *Dune Acres*
- *Beverly Shores*

Pre-attack plans should include the following information:

- Detailed Map(s) including:
  - Safety hazards.
  - Structures or other values at risk.
  - Water sources.
  - Roads and engine access points.
  - Possible control line locations, including roads, trails, and natural fuel breaks.
  - Perimeter and dates of any recent fires or burns in the area.
- Listing of neighboring cooperators and available resources.
- Assessment of structure protection requirements.
- Assessment of any safety hazards and mitigation actions.

A Pre-Attack Planning Checklist can be found in Chapter 7, Exhibit 3 of RM-18. Copies of pre-attack plans are kept in the office of the Wildland Fire Specialist.

4.3.6 Detection

There are many ways wildland fires occurring in or near the national lakeshore can be reported to NPS officials:

- Fires that are reported by visitors, local residents, or other agencies are usually reported to the local fire authority or local law enforcement dispatcher. The national

lakeshore may be notified when the reported wildland fire appears to be on NPS lands.

- During periods of high fire danger, increased probability of starts, and when burn bans are in effect, FIREPRO Funded Firefighters conduct fire prevention patrols. All unstaffed wildland fires observed by national lakeshore employees are reported to the Dispatch Center.

4.3.7 Initial Reporting and Dispatching

All fires that are observed by NPS personnel will be immediately reported to the Dispatch Center. When a report of a fire or smoke is received, the following information should be collected from the reporting party.

- Name of the reporting party.
- Address of the reporting party.
- Contact telephone number.
- Location of fire and size.
- Fuels and observed fire behavior.

The Dispatcher receiving the report at national lakeshore headquarters will assume the duties of Fire Dispatcher until relieved or released. The Dispatch Center will promptly notify the AFMO Wildland Fire Suppression Specialist. The Fire Dispatcher will be responsible for coordinating the filling and delivery of any resource orders made by the Incident Commander (IC) for all operational and logistical needs, including engines, tools, supplies, meals, and personnel. The IC will place all resource orders through the Fire Dispatcher, and specify when and where the resource is needed. A Resource Order Form (NFES 1470) will be used by the Fire Dispatcher to document all requests. The Fire Dispatcher will promptly determine if a resource order can be filled or procured locally and notify the IC of the status of the order. If a resource order cannot be filled locally, the Fire Dispatcher will place the order with the Indiana Interagency Coordination Center or the appropriate local fire district. The Fire Management Officer will generally be able to assist in ordering resources from outside the local area. All resources dispatched to a fire must be fully qualified for the position for which they are ordered.

Wildland fires will be named after either geographic place names or map references.

Standard Operating Procedures for the dispatching of firefighters can be found in Appendix J.

4.3.8 Suppression Response

All wildland fires occurring on national lakeshore lands or within the mutual response zone will be suppressed using the appropriate management response concept. The appropriate management response will vary from fire to fire and sometimes even along the perimeter of a fire depending on the situation. Appropriate management response options range from monitoring with minimal on-the-ground disturbance, to aggressive initial attack on all perimeters of the fire, to a combination of strategies to achieve confinement. The Incident Commander will develop the appropriate management response as part of the initial evaluation (size-up) process by analyzing the current situation and the expected fire weather.

The appropriate management response will be determined after evaluating factors such as:

- Firefighter and public safety;
- Values to be protected (unique biological communities, cultural and historic sites, structures, and other man-made developments);
- External concerns;
- Land use; and
- Estimated cost of suppression.

Resource value will not be a factor when determining the appropriate suppression response.

4.3.9 Mobilization

4.3.9.1 In-Area Assignments

Although the national lakeshore relies on FIREPRO funded firefighters for initial attack, the Wildland Fire Specialist maintains a roster of pre-approved collateral duty firefighters available to respond to wildland fires reported in the national lakeshore or the immediate vicinity. When a report of a wildland fire is received, the Wildland Fire Specialist designates an Incident Commander and firefighters are dispatched, usually within two minutes. When the number of firefighters needed exceeds the number of available FIREPRO funded firefighters, a Resource Order requesting collateral duty firefighters is submitted to the assigned fire dispatcher, who contacts the firefighter(s) and the firefighter's supervisor. The collateral duty firefighter(s) report to Station 1 for mobilization.

4.3.9.2 Out-of-Area Assignments

When firefighters or other wildland fire suppression resources are needed for interagency assignments, the Fire Management Officer is generally contacted by the Indiana Interagency Coordination Center. The Coordination Center provides the FMO with the information contained on the Resource Order.

A pre-approved roster of firefighters available to respond to interagency incidents is maintained by the Fire Management Officer during Staffing Levels IV and V. The roster, which lists available firefighters and their qualifications should be sent to the Indiana Interagency Coordination Center and updated weekly. When a Resource Order is received, the Fire Management Officer or his/her designee will contact the appropriate Division Chief to verify that the firefighter is still available and to gain permission to commit the firefighter. Once permission is received, the firefighter is contacted and, if personally available, committed to the incident. Normally there is a one hour "Fill or Kill" time specified by an Interagency Coordination Center.

4.3.10 Initial Attack

Criteria to be considered when selecting an appropriate initial attack response that is consistent with the national lakeshore's fire management goals and objectives are:

- Public and firefighter safety.
- Fire behavior based on fuel, weather, and topography.
- Availability of suppression resources and response times.
- Protection of cultural, historic, and natural resources.
- Protection of improvements and private property.
- Minimum impact from suppression actions.

When multiple fires are reported, fires occurring in the wildland-urban interface will be of higher priority than fires occurring in more remote natural areas. When multiple fires are reported in the same unit the following will be used to set priorities:

- Threat to human life.
- Threat to cultural and historic sites.
- Threat to private property.
- Threat to threatened and endangered species, and sensitive habitats.
- Threat to national lakeshore developments.

Suppression actions that restrict the spread of a fire to a given area may be used as an initial attack strategy as long as it is not being used solely to meet resource management objectives. Resource benefits may be a by-product, but the strategy must be based on the criteria previously listed. A confinement strategy may also be selected in the WFSA process when the initial attack action fails to halt the spread of a wildland fire.

Typical response times to wildland fires may vary depending on staffing and individual personnel work assignments. An effort will be made to respond to a wildland fire within thirty minutes of receiving a report.

Table 9: Recommended Initial Attack Actions to be Taken Based on Staffing Class

INITIAL ATTACK ACTIONS	STAFFING CLASS				
	I	II	III	IV	V
Initial Reporting					
• Receive report of fire and complete fire report form	X	X	X	X	X

• Notify the FMO /Wildland Fire Specialist	X	X	X	X	X
• Notify appropriate fire department	X	X	X	X	X
Initial Dispatching (no structures reported threatened)					
• Dispatch closest NPS engine w/ ENGB and two FFT2	X	X	X	X	X
• Dispatch additional NPS engine with ICT4/ENGB and 2 FFT2			X	X	X
• Request cooperator engine and crew				X	X
• Mobilize additional NPS staff for dispatch as requested by IC			X	X	X
Initial Dispatching (structures reported threatened)					
• Dispatch closest NPS engine w/ ENGB and two FFT2	X	X	X	X	X
• Request cooperator engine and crew			X	X	X
• Dispatch additional NPS engine with ICT4/ENGB and 2 FFT2			X	X	X
• Mobilize additional NPS staff for dispatch as requested by IC	X	X	X	X	X
• Determine availability of additional resources from cooperators		X	X	X	X
• Dispatch AFMO, FMO or ICT3				X	X
• Dispatch closest helicopter or air tanker if requested by IC or Wildland Fire Specialist, if available.				X	X
• **Note:** • 1st NPS ICT4 or ENGB on scene will serve as Incident Commander until relieved. • IC to conduct size up and order/release resources as necessary. • IC to direct fire suppression following standard safety and operational procedures. • Air tankers and helicopters can be requested at any time, but when the national lakeshore is in SC IV or V, their dispatch should be routine, if available.					

4.3.11 Extended Attack

Extended attack occurs when a fire has not been contained or controlled by the initial attack forces and continues either until the transition to a higher level incident management team is completed or until the fire has been contained and/or controlled. Whenever it appears that a fire will escape initial attack efforts, leave NPS lands, or when fire complexity exceeds the capabilities of command or operations, the IC will take appropriate, proactive actions to ensure that additional resources are ordered. Extended attack action requires that a Wildland Fire Situation Analysis (WFSA) be completed by the FMO to re-evaluate the suppression strategy.

The WFSA is a decision-making process which describes the fire situation, establishes objectives and constraints for the management of the fire, compares multiple strategic wildland fire management alternatives, evaluates the expected effects of the alternatives, selects the preferred alternative, and documents the decision. A WFSA will be completed for all fires that escape initial attack and require a Type III organization. The WFSA is vital when fire spread and behavior exceed suppression efforts or when prescribed fires can no longer be implemented in accordance with the approved plan. The process is intended to guide the Agency Administrator (Superintendent) in assessing the current situation, developing suppression alternatives, evaluating those alternatives, and deciding on a course of action. The situation is generally reviewed daily to determine the effectiveness of the strategy chosen. Software to complete this planning document is available on the Internet at http://www.fs.fed.us/land/fire/wfsa.htm.

In the event an Incident Commander or Incident Management Team is ordered, the transfer of responsibility for suppression actions on the fire will be documented through a Limited Delegation of Authority signed by the Superintendent or designated acting official. A draft copy is included in Appendix K.

4.3.12 Minimum Impact Suppression Tactics (MIST)

Fire management activities within the national lakeshore will be carried out in a manner that minimizes impacts to the area's natural and cultural resources, while maintaining the safety of firefighters, the public, and other personnel. Minimum Impact Suppression Tactics (MIST) to be used when suppressing fires on national lakeshore lands include:

- Use of natural or manmade barriers whenever possible.
- Use leaf blowers and wetlines wherever possible.
- Cold-trail the fire edge when practical.
- Branches and other debris from line construction will be scattered in accordance with guidelines contained in the Fireline Handbook (PMS 410-1).
- Use mop-up kits and other low-pressure nozzles setting to prevent erosion.

- Minimize the falling of trees. Snags near the firelines will be removed only if they present a hazard to firefighters or constitute a threat to the fireline integrity. Lower branches on living trees will be pruned to remove ladder fuels as opposed to falling the tree whenever possible.

- The approval of the Superintendent or his/her representative is needed for off-road use of vehicles and the use of plows and other mechanized equipment, unless human life or private or public property are threatened.

- Aerial retardants and foams will not be used within 300 feet of any waterway as described in the Guidelines for Aerial Delivery of Retardant or Foam near Waterways.

4.3.13 Burned Area Emergency Rehabilitation (BAER)

All rehabilitation actions will be in accordance with National Park Service Policy found in RM-18, Chapter 12, Departmental Manual (620 DM 3, Burned Area Emergency Stabilization and Rehabilitation) and the guidelines found in the Interagency BAER Handbook. After the fire is declared out, all flagging, litter and trash associated with the suppression operations will be removed. Firelines will be rehabbed and erosion control devices installed as necessary. Brush will be scattered and stumps will be flush cut and covered with soil. Plow furrows will be rehabilitated by rolling the materials back into the furrow. Public use trails will be patrolled and measures taken to ensure public safety.

The severity of the burn and the resulting impacts will dictate the need to re-seed or reestablish native plant species. Although the likelihood of the need is considered to be quite low, before any action is taken a rehabilitation plan will be prepared and approved in accordance with Park Service policy.

Interagency BAER handbook states that damage to improvements caused by suppression efforts and repairs required to protect national lakeshore resources from imminent damage can be charged to the individual fire suppression account. Emergency Stabilization and Rehabilitation (ESR) funds can be used to repair damage caused by the fire itself as follows:

- Health and safety (imminent danger or immediate threat to life and property)
- Municipal water source loss of capacity (not water quality)
- Threatened and endangered species habitat treatments (not enhancements)
- Cultural site treatments to prevent further erosion (not inventory or mitigation of site)
- Treatments to prevent invasive plant establishment
- Resource protection treatments (site stabilization of soil)

ESR funds generally cannot be used to repair fire damage to park infrastructure. Funds to repair or replace fire damaged infrastructure will come from non fire sources. ESR

funds, if approved, are available for the first two years after the fire is declared out. Rehabilitation extending beyond two years is not considered an emergency. Long term rehabilitation will be funded from non fire funding sources.

4.3.14 Records and Reports

4.3.14.1 Individual Fire Report (DI-1202)

The Individual Fire Report (Commonly referred to as a DI-1202 or 1202) is the primary means of documenting fire management activities for the Department of the Interior. A DI-1202 is to be used to document wildland fires, including suppression actions, natural outs, support actions, false alarms, and prescribed fires. Wildland Fires will be named after either geographic place names or map references.

The Initial and/or Extended Attack Incident Commander or the Burn Boss is responsible for completing the DI-1202 as well as Crew Time Report(s) for personnel assigned to the incident, requisitions for items expended on the incident, Compensation and Claims For Injury forms, and other documents relating to the incident. The person completing the DI-1202 will enter the fire number from the list maintained by the national lakeshore and request an account number from the Wildland Fire Specialist.

A completed DI-1202 actually forms a package that may include the following:

- Any written documents relating to the incident signed by the Superintendent or his/her representative.
- A copy of the WFSA.
- The original copy of any Resource Order Form(s).
- Copies of Crew Time Reports and Individual Firefighter Time Reports.
- Listing of firefighters, including positions held.
- Dispatch log.
- Copies of requisitions.
- Situation maps that indicate the location of the daily fire advance, weather data, etc.
- Accident reports.
- Press clippings.
- Rehabilitation Plan.

The completed package will be submitted to the Fire Management Officer who will review the report for completeness. Once the review has been completed, the data will be entered into the SACS database within 10-days of the fire being declared out and the package filed in the Fire Program Clerk's Office for permanent record keeping.

4.3.14.2 Resource Order Form (NFES 1407)

All requests for outside assistance will be documented on a Resource Order Form

(NFES 1407). The order form is, in essence, an obligating procurement document. When an incoming order is received for national lakeshore resources, the Indiana Interagency Coordination Center should fax a copy of the Resource Order to the national lakeshore for inclusion in the incident package.

4.3.14.3 Daily Situation Report (ICS 209)

Daily Situation Reports should be submitted on those days when the national lakeshore moves into Staffing Classes IV and V, or when a fire has occurred or is on-going. The Cache Manager is responsible for preparing the report and entering it into SACS by 0930 hours. An ICS-209 form will be completed and forwarded to the Indiana Interagency Coordination Center when fires exceed 100 acres for timber or brush or 300 acres for grass fuels.

4.3.14.4 Fire Experience and Qualifications

SACS or its replacement is the central repository for all individual firefighter experience, fitness, and training records. The Cache Manager is responsible for overseeing the entry of all training and experience into the system and ensuring the information is up to date. Prior to the advent of fire season, each firefighter should be given the opportunity to check and validate their records and make any corrections, if necessary. This can be done as part of an annual Individual Development Plan (IDP) process.

4.3.14.5 Year-end Accomplishment Report

The FMO or his designee will complete and submit the year-end accomplishment reports in time to meet Midwest Region and national deadlines.

CHAPTER 5.0 FUELS MANAGEMENT

5.1 Scope of Long-term Prescribed Fire and Hazard Fuels Management Program

Prescribed fire has become a recognized management technique to accomplish beneficial resource objectives including fuel treatment and reduction, site preparation, seedbed preparation, changes in species composition, forest stand thinning, wildlife habitat improvement, ecosystem health maintenance, and numerous other objectives (National Park Service 1999b). Federal Wildland Fire Management Policy directs federal agencies to achieve a balance between suppression to protect life, property, and resources, and fire use to regulate fuel and maintain healthy ecosystems (NWCG 1998). One of the guiding principles established by the policy recognizes the role of wildland fire as an essential ecological process and natural change agent and requires that it be incorporated into the planning process. A second guiding principle in this directive requires fire management actions be based on the best available science (NWCG 1998).

Congress has determined that the buildup of hazardous levels of fuel is threatening federally owned resources and developments directly and visitor and employees safety indirectly, and has provided funding to treat the problem.

NPS policy states that units shall minimize, as possible, hazardous fuel in the wildland-urban interface. RM-18 recognizes that hazard fuel management activities reduce fire hazard of natural fuel in areas where weather and risk assessments demonstrate a reasonable chance for wildland fire damage. Hazard fuel management activities protect real property, natural and cultural resources and enhance public and firefighter safety.

The national lakeshore prescribed fire program extends back to 1986 when the first research burn was conducted at Howes Prairie. Since that time, over sixty prescribed burns have been carried
out to accomplish a variety of objectives, including research, fuels management, habitat manage-ment and manipulation, and other resource benefits. The program is based on resource management objectives established by the national lakeshore and actions, such as fuels management, mandated by policy.

A Fuels Management Plan will be developed by the national lakeshore staff and included as an appendix to this plan (Appendix L). The plan will identify areas to be treated, the method to be used, standards, and responsibilities.

5.2 Prescribed Fire

5.2.1 Prescribed Fire Planning

5.2.1.1 Planning Process

The following guidelines will be used when developing and planning annual prescribed fire and hazard fuel management actions:

- A 10-year treatment plan has been drafted by the national lakeshore (see Fuels Management Plan in Appendix L). The national lakeshore will also develop an annual fuel treatment program based on the 10-year plan (See section 5.2.2). Staff will identify areas to be treated, develop project objectives, determine who will write the various burn or mechanical fuel reduction plans or review plans written by others, ensure monitoring is conducted in accordance with established guidelines, and identify research projects and other monitoring needs.

- A national lakeshore management/inter-disciplinary team composed of the Fire Management Officer, Chief of Resource Management, the USGS Staff at the national lakeshore, and cooperators and other interested agencies, as appropriate, will meet annually to review the proposed projects. The purpose of this meeting will be to review proposed burns and other fuel management projects, foster support for the national lakeshore's prescribed fire program, and schedule prescribed burns and mechanical fuel reduction projects.

- Once approved by the Superintendent, the projects will be submitted as part of the FIREPRO budgeting process for consideration for funding. The Resource Management Division may also request funding from other sources for monitoring and research projects.

- The Fire Management Officer will implement approved projects with the assistance of the Chief of Resource Management and other Division Chiefs and the USGS Staff at the national lakeshore.

5.2.1.2 Prescribed Fire Plan

Before a prescribed burn can be implemented a Prescribed Fire Plan (Burn Plan) must be completed, reviewed, and approved by the Superintendent. Guidance for this program can be found in RM-18 Chapter 10. A Burn Plan includes the following minimum elements:

- Description of the area to be treated, including maps that indicate the area to be treated and the Maximum Management Area (MMA) to be used when evaluating escapes.
- Goals and Objectives.
- Range of acceptable results expected.
- Project Assessment – Complexity and Risk Assessment.
- Prescribed Fire Implementation Actions.
  - Test Fire
  - Prescribed Fire Prescription
  - Special Conditions
  - Burn Organization
  - Ignition Actions
  - Holding Actions

- Cooperation – Interagency and burn-day notification.
- Wildland Fire Transition Plan.
- Costs.
- Smoke Management and Air Quality.
- Post-burn Activities.

Additional guidance, including explanation of each element can be found in RM-18, Chapter 10.

5.2.1.3 Wildland Fire Transition Plan

Each prescribed fire plan will include a section that thoroughly addresses the actions to be taken in the event a prescribed burn must be suppressed or managed as a wildland fire. Developing the Wildland Fire Transition Plan is an integral part of the prescribed fire planning process, and begins with the first visit to the burn unit. It is important to identify in advance, circumstances or conditions that may require the implementation of the transition plan.

The Wildland Fire Transition Plan should consider:

- The individual(s) who has the authority to convert the prescribed fire to wildland fire status.
- Clearly defined conditions ("trigger points") that indicate the transition plan should be activated.
- A listing of those to be notified or contacted.
- Who will assume the duties of the Incident Commander.
- The location of values at risk and other resources requiring protection.
- The preferred strategy and tactics.
- The location of containment lines or natural fuel breaks outside the burn unit.
- The location of water refill points, staged equipment, etc.
- Contingency forces (Type, number, location).

A prescribed burn will not be implemented unless all elements of the prescribed fire plan have been met.

5.2.2 Ten Year Prescribed Fire Plan

The national lakeshore's strategy will be to periodically treat forest, grassland, and shrub vegetation types to reduce fuel loading and restore a more natural composition and structure to native vegetation communities. Prescribed fires will be conducted for the following reasons:

- **Hazard Fuel Reduction** - The purpose of these burns will be to mitigate hazard fuel conditions. These burns are expected to be relatively complex due to the adjoining wildland-urban interface areas. Some areas may require only one treatment; while the majority will require a series of relatively light frequent burns to achieve restoration goals. Many areas, will require mechanical treatments ranging from fuel break construction to mechanical brush removal before the areas can be safely and effectively burned. Prescribed fires will be scheduled to mitigate smoke impacts and/or alleviate other concerns, and may initially be conducted outside the normal fire season in deference to the same concerns.

- **Maintenance** - Maintenance burns will be initiated once more natural fuel levels and vegetation community structure and composition have been restored. At that point, periodic prescribed burns will continue to maintain natural conditions, but will

generally be less frequent and complex. Actual maintenance fire return frequencies will need to be determined based upon fire effect monitoring results obtained from restoration burns, but are expected to resemble natural fire return intervals for similar vegetation types.

- **Resource Management -** Conduct prescribed burns to help achieve natural and cultural resource management goals, such as habitat enhancement for the federally listed Karner blue butterfly and other listed species, maintenance of oak savanna ecosystems, rehabilitation of cultural landscapes, debris removal, and as a supplement to other treatments during restoration projects.

- **Research -** Site specific study may be conducted to determine the role fire played in the various vegetative and animal communities. In addition, careful monitoring will be conducted to determine the effectiveness of the use of fire to achieve resource objectives, refine prescriptions, and develop baseline data that can be used for future planning initiatives.

Presently, the national lakeshore plans to treat an average of 300 ac (120 ha) annually to meet initial treatment objectives. In order to achieve this, an average of five prescribed burns will be scheduled each year. The number of acres treated annually may be significantly reduced as maintenance prescriptions are implemented. However, as the program evolves, additional burn units may be added or removed, as necessary, to accomplish overall resource management goals.

Treatment priorities will be determined by the Chief of Resource Management and the Fire Management Officer, and based on the availability of funding, threat to public and private property, habitat condition, and staffing.

In addition to conducting the burns, the primary administrative tasks to be accomplished by the national lakeshore staff include:

- Coordinating and managing the necessary mechanical fuel reduction activities prior to burning an area.

- Continuing and expanding the fire education program and informing landowners adjacent to or within national lakeshore in order to gain additional support for the program.

- Initiating and implementing agreements and Annual Work Plans with cooperators to facilitate sharing of staff and equipment, as well as conducting interagency prescribed burns when appropriate.

- Managing a relatively high number of prescribed burns within a limited burn window.

- Developing, implementing, and managing a fire effects monitoring program.

- Providing oversight for prescribed burns conducted by contractors and agents.

5.2.3 Personnel Requirements

The national lakeshore has a wildland fire qualified staff adequate to meet the operational staffing needs necessary to implement the plan, contingency forces excepted. (Table 11: Minimum Staffing Targets in the following section contains a listing of the positions required to meet minimum suppression requirements and fill key prescribed fire positions.) Possible staffing sources to meet additional resource needs include: the USDA Forest Service, Service Fire Use Modules and Fire Effects Teams not assigned to the national lakeshore, and other federal and state cooperator personnel from the Great Lakes region. Necessary resources will be ordered based on the complexity of the burn as determined by the complexity and holding analysis completed as part of the planning process for each burn unit.

If possible, an Incident Commander Type 3 (ICT3) will be assigned to a prescribed fire of moderate complexity or higher. The ICT3 may participate as a member of the Management Team or be available to respond in a timely manner in the event the burn must be declared a wildland fire. The ICT3 would assume command of the suppression operation and implement the actions indicated in the Wildland Fire Transition Plan or the preferred strategy identified through the Wildland Fire Situation Analysis (WFSA) process.

5.2.4 Fire Behavior and Fire Effects Monitoring

A fire effects monitoring program, in accordance with the NPS Fire Monitoring Handbook (2001), will be included as part of the prescribed fire program. Short and long-term monitoring will include the installation of permanent plots in representative habitats to determine the effects of prescribed fire. The program will ascertain if the quantifiable burn unit objectives identified in the individual burn plans have been achieved and if the desired long-term biological changes are occurring. Monitoring results will be used to validate the program, adjust prescriptions, and identify new units suitable for similar treatment.

As a minimum, at least one trained monitor will be assigned to each prescribed burn to monitor and record on a periodic basis environmental conditions (fuel moisture, temperature, relative humidity, wind speed and direction, cloud cover, etc.) and fire behavior (flame length, rate of spread, smoke trajectory, percent of fuels burned, etc.).

All prescribed fire monitoring activities will follow the guideline established in Chapter 11 of RM-18. The Resource Management Division in consultation with others, as appropriate, will determine the monitoring technique to be used to sample the permanent plots. All plots will be sampled prior to treatment and will be sampled after the treatment to gather baseline data for both short-term and long-term effects.

Additional sites can be established at the discretion of the Chief of Resources Management or the FMO or Lead Fire Effects Monitor. A Monitoring Plan is included as part of this plan (Appendix M).

A copy of the NPS Fire Monitoring Handbook (2001) is also available at national lakeshore headquarters.

5.2.5 Critiques

This important activity will be conducted in accordance with RM-18 guidelines. Before personnel are released from a burn, the Burn Boss will hold a brief critique. The purpose of the debriefing is to gather information that can be used to improve the effectiveness of the prescribed fire program and to gather information for the final report.
A more formal review will be conducted in the event of:

- Entrapment, serious accident, injury, or fatality.
- An escaped prescribed fire resulting in significant property or resource damage.
- Significant safety concerns are raised (Incident with potential).
- A significant smoke management problem occurred.
- Adverse media attention.

The review will be conduct at either a Park, Regional or National level depending on the complexity and seriousness of the issues. Refer to Chapter 12.0 "Fire Critiques and Annual Plan Review" and RM-18 Chapter 13 "Evaluation and Review" to determine the appropriate level of review requirements.

5.2.6 Documentation and Reporting Requirements

As the prescribed fires are conducted, they will be reported in SACS or its replacement. Escaped fires will be documented in the Individual Fire Report DI-1202 initiated for the prescribed burn and if the escape is converted to a wildland fire, a second Individual Fire Report DI-1202 will be initiated and completed by the Incident Commander or his/her designee.

The Burn Boss is responsible for completing the Individual Fire Report DI-1202 and submitting it to the Cache Manager within 10-days for entry into SACS or its replacement. The Burn Boss will also update the Individual Fire Report, as required, and submit the additional documentation to the Cache Manager who will enter the updated information into the system. The Prescribed Fire Monitor will complete the forms specified in the Monitoring Handbook. The Burn Boss or his/her designee will also be responsible for completing fire time reports and necessary forms to replace expended supplies and document other charges to the project.

Each prescribed burn will be entered in a GIS database so that the information can be used for future planning purposes.

5.3 Exceeding Established Prescription

The complex nature of fires and land management precludes the ability of managers to write a set of guidelines or directions that cover all potential situations (NWCG 1998). There are situations where it is acceptable for a prescribed burn to exceed the Maximum Management Area on a very small or non-threatening scale, provided it can be managed by available holding forces (NWCG 1998). Every Burn Plan will provide guidance in the Wildland Fire Transition Plan for the Burn Boss to consider before declaring an escape.

In the event the Burn Boss declares an escape, the Wildland Fire Transition Plan will be implemented and the prescribed burn declared a wildland fire.

5.4 Air Quality and Smoke Management

The Environmental Protection Agency (EPA) has developed National Ambient Air Quality Standards for criteria pollutants, including particulate matter. Section 118 of The Clean Air Act, as amended in 1977 and 1990, requires federal agencies to comply with all federal, State, and local air quality regulations. In compliance with the Clean Air Act, the State of Indiana has regulations concerning open burning. The national lakeshore is exempted from these regulations "in order to facilitate a National Park Service Fire Management Plan for the Indiana Dunes National Lakeshore" [326 IAC 4-1-3 Exemptions. Sec. 3 (a) (9)].

Smoke management concerns requiring mitigation in fire management operations include:

- Visibility impairment on highways and roads - particularly major roads and Interstate highways.
- Visibility impairment CONRAIL and the South Shore rail systems.
- The effect of smoke on the health of visitors, local residents, and firefighters.
- National Ambient Air Quality Standards (NAAQS) within national lakeshore and adjacent air sheds.

The national lakeshore will utilize the following tactics to manage smoke impacts as needed:

- **Planning**
    - Detailed smoke management actions will be made part of each prescribed fire plan.
    - Smoke trajectory maps will be developed and sensitive targets identified.

- Mitigation measures will be defined in the plan, and a transition plan developed and arrangements made prior to ignition to insure designated resources are available if needed to implement the mitigation measures.
- A spot weather forecast will be requested the day of the burn from the National Weather Service (NWS) prior to ignition of any prescribed fire.
- Advanced notice will be provided to the local fire district, and the district will be provided the following information:
  - Location
  - Fuels to be treated
  - Proposed ignition time

- **Avoidance**

  - Prescribed fires will not be initiated unless atmospheric conditions, fuel loading, and distance to nearest downwind smoke sensitive area are within the limitations set in the prescribed fire plan.

- **Reduction**

  - If the smoke emissions are predicted to be within the guidelines prescribed in the prescribed fire plan, the burn can be initiated. If the prescriptive criteria for smoke emissions are exceeded, the burn boss can mitigate the problem by breaking the burn into smaller parcels or waiting until better smoke dispersal conditions are present.
  - Initiate aggressive mop-up, as needed.
  - Interior fuel breaks may be established to limit the spread of a prescribed burn.
  - Mechanical fuel reduction may be utilized to reduce fuel loading as needed and where practical.

- **Dilution and other reduction methods**

  - All prescribed fires in the national lakeshore will be conducted under adequate smoke dispersion conditions. When appropriate, prescribed burns will be conducted when the prevailing winds will carry the smoke out over Lake Michigan. However, during certain times the Lake can produce land/sea breezes that prevent dispersal. As a result, the smoke can be transported back to the land. To the maximum extent possible, fires will be ignited when the National Weather Service dispersal index is good.
  - Conduct operations when dry fuel conditions and low humidity will produce the lowest possible emissions.

- **Traffic Management and Public Safety**

  - Prescribed fire plans will contain specific monitoring requirements for nighttime monitoring of smoke on roads and in communities, as appropriate.

- In the event that smoke from a fire obscures visibility on roads below a limit defined by the state or creates a safety hazard, the following actions will be initiated:
  - NPS rangers will be requested to respond to the scene to provide for public safety.
  - The local jurisdiction, State Highway Patrol and/or Department of Transportation and the appropriate county law enforcement agency will be notified of the smoke incident and requested to dispatch personnel to the scene to provide for public safety. NPS Rangers will assist as needed.
  - If a national lakeshore road is involved, the ranger(s) on scene will determine what type of traffic control is needed and take immediate action. Additional rangers and/or fire management staff will be dispatched to assist as needed.

5.5 Non-Fire Applications

For those projects where prescribed fire alone cannot be used to manage hazard fuels, mechanical means will be the primary method, either alone or in combination with prescribed fires. The available means include, but are not limited to mowing, using a large piece of equipment with rotating flails that reduces small diameter trees & brush to kindling or the use of other mechanical means; cutting, scattering, and chipping; limited pile burning; and the application of chemicals in accordance with an exotic species control program.

One possible hazard fuel reduction project scenario involving both mechanical means and prescribed fire would be to use power saws to fall and buck-up smaller trees into manageable lengths, chip the limbs and needles or leaves to reduce the 10 and 100-hour fuels, and conduct a light underburn to reduce the amount of fine fuels. A later burn under drier conditions could be used to reduce the larger fuels.

The Chief of Resource Management and Fire Management Officer will develop and update in accordance with budget requirements a 10-year hazard fuel reduction program (Appendix L).
Once individual projects are identified and approved, the Fire Management Officer will supervise the development of individual plans for each project. The plans will be developed in accordance with NPS guidelines and include the location and size of the burn unit, a brief justification, recommended time frames, preferred method of treatment, staffing requirements, cost estimates, monitoring protocols, reporting requirements, and other required information. Depending on the budget cycle, the requests will be submitted in a timely manner in accordance with established procedures.

Projects should be scheduled when they will have the least impact on natural resource, including bird-nesting season. The use of off-road equipment will be in accordance with national lakeshore guidelines. Mechanized equipment should not be used if excessive soil moisture will cause rutting.

Timelines will be developed and progress monitored for each project, and updated as necessary. All costs associated with the project will be tracked by the Fire Program Assistant and submitted in accordance with Regional and NPS reporting guidelines.

Critiques will be conducted in accordance with the procedures developed for wildland and prescribed burns. Accomplishment reports and other reporting will utilize SACS, when appropriate, and be in accordance with National Park Service policy and guidelines as established in Chapter 18 of RM-18.

CHAPTER 6.0 FIRE MANAGEMENT ORGANIZATION AND RESPONSIBILITIES

6.1 Staff Responsibilities

Although there is a cadre of FIREPRO funded fire management personnel, it is the goal of the national lakeshore to involve all employees as members of the fire management team. Individual responsibilities that relate to fire management are identified in Table 10.

Table 10: Staff Responsibilities

Position	Primary Fire Management Related Responsibilities
Superintendent	• Responsible for the overall management of the national lakeshore including fire management. • Appoints Agency Administrator's Representative. • Signs Interagency Fire Management Agreements. • Ensures that both a briefing statement and delegation of authority are prepared for an incoming Incident Management Team, as required. • Declares closures of NPS lands when necessary. • Approves prescribed fire plans. • Ensures that fire information is managed in accordance with the national lakeshore's FMP. • Approves the use of mechanized equipment and off-road operation when necessary.
Assistant Superintendent	• May be delegated the responsibilities assigned to the Superintendent. • May be delegated to represent the Superintendent or serve as acting in his/her absence.
Chief of Resource Management	• Ensures that the fire management program is an integral part of the national lakeshore's resource management program. • Lead for fire-related monitoring and research, resolving air quality issues, and developing and implementing rehabilitation projects. • May serve as Resource Advisor during wildland fire suppression operations, as assigned. • Provides input concerning threatened and/or endangered species. • Provides oversight for prescribed fire planning activities. • Recommends prescribed fire and hazard fuel reduction projects, and reviews and comments on similar plans written by others. • Reviews fire management plans and other planning documents, as appropriate. • Arranges for GIS products.

	• Supports the fire management program with staff as appropriate.
Fire Management Officer (FMO)	• Ensures that a comprehensive fire management program for the national lakeshore is adequately planned and implemented and that the Fire Management Plan is reviewed annually and revised as necessary. • Prepares and submits annual normal year FIREPRO budget, and approves expenditures for emergency preparedness, suppression, and prescribed fire activities. • Ensures the proper preparation and approval of individual hazard fuel reduction and prescribed fire plans. • Ensures that an adequately trained and experienced staff of incident qualified personnel is available to handle a normal fire year workload. Issues Incident Qualification Cards annually. • Maintains a public awareness program for all aspects of fire management, and ensures that positive relationships are maintained with cooperators, other agencies and adjacent landowners. • Serves as Agency Administrator's Representative, when assigned, and drafts the Limited Delegation of Authority and briefing statement for approval by the Superintendent. • Represents the national lakeshore and coordinates fire related activities with other NPS areas, regional and national fire staff, and local, state, and federal fire organizations. • Negotiates and coordinates Interagency Fire Management Agreements. • Coordinates with the Midwest Regional Fire/Aviation Manager and staff. • Ensures an adequate, effective fire prevention program is implemented. • Issues press releases prior to prescribed fire operations. • Serves as duty firefighter, as qualified.
Wildland Fire Specialist/ Assistant Fire Management Officer (AFMO)	• Implements the operational aspects of the Fire Management Plan, including fire prevention, wildland fire suppression, prescribed fire operations, dispatching and mobilization. • Ensures that the fire program is managed within NPS guidelines as defined in RM-18 and DO-18. • Supervises fire management staff. • Prepares and revises cooperative agreements. • Develops prescribed fire plans. • Reviews Prescribed Fire Burn Plans and similar plans written by others.

	• Ensures pre-burn preparations including installation of control lines are completed prior to ignition. • Prepares the Annual Prescribed Fire/Hazard Fuel Reduction Plan and forwards it to the FMO for approval. • Maintains training and qualification records for national lakeshore personnel, assesses staffing needs, recommends staff development to meet initial attack and prescribed fire needs, coordinates the training program and recommends individual qualifications for approval by the FMO. • Coordinates mobilization of national lakeshore resources for in-area and out-of-area assignments. Assigns Type IV or Type III Incident Commanders for suppression operations and Prescribed Burn Bosses for prescribed fire activities. • Approves the use of air attack resources on all wildland fires occurring within the national lakeshore. • Coordinates and presents area-level fire training. • Serves as firefighter, as qualified. • Acts as Fire Management Officer during the Fire Management Officer's absence.
Cache Manager	• Manages the national lakeshore's fire caches. • Responsible for maintaining issued personal protective equipment and coordinating physical fitness testing. • Completes daily situation reports and transmits ICS-209s as required. • Responsible for maintaining Bailly RAWS Weather Station. • Ensures Individual Fire Reports (DI-1202) are entered into SACS within ten days of being declared out. • Coordinates cache project work with other divisions. • Implements an effective fire prevention program. • Serves as firefighter, as qualified.
Chief Ranger	• Designs and implements the national lakeshore's evacuation plan at the discretion of the Superintendent. • Coordinates activities associated with the investigation of all wildland fires.
Fire Program Assistant	• Tracks expenditures against fire accounts for prescribed fire operations, mechanical fuel treatment projects, and preparedness activities. • Tracks expenditures for suppression and prescribed fire/hazard fuel reduction projects. • Reports status of funds/expenditures to the FMO. • Prepares a final financial report as an official record.
Chief of Interpretation	• Supports the fire management program with staff as

	appropriate. • Incorporates fire management materials in visitor programs.
Chief of Maintenance	• Ensures the maintenance and repairs of fire engines and pumps. **Maintenance and repair of fire equipment will be given the highest priority during fire season or periods of high fire danger.** • Supports fire management operations with staff as appropriate.
Park Ranger(s)	• Conducts patrols, as assigned. Gathers fire intelligence and reports situation to the FMO. • Serves as a collateral duty firefighter, as qualified.
Lead Fire Effects Monitor	• Directs and implements the fire effects monitoring program and assists in prescribed fire plan preparation. • Supervises the fire effects monitoring crew.
Resource Coordinator	• Updates individual fire qualification records, prepares Incident Qualification Cards. • Ensures Individual Fire Reports (DI-1202) are entered into SACS within ten days after the fire has been declared out. • Submits daily reports to IICC.
FIREPRO Funded and Collateral Duty Firefighters	• Performs routine maintenance on engines, pumps, ATVs, FIREPRO vehicles, hand tools, brush hogs, weed eaters, leaf blowers, chainsaws and portable pumps, including filter cleaning and replacement, oil changes, pump lubrication, chain sharpening, and bar replacement. • Performs monitoring duties and gathers other fire related information, including fire history and fuels inventories. • Responsible for maintaining their issued personal protective equipment and physical conditioning. • Successfully completes the annual fitness test prior to the start of fire season or within two weeks of reporting for duty. • Completes Annual Refresher Training prior to April 1. • Maintains assigned fire equipment in ready state and uses all safety gear assigned. • Uses all assigned Personal Protective Equipment. • Performs fire management duties, as qualified.
Great Lakes Ecoregional Ecologist	• Assists Resource Management Specialists and fire management staff develop resource management objectives related to fire's role in ecosystems. • Works closely with fire management staff to identify priorities and methods for the use of fire as a management tool, including planning, compliance, mitigation, and rehabilitation as needed.

	• Provides technical guidance for fire effects monitoring activities and data analysis and interpretation and makes recommendations regarding fire effects to the fire management staff. • Maintains the fire effects monitoring plan and assists in development of fire effects monitoring and data collection protocols.
Incident Commander Type 4 (ICT4)	• The Incident Commander (IC) will be responsible for the safe and efficient suppression of the assigned wildland fire. • Fulfills the duties described for the IC in the Fireline Handbook. • Notifies the Wildland Fire Specialist or Dispatcher of all resource needs and provides situation updates, including the need for an extended attack. Briefs the incoming ICT3, when necessary. • Ensures that wildland fire behavior is monitored and required data is collected. • Ensures that personnel are qualified for the duties they are performing. • Identifies and protects threatened and endangered species and sensitive areas such as cultural and historic sites. • Uses Minimum Impact Suppression Tactics where applicable. • Ensures the fire is staffed or monitored until declared out. • Submits completed DI-1202, Crew Time Report, and a listing of any other fire related expenditures or losses to the Cache Manager/Resource Coordinator within three days of the fire being declared out.
Incident Commander Type 3 (ICT3)	In addition to the duties outlined in the Fireline Handbook that are normally assigned to an ICT3, the individual performs the following tasks: • Requests the assignment of an incident dispatcher. • Requests logistical support, as needed. • Requests air attack resources, if available. • Requests the assignment of an Incident Management Team when the fire exceeds or can be expected to exceed the capabilities of the Incident Commander and/or the Type 3 team.
Prescribed Burn Boss	In addition to the supervisory and managerial duties associated with the position, the individual performs the following tasks: • Reviews prescribed fire plans prior to implementation. • Implements prescribed fire plans in accordance with prescription.

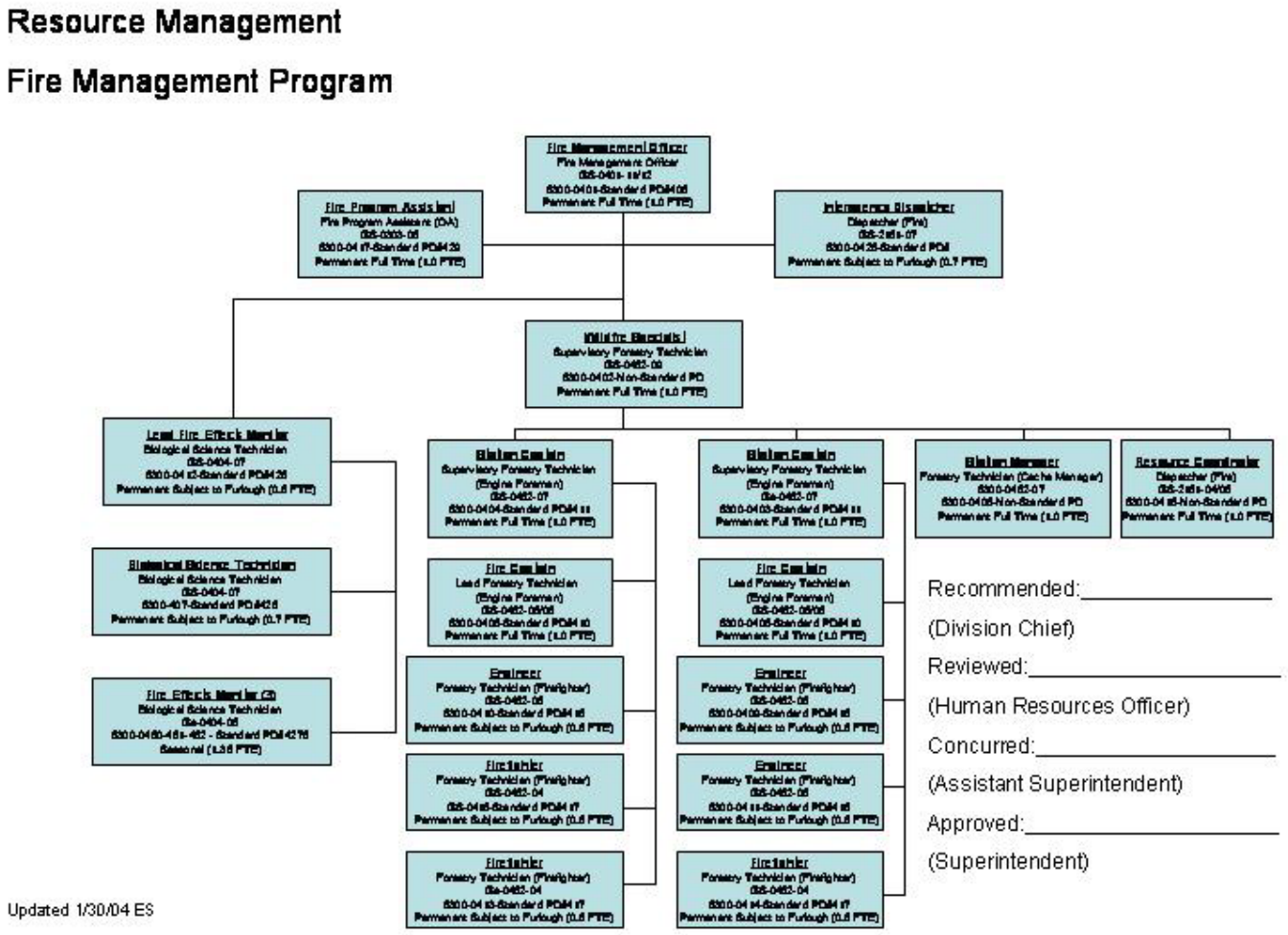
	• Assists with the administration, monitoring, and evaluation of prescribed burns. Submits completed DI-1202, Crew Time Report, and a listing of any other fire related expenditures or losses to the FMO within three days of the fire being declared out.

6.2 Wildland Fire Management Organization

The Fire Management Program (Program) is within the Division of Resource Management. A Fire Management Officer (FMO), who reports to the Chief of Resource Management, is responsible for the overall management of the Program. The Program is authorized a Wildland Fire Specialist, Fire Program Assistant, Resource Coordinator, Lead Fire Effects Monitor and a staff of three, and a Cache Manager/Fire Prevention Officer, all who are supervised directly or indirectly by the FMO. In addition, the Fire Management Officer provides administrative support to an Interagency Dispatcher assigned to the Indiana Interagency Dispatch Center.

The Wildland Fire Specialist is responsible for the day-to-day operation of the Program. The Wildland Fire Specialist directly supervises two Station Captains and indirectly supervises a complement of eight Forestry Technicians who staff the national lakeshore's engines and perform other wildland fire related duties. An organization cart indicating FIREPRO funded positions is included in this plan (Figure 3). A Call-out list is included in Appendix N.

Figure 3: Organization Chart – Indiana Dunes Fire Staff



The FIREPRO funded cadre is augmented by collateral duty firefighters from the various divisions. The personnel required to carryout the fire management program during a normal fire year are indicated in Table 11.

Table 11: Minimum Staffing Targets

Position	Minimum Staffing	Target Staffing
Incident Commander - Multiple Resources (ICT3)	1	2
Incident Commander - Initial Attack (ICT4)	3	4
Strike Team Leader - Engines (STEN)	1	2
Engine Boss (ENGB) – Fire Captain	2	3
Firing Boss (FIRB) or Ignition Specialist (RXI2)	2	2
Advanced Firefighter (FFT1)	4	6
Firefighter (FFT2)	16	20
Prescribed Fire Burn Boss (RXB2)	2	2
Prescribed Fire Monitor (RXFM)	3	3

6.3 Interagency Coordination

6.3.1 Wildland Fire Agreements

Current fire agreements can be found in Appendix O.

6.3.2 Local Fire Departments

Including the national lakeshore, there are twenty-three fire departments in Porter County, Indiana. The Porter County Fire Association, Inc., which the national lakeshore is a member, was formed to better coordinate fire suppression activities and hazmat responses in the County (Appendix O). The national lakeshore also maintains fire related agreements with four local communities that are within the boundaries of the national lakeshore (Appendix O).

The Agreement for Mutual Aid Between Municipalities, Townships, Fire Protection Districts, and the Units of Government in Porter County, Indiana (Agreement) was established to provide for mutual aid responses countywide. Under the terms of the Agreement, the neighboring Fire Chiefs and the FMO are to establish rules and regulations for the mutual response zone along the national lakeshore boundary. When fuels are continuous, it may be appropriate to initiate initial attack on wildland fires that are adjacent to the national lakeshore when there is a threat to national lakeshore lands.

Fire suppression forces from the national lakeshore will respond to reports of wildland fires within the fire protection zone, regardless of jurisdiction. The fire department having jurisdiction for fire suppression in the area of a reported fire will also respond. The fire department will manage wildland fires occurring on private lands adjacent to NPS lands. The national lakeshore will manage wildland fires occurring on national lakeshore lands. When appropriate, a unified command will be established.

The national lakeshore may request assistance from the local structural fire departments and volunteer fire departments by calling the Porter County Dispatch Center or the municipal dispatch center having jurisdiction. Resources are also available from other federal land management units, but must be ordered through the Indiana Interagency Coordination Center. Few of the other federal resources are within a 2-hour travel time of the national lakeshore. A listing of key interagency contacts is included in Appendix P.

The FMO or Wildland Fire Specialist will represent the national lakeshore at interagency meetings held at the local level to discuss topics of mutual concern and to coordinate prescribed fire and wildland fire suppression activities during the upcoming fire season.

6.3.2.1 Rural Fire Assistance

As part of the Wildland-Urban Interface Initiative Response as authorized by the Fiscal Year 2001 Interior Appropriations Bill and the President's Fire Initiative (National Fire Plan), the national lakeshore has been working with local fire departments to provide them personal protective equipment, training, and basic hand tools. As of Fiscal Year 2003, the national lakeshore has entered into agreements with four departments to provide equipment, training and assistance to enhance firefighting capability in the wildland-urban interface adjacent to national lakeshore lands. It is the intention of the national lakeshore to enter into agreements with other departments as well.

6.3.3 Federal Agencies

The national lakeshore maintains an Interagency Agreement between the Park Service, the USDA Forest Service, and the U.S. Fish and Wildlife Service for the establishment of the Indiana Interagency Coordination Center; and the Park Service and the U.S. Fish and Wildlife Service for the purpose of providing for the partial funding of a Support Dispatcher at the Indiana Interagency Coordination Center located in Tell City, Indiana (Appendix O).

6.4 Interagency Fitness and Training Standards

In keeping with the National Wildfire Coordination Group (NWCG) guidelines, each agency will meet its own fitness and training standards. All fire suppression forces involved in wildland fire suppression actions on NPS lands will meet Personal Protective Equipment (PPE) standards established by NWCG. By NPS policy, personnel from departments that do not meet NPS standards may only assist with initial attack on NPS lands, and must be released as soon as possible. Also according to NPS policy, personnel from departments that do not meet NPS standards cannot participate in prescribed fire operations.

CHAPTER 7.0 FIRE RESEARCH

Implementation of the Fire Management Plan should be based on the best available science (NWCG 1998). A great deal of research dating back to the 1800's has been conducted at the national lakeshore.

Recent fire ecology studies that have completed include:

Choi, Y. D. (1994). Comparison of fire, herbicide, and sod removal to restore native vegetation in the razed residential sites in the Indiana Dunes National Lakeshore: A 3-year study. Porter, IN, The National Biological Survey.

Choi, Y. D. (1995). Effects of prescribed burning, herbicide, and sod removal on the restoration of native vegetation in razed residential sites of Indiana Dunes National Lakeshore: 4-year study. Porter, IN, The National Biological Service.

Cole, K. L. (1990). Major conclusions from fire research projects. Porter, IN, Report for the Indiana Dunes National Lakeshore, National Park Service, Department of the Interior.

Cole, K. L. (2001). A multiple-scale history of past and ongoing vegetation change with the Indiana Dunes. The Historical Ecology Handbook: A Restorationist's Guide to Reference Ecosystems. D. Egan and E. A. Howell, Island Press**:** 391-412.

Cole, K. L., P. K. Benjamin, et al. (1990). "The effects of prescribed burning on oak woods and prairies in the Indiana Dunes (Indiana)." Restoration & Management Notes 8: 37-38.

Cole, K. L., K. F. Klick, et al. (1992). "Fire temperature monitoring during experimental burns at Indiana Dunes National Lakeshore." Natural Areas Journal 12: 177-183.

Cole, K. L. and N. B. Pavlovic (1988). Howes Prairie, a remnant of the Indiana Dune prairie preserved by periodic flooding. Porter, National Park Service**:** 33.

Conklin, G., M. Doyle, et al. (1992). Fires in Dune Acres. Dune Acres, Dune Acres Historical Commission, Occasional Papers, #4.

Daniel, G. (1980). "Fire in the woods." Singing Sands Almanac 3: 1-2.

Girshner, K. (1988). Mid-summer fire: effects on the vegetation of Tolleston Dunes. Valparaiso, Valparaiso University.

Grundel, R., N. B. Pavlovic, et al. (1998). "The effect of canopy cover and seasonal change on host plant quality for the endangered Karner blue butterfly (*Lycaeides melissa samuelis*)." Oecologia 114: 243-250.

Grundel, R., N. B. Pavlovic, et al. (1998). "Habitat use by the endangered Karner blue butterfly in oak woodlands: the influence of canopy cover." Biological Conservation 85: 47-52.

Grundel, R., N. B. Pavlovic, et al. (2000). "Nectar plant selection by the Karner Blue butterfly (*Lycaeides melissa samuelis*) at the Indiana Dunes National Lakeshore." The American Midland Naturalist 144: 1-10.

Henderson, N. R. (1987). The role of fire in succession in the sand dune plant communities of Lake Michigan. Proceedings of the First Indiana Dunes Research Conference: Symposium on Plant Succession. K. L. Cole, R. D. Hiebert and J. D. Wood. Atlanta, GA, U.S. Department of Interior, National Park Service, Science Publications Office**:** 34-46.

Henderson, N. R. and R. D. Hiebert (1983). Proposal to study the effects of fire and flooding on the Howes Prairie Ecosystem. Porter, IN, Indiana Dunes National Lakeshore, National Park Service, Department of the Interior.

Henderson, N. R. and J. N. Long (1984). A comparison of stand structure and fire history in two black oak woodlands in Northwestern Indiana. Logan, UT, Utah State University Agricultural Experiment Station Journal Paper No. 2839.

Klick, K. F. (1988). Proposal for the research burn at Cowles Bog. Porter, IN, Unpublished, Department of the Interior, National Park Service, Indiana Dunes National Lakeshore.

Knutson, R. L., J. R. Kwilosz, et al. (1999). "Movement patterns and population characteristics of the Karner Blue butterfly (*Lycaeides melissa samuelis*) at Indiana Dunes National Lakeshore." Natural Areas Journal 19: 109-120.

Pavlovic, N. B., N. R. Henderson, et al. (1983). Status Report Concerning the Study of the Effects of Fire and Flooding on the Howes Prairie Ecosystem. Porter, Department of the Interior, National Park Service, Indiana Dunes National Lakeshore**:** 12.

Peloquin, R. L. (1989). Report of a pilot study of the influence of fire on the growth of *Robinia pseudoacacia* and the effects of species density on soil nitrogen levels at selected locations in Miller Woods. Hammond, IN, Purdue University Calumet**:** 12ff.

Schweitzer, D. F. (1992). The status of the Karner Blue butterfly (*Lycaeides melissa sameulis* Nabakov) at Indiana Dunes National Lakeshore, with special

consideration of planning of prescribed burns at major sites. Porter, IN, Indiana Dunes National Lakeshore, National Park Service, Department of Interior.

Taylor, R. S. (1990). Reconstruction of Twentieth Century Fire Histories in Black Oak Savannas of the Indiana Dunes National Lakeshore, University of Wisconsin-Madison**:** 123.

West, P. C. and J. A. Harrington (1996). Comparison of short-term impacts on vegetation cover in response to a spring, early- and late-summer fire. Abstracts of the 23rd Natural Areas, 15th North American Prairie, and Indiana Dunes Ecosystems Conferences. St. Charles, IL, Natural Areas Association**:** 105-106.

Summaries of some of the above mentioned literature:

- Henderson, N. R. and J. N. Long (1984). A comparison of stand structure and fire history in two black oak woodlands in Northwestern Indiana. Logan, UT, Utah State University Agricultural Experiment Station Journal Paper No. 2839.

  A significant conclusion of this study was that catastrophic wildland fires initiate the resprouting of vegetation and without a reoccurrence of fire these resprouts create a doghair thicket.

- Choi, Y. D. (1995). Effects of prescribed burning, herbicide, and sod removal on the restoration of native vegetation in razed residential sites of Indiana Dunes National Lakeshore: 4-year study. Porter, IN, The National Biological Service.

  Conclusions showed that, although fire will clear litter away making it possible for native plants to become established, prescribed fires will not eliminate non-native lawn grasses.

- Grundel, R., N. B. Pavlovic, et al. (1998). "Habitat use by the endangered Karener blue butterfly in oak woodlands: the influence of canopy cover." Biological Conservation **85**: 47-52.

  It was found that Karner blue butterflies (Kbb) need a mosaic of canopy covers in close proximity because male butterflies use open sites for feeding and breeding, while female butterflies use a broad range of habitat from open sites to shaded sites to lay eggs. Since prescribed fire is most often used at the park to create and maintain Kbb habitat, a fire regime that creates or maintains a mosaic of canopy covers in close proximity is needed.

On-going fire research includes:

- Resampling of Norm Henderson's plots used for his A comparison of stand structure and fire history in two black oak woodlands in Northwestern Indiana paper and sampling of similar additional plots in other locations of the park.

- A study examining the relationship between fire history, community structure (open field, oak savanna/woodland, oak scrub, and oak forest), and biodiversity of birds, butterflies, ground-dwelling beetles, reptiles, amphibians, and plants. Preliminary conclusions show that these different groups of animals respond differently to the different structures and other components of the habitat such as wetlands.

- A study examining the effects of fires in different seasons on composition and flowering phenology of understory plants. Preliminary conclusions show that different plants respond differently to growing season fires. Some species will not resprout till the following year, while others resprout, but have low stature when they bloom.

- There is also a study on the phenological effects of a May wildland fire on understory vegetation.

<u>The following research needs were identified during the Developing Landscape Strategies Workshop at Indiana Dunes National Lakeshore in December 2002</u>.

- Mnoké Tallgrass Prairie

    - Determine what species really belong in a native tallgrass prairie.
    - Relationship of species richness to area among understory species.
    - Survey for sensitive archaeological resources on-site.
    - Effects of artificial drainage.
    - Effects of herbivory.
    - Occurrence and maintenance of sedge (wet) pockets.
    - Sources for clay prairie native materials.
    - Native prairie insects and minimum landscape size for such insects.
    - How to achieve a mosaic burn with prescribed fire.

- Mesic Sand Prairie

    - Complete a comprehensive inventory of locations.
    - Acquire data on fire-sensitive species of special concern, including insects.
    - Information about *refugia* for fire-sensitive species.
    - Effects of changes in water levels.

- Mesic Dune Forests

    - Historic disturbance regime.
    - Effect of fire on duff.
    - Residence time and heat penetration of head and backing fires.
    - Presence and effect of fire on boreal species.
    - Presence and effect of fire on fire-sensitive animals such as salamanders.

- Oak Prairie-Savanna-Woodland-Forest Complex

    - Determine how canopy closure (as measured on the ground) correlate to canopy cover (as measured form the air).
    - Fire regime and fire effects on moraine forests.
    - Fire regime and fire effects on pin oak flats.
    - Fire regime and fire effects in oak-hickory forests.
    - Determine where oak scrub fit in to the ecological model.
    - Determine how can the matrix be measured.
    - Determine what characterized the historical / natural oak savanna that is now nearly extirpated from the Midwest.

- Herb-dominated Wetlands

    - Interaction between thistles and fire.
    - Identify characteristic, especially fire-sensitive, native birds and amphibians.
    - Presence and effect of fire on Massasaga rattlesnake.
    - Presence and effect of fire on Hines emerald dragonfly.
    - Presence and effect of fire on Mitchell satyr.
    - Role and uses of fire in wetland systems, including use of fire for restoration.
    - Effects of upland fire on wetland systems.
    - Effects of timing of burns – seasonal, phenological, and diurnal.
    - Alternative monitoring techniques.

- Other

    - Sand-based wetlands.

CHAPTER 8.0 MONITORING

8.1 Short and Long-Term Monitoring

All prescribed fires will be monitored. Individual fire monitors or a monitoring team will observe the fire and assess the fire's potential. Monitoring will include documenting the fire environment (weather, fuels, topography), fire behavior (manner and rate of spread, flame length, etc.), and fire effects (percent of fuels consumed, changes in plant and animal community composition and structure, etc.). Information gathered during fire monitoring will be used by the Burn Boss to determine if prescriptive criteria are being met or if it is necessary to take suppression action in order to protect human life, health, and/or property. Other monitoring activities will include the taking of photographs to document conditions. In addition, periodic weather observations will be taken at or near the burn unit, usually using a belt weather kit. Forms for recording data will be supplied to monitors and the information collected will be included in the DI-1202 package for the burn to provide a historical record.

Fire weather observations will be taken every day at 1300 hours (CST) at the Bailly weather station from April 1 through November 1. The Fire Program Assistant will enter the fire weather observations into the Weather Information Management System (WIMS) immediately after collection each day. The weather station readings will provide the information required to calculate the daily fire danger indices and fire behavior parameters under the National Fire Danger Rating System (NFDRS). All data entered directly into WIMS will be automatically archived on the National Fire Weather Data Library (Bradshaw and Fischer 1984). The resultant time series database of fire weather provides management a powerful foundation to assess the significance of current fire danger in comparison to historic trends and fire occurrence data using FIREFAMILY Plus software.

Additional general weather information can be obtained from the National Weather Service (NWS). The National Weather Service Chicago Forecast Office is responsible for providing fire weather forecasts for Northwest Indiana. The fire weather service program provides forecast, warning, and consultation services for the prevention, suppression and management of forest and rangeland fires. During the normal fire season (Spring and Fall), the Chicago Forecast Office issues a daily Narrative Fire Weather Forecast by 7:00 a.m. Central Standard Time. This forecast consists of a brief weather discussion, a 36-hour forecast of weather, precipitation amount, temperatures, relative humidity, and winds, along with an extended three to seven day forecast.

In order to track trends, weather observations will be taken at the prescribed fire site at least two weeks, and preferably one month, prior to the earliest planned ignition date of the burn. The Prescribed Burn Boss or his/her designee will

record the observations. When possible, a portable, temporary remote area weather station (RAWS) will be established for each prescribed fire so that fire danger indices can stabilize before the burn. The station will be positioned, and readings will be taken in such a way as to reflect the average peak burning period conditions within the most flammable fuel type in the unit, as well as 24-hour variations. Fire danger indices from these portable stations will be calculated using the weather station software.

8.2 The Fire Monitoring Handbook

This handbook, developed by the National Park Service (NPS, 2001) outlines standards for monitoring fire weather, behavior and effects, and describes in detail many aspects of a comprehensive monitoring program. These standards have been adopted at Indiana Dunes National Lakeshore.

8.3 Fire Monitoring Plan

The Indiana Dunes Fire Effects Monitoring Plan is an attached appendix, (M), to this fire plan. It defines for the national lakeshore: fire monitoring goals and objectives, minimum qualification standards for fire monitors, and monitoring levels and minimum acceptable standards for documenting fire weather, behavior and effects. In brief, fire effects monitoring in the national lakeshore consists of sampling permanent vegetation plots, which may include measurements of canopy and understory trees, shrubs, ground cover, and dead and down fuels, and taking photographs. Plots are sampled pre-burn and post-burn. Annual fire effects monitoring information is available to resource management staff to provide feedback on the success of fire use with respect to meeting national lakeshore vegetation management goals and to approaching the desired future condition of national lakeshore vegetation.

CHAPTER 9.0 PUBLIC SAFETY

All aspects of the fire management program will provide for public safety, and an incident will be managed so that the safety of firefighters and visiting public are protected. The safety of all people in the area is the primary concern of the Incident Commander or Burn Boss.

The typical wildland fire in the national lakeshore is generally small. This makes it relatively easy to monitor the entire perimeter of the fire to ensure the public are kept out of the immediate area and are far enough away that they will not hinder the suppression activities. Under no circumstances will anyone be permitted near a fire without the appropriate training and required personal protective equipment. Members of the press will be allowed in the vicinity of the fire provided they wear personal protective equipment, including a fire resistant shirt and pants, leather boots, and fire shelter; receive a fire shelter deployment demonstration; and are accompanied by a qualified firefighter who can assist them.

During a wildland fire or prescribed fire event, it may be necessary for the Superintendent or his/her designee to close a portion of the national lakeshore lands to the visiting public for a short period of time. The Fire Management Officer will coordinate with the Division of Resource and Visitor Protection the closing and signing of roads and trails. The Chief of Interpretation will then coordinate public notification efforts within and outside the national lakeshore. Every effort will be made to inform hikers and campers and the public of the situation and evacuate the area, if necessary. Signs will be posted at trailheads and at other locations warning hikers and others of the situation. The extent of public notification will depend on the specific situation.

When a fire threatens to escape from NPS lands or has the potential to do so, adjacent authorities and landowners will be given as much advanced notice as possible so that they may take appropriate action.

Specific actions will be taken to provide for the safety of the public during prescribed fire operations. Mitigation measures will be outlined in each individual prescribed fire plan. Necessary action will be taken to ensure public safety including:

- Contacting national lakeshore neighbors.
- Posting warning signs on roads.
- Providing for pilot cars or rerouting traffic.
- Closing certain areas of the national lakeshore.
- Posting signs at trailheads warning hikers and others of the situation.
- Evacuating national lakeshore neighbors who may be adversely affected by smoke. National lakeshore neighbors are to be given as much advanced notice as possible to properly plan for the event.

CHAPTER 10. PUBLIC INFORMATION AND EDUCATION

An informed public is a vital component of the prescribed fire program. Areas that have been burned will present opportunities for the public to actually see the effects of fires, and offer staff members an opportunity to explain the purpose of the burns to the public. There are several ways to convey this message to the public including interpretive folders such as Wildland Fire in the National Park Service, interpretive programs, presentations to school children in the field or in the classroom, attendance at meetings, and through press releases. If the situation warrants and adequate supervision is available, the public may actually observe a prescribed burn as it is conducted. During the burn, the Burn Boss or his/her designated representative is responsible for dispersing information to the public. It is best, however, to delegate this responsibility to a Public Information Officer (PIO) or Fire Information Officer (FIO) whenever possible.

The visiting public and local population will be made aware of local conditions during periods of high fire danger. This can be accomplished primarily through signing and the issuance of press releases. Wildland fires convey a different set of circumstances in that they are unplanned events that constitute emergency situations. Public access must be managed. Any media access to wildland fires will be in compliance with the safety guidelines outlined in the previous section. During the fire, the Incident Commander is responsible for the dispersal of information to the press and the public. This activity may be delegated. Post-fire information will be issued in accordance with the national lakeshore's public information guidelines.

CHAPTER 11 PROTECTION OF SENSITIVE RESOURCES

11.1 Archeological/Cultural/Historical Resources

Fire Management activities within the national lakeshore will be implemented in accordance with the regulations and directions governing the protection of cultural resources as outlined in Departmental Manual Part 519; Code of Federal Regulations (36 CFR 800); the Archeological Resources Protection Act of 1979, as amended; the Archeological and Historic Preservation Act of 1974; and Director's Order 28. All fire management activities will be conducted in accordance with Section 106 of the National Historic Preservation act of 1966, as amended.

Impacts to archeological resources by fire vary. The four basic factors determining the severity of impact 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 prescribed fires or wildland fire holding actions (Anderson 1983). Forest Frost of the Midwest Archaeological Center (1992) concluded that a national lakeshore prescribed fire "did not generate enough heat to penetrate to the depths required to harm most buried material," and that "present practices during controlled burning seem to pose little threat to the cultural resources."

Goals and objectives developed by the national lakeshore staff to protect cultural resources from the impacts of wildland fire are listed below:

- **Goal 1 -** Protect historic structures located on National Park Service lands within the legislative boundaries of the lakeshore from the adverse impacts of wildland fire through fuel reduction.

Mitigation Objective: Within five years the national lakeshore will provide a minimum of at least thirty feet of defensible space around key historic structures through the use of prescribed fire and mechanical fuel reduction, while taking into consideration cultural landscape values. When ever possible natural control lines (streams, roads, trails etc.) will be incorporated into the defensible space around sites to help preserve the historic setting of these structures.

Maintenance Objective: Establish a cyclic fuel reduction program to maintain the defensible space in an effort to prevent potential damage from wildland fire. This will be accomplished through the use of prescribed fire and low impact mechanical fuel reduction, such as mowing and hand-cutting.

- **Goal 2 -** Protect historic structures located on and adjacent to National Park Service lands within the legislative boundaries of the national lakeshore from the adverse impacts of wildland fire through education programs specific to historic structures.

  Suppression Objective: Implement an initial response wildland fire suppression program specific to historic structures. This will include cooperation with local and state agencies, providing guidelines and constraints on suppression tactics, and providing appropriate training and equipment to these agencies when funding permits.

  Prevention Objective: Implement an aggressive wildland fire prevention program including public education and programs presented by Interpretive Division staff.

The following actions will be taken to achieve the stated goals and objectives established by the national lakeshore to the protect archeological and cultural resources:

- The staff will consult files and records of cultural resources and the cultural resources staff when planning prescribed burns or hazardous fuel reduction projects, developing pre-attack plans, and performing other preparedness actions. The potential for adverse impacts to cultural resources will be evaluated prior to prescribed burning and in the selection of fire suppression strategies during wildland fires.

- The Chief of Resource Management will be contacted during the development phase of the burn plan writing process when cultural resources are suspected or known to exist in the project area.

- The national lakeshore's Historian will contact the Indiana State Historic Preservation Officer (SHPO) during the planning phase of a fuels management project. By law, the SHPO has 30-days to respond. The national lakeshore will follow any programmatic archeological/cultural resources management plan that may be implemented in the future.

- Minimum Impact Fire Suppression Tactics (MIST) will be used to the fullest extent possible. MIST includes minimum width handline construction, cold-trailing, use of

foam/wet-water/water, use of natural and manmade barriers, change in vegetation and mowing. Line construction for prescribed fire activities will follow the same principle. Maps indicating the known location of significant cultural resources will be consulted prior to laying out prescribed burn units, and whenever possible, before constructing firelines to halt the spread of a wildland fire.

- Prescriptions for prescribed fires will take into account the presence of known cultural sites. Cooler fires with short residence time will be used in areas containing known cultural sites, whenever possible.

- Known surface sites will be marked, protected, and excluded from the burn, if possible. Foam will not be used in areas known to harbor surface artifacts.

- The use of mechanized equipment on national lakeshore lands must be approved by the Superintendent or his/her representative on a fire-by-fire basis, unless human life or private or public property are threatened.

- The location of sites discovered as the result of fire management activities will be protected and reported by the Chief of Resource Management.

- Rehabilitation plans will address cultural resources and will be reviewed by the national lakeshore's Historian, Historical Architect and Section 106 archeological advisor.

A matrix identifying culturally significant resources and their association with wildland fire has been included as part of this plan (Appendix Q).

11.2 Sensitive Resources Requiring Treatment or Protection

The national lakeshore has federally and state listed threatened and endangered plant and animal species that must be managed in accordance with the Endangered Species Act.

As part of the prescribed fire plan development process, the burn unit will be surveyed for natural and cultural resources requiring additional protection. A mitigation plan will be developed as part of the Burn Plan to afford the resource the highest degree of protection.

CHAPTER 12 FIRE CRITIQUES AND ANNUAL PLAN REVIEW

12.1 Critiques

This important activity will be conducted in accordance with RM-18 guidelines. All wildland and prescribed fires occurring in the national lakeshore will receive at a minimum a review by those involved to evaluate operational aspects associated with the incident. The Incident Commander and the Fire Management Officer will conduct the review. The purpose of the review is to recognize and document actions that were successful and identify and correct actions that did not contribute to the successful conclusion of the incident or compromised firefighter safety.

Park Level Fire Review
A Park level review may be convened at any time as seen necessary by the Superintendent. The review will be conducted by the Superintendent or his/her designated representative.

Regional Level Fire Review
A Regional level fire review may be conducted for any fire that:

1. Crosses the national lakeshore's boundary into another jurisdiction without the approval of the landowner or the other agency.
2. Results in serious injury to less than 3 personnel, significant property damage or an incident with potential.
3. Results in controversy involving another agency.
4. Results in adverse media attention.

The regional fire management officer or his/her designated representative will convene it.

National Level Review
A national level review will be conducted for any fire that involves Servicewide or national issues, including:

1. Significant adverse media or political interest.
2. Multi-regional resource response.
3. A substantial loss of equipment or property.
4. A fatality, or multiply, serious fire related injuries (three or more personnel).
5. Any other fires that the Associate Director, Park Operations and Education, wants reviewed.

The National Fire Management Officer or his/her designated representative will convene it.

Entrapment and Fire Shelter Deployment
All entrapments and fire shelter deployments will be reported to the regional fire management officer and investigated in accordance with NPS policy as soon as possible after the incident occurred.

Incident Management Team (IMT) Closeout and Review
The Superintendent or his/her representative and the FMO will conduct a closeout review with each Incident Management Team prior to their release to ensure a successful transition of the incident back to the national lakeshore. Chapter 13, Exhibit 1 of RM-18 contains a sample closeout review with an IMT.

12.2 Fire Plan Review

The Fire Management Officer will review the plan annually and identify any changes that need to be made. A formal fire management review will be conducted every five years. The Superintendent must approve significant changes to the body of the plan. The only exceptions to this procedure are the correction of grammatical errors; minor procedural changes, deletions, or similar corrections; and additions to the appendices. Copies of all changes will promptly be forwarded to the Regional Fire Management Officer. Changes requiring approval and concurrence will be submitted with a new cover sheet for signature and dates, which will replace the original cover sheet upon receipt by the Superintendent.

CHAPTER 13.0 CONSULTATION AND COORDINATION

The following individuals were consulted or provided review comments during the development of this plan:

Doug Alexander	Prescribed Fire Specialist, NPS, Midwest Regional Office, Omaha, NE
Amy Manke	Biological Science Technician, NPS, Indiana Dunes NL, Porter, IN
Jim DeCoster	Fire Ecologist, NPS, Midwest Regional Office, Omaha, NE
Kelly Ann Gorman	Fire Ecologist, NPS, Voyageurs NP, International Falls, MN
Kara Meckley	Planner, Mangi Environmental Group, Falls Church, VA
Neal Mulconrey	Lead Fire Effects Monitor, NPS, Indiana Dunes NL, Porter, IN
Sarah Robertson	National Fire Planner, USDA FS/NPS, Boise ID
Webb Smith	Planner, Mangi Environmental Group, Falls Church, VA
Doug Wallner	Fuels Management Specialist, NPS, NE Region, Philadelphia, PA
Kevin Walsh	Regional Prescribed Fire Specialist, NPS, SE Region, Atlanta, GA
Tim Oliverius	Acting Fire Management Officer, NPS, Indiana Dunes NL, Porter IN
Andy Bundshuh	Assistant Fire Management Officer, NPS, Indiana Dunes NL, Porter IN
Louis Hartjes	Fire Management Officer, NPS, Indiana Dunes NL, Porter IN

The following individuals or organizations provided written comments concerning the fire management plan:

Em'rynn Arturian	No affiliation indicated, Hammond, Indiana
Eric D. Kurtz	Fire Chief, Ogden Dunes Fire Department, Ogden Dunes, Indiana
Laura Nirenberg	Executive Director, Wildlife Orphanage, Inc., LaPorte, Indiana
Sandy O'Brien	Botanist, Dunelands Sierra Club, Hobart, Indiana
Stephen Packard	Director, National Audubon Society –Chicago Region, Skokie, Illinois
Thomas W. Post	Regional Ecologist, Indiana DNR, Medaryville, Indiana
Sandra L. Wilmore	Director, Save the Dunes Council, Michigan City, Indiana