WILDLAND FIRE MANAGEMENT PLAN

Voyageurs National Park
Minnesota

1987


Recommended by: [Signature] Superintendent, Voyageurs N.P. [Signature] April 24, 1987

Concurred in by: [Signature] Chief, Branch of Fire Management [Signature] 6/11/87

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INTRODUCTION

This Wildland Fire Management Plan is a subsection of Voyageurs National Park's Natural Resources Management Plan and Environmental Assessment (EA) (U.S. NPS 1981a). It implements the approved course of action described in the Resource Management Plan's fire management project statement (VOYA-N-024) and the Wildland Fire Management Plan Environmental Assessment (U.S. NPS 1987d). The Resources Management Plan and the Wildland Fire Management Plan EA recommend that lightning-caused fires be allowed to burn within designated areas when they can be contained within park boundaries, except when this would endanger visitor safety, private or leased lands or structures. They also recommend that designated areas be intentionally burned to maintain or reestablish pine stands or critical wildlife habitat when and where such burns can be contained within park boundaries. National Environmental Policy Act compliance for this plan was covered in the Resources Management Plan and the Wildland Fire Management Plan EA.

This Wildland Fire Management Plan is a detailed program for action for park management to implement National Park Service and Voyageurs National Park fire management policies and objectives. The plan is, therefore, the primary guide for all wildland fire management actions within Voyageurs, including response to wildfire and the conduct of prescribed fires. Although the plan provides specific direction for implementing a fire management program at Voyageurs, it is also a flexible document that will change in response to increasing knowledge of fire behavior and effects in the park's ecosystem.

The authorities for implementing this plan are contained in the National Park Service's Wildland Fire Management Guideline (NPS-18). NPS-18 cites from the Departmental Manual (910 DM) the statutes which authorize the prevention, presuppression, control and suppression of fire on or threatening lands under the jurisdiction of the Department of the Interior. This guideline also requires that all parks which contain vegetation that can support fire will develop fire management plans and programs reflecting National Park Service policies and relating to ecological characteristics specific to the area. The specialized fire management terms used in this plan are defined in Appendix B.

Lightning fires in combination with aboriginal burning during the last 10,000 years shaped the northwoods landscape that was an integral part of the lives of the Chippewa, Voyageurs and early European settlers (Poltzheimer 1953, Craig 1972, Swain 1973, 1981). Loggers came to the northwoods in the 1890's to exploit the forests of pine and spruce that had been created by fire or the lack of it. Effective fire suppression and prevention programs since the 1940's, in conjunction with large scale logging and market and subsistence hunting, have dramatically altered Voyageurs' terrestrial ecosystem from its original pre-European conditions (Kurmis et al. 1980, Coffman et al. 1980, U.S. NPS 1981b, Cole 1982, 1986).

The exclusion of fire from Voyageurs' fire-maintained ecosystem is gradually shifting the composition and structure of the park's plant communities away from jack, red and white pine, black spruce, aspen and paper birch dominated communities to white spruce and balsam fir dominated communities (Kurmis et al. 1980, Coffman et al. 1980, Cole 1982, 1986). Periodic lightning-caused fires created openings in the forest canopy, exposed mineral soil and increased light and nutrient availability that favored the regeneration and growth of pines, black spruce, aspen and birch. High grade and clearcut logging increased the proportion of aspen-birch forest in the park by removing large quantities of red and white pine, spruce and fir. Logging thus removed a significant proportion of the stock of red and white pine seed sources in some areas of the park.

Fuel accumulations, spruce budworm outbreaks, blowdowns, and other disturbances related to time since last fire or logging increase the probability that old stands will burn. Given the frequency of severe drought in the region, it is inevitable that all vegetation in the park will eventually burn due to lightning or human-caused fires. Our present policy of fire suppression, therefore, only increases the interval between successive burns on any given acre. The environmental and economic costs of such a policy are: increased fire intensity due to fuels buildup; increased fire size; reduction in the total area of early successional stages and fire-maintained communities; reduced nutrient cycling; increased risk of fire-caused injury or death and property loss for park visitors, employees and neighbors; and dramatically increased costs for fire suppression during large, project fires that may be as high as $100,000 per day in personnel, equipment and other support costs.
The exclusion of fire from Voyageurs' fire-maintained ecosystem, in conjunction with logging, market and subsistence hunting, and trapping, has dramatically altered the composition, distribution and abundance of the park's wildlife communities (Cole 1982, 1986). Hunting eliminated woodland caribou and elk from the park, and severely reduced the size of the moose population. The park's progressively maturing forests have severely limited the availability of critical winter habitat for white-tailed deer and moose (Cowan et al. 1950, Irwin 1975). Consequently, the size of the park's deer population has declined dramatically in recent years while the moose population has been unable to recover from low numbers.

Periodic lightning-caused fires created openings in the forest canopy, exposed mineral soil and increased light and nutrient availability that favored the establishment of grasses, forbs, shrubs and trees that are key forage and browse species for moose, deer, woodland caribou and elk (Cringan 1957, Tefler 1970, Hansen et al. 1973, Krefting 1974, Irwin 1975, Wetzel et al. 1975, Peek et al. 1976, Seal et al. 1978, Boonstra and Sinclair 1984, Darby and Pruitt 1984, Potter 1985). Fifteen to 20 years after a fire, canopy closure and the growth of trees and shrubs beyond the reach of deer, caribou, elk and moose reduce the capacity of these burned areas to support these species. Although the moose brainworm, Parelaphostrongylus tenuis, is regarded as a major factor limiting moose population increases if a deer population is also present (Karns 1967), the moose population on the Little Sioux Burn was able to increase five-fold in the presence of a significant population of white-tailed deer (Peek 1974, Irwin 1975, Cole 1981). Also, densities of about 3 moose and 20 deer per square mile coexist in the Agassiz National Wildlife Refuge which is about 130 miles west of the park.

The elimination of caribou and elk, the low moose population, and the recent dramatic decline in white-tailed deer numbers have resulted in a 66 percent reduction in the park's pre-1890 overwinter ungulate biomass (Cole 1982, 1986). This severe reduction in the overwinter food supply has dramatically reduced the size of the park's predator and scavenger populations. Predators and scavengers that were once abundant are now absent (wolverine), exist in remnant numbers (Canada lynx, bobcat), or are less abundant than previously (threatened gray wolf and bald eagle, coyote, red fox, pine marten, raven) (Mech 1973, Van Ballenberghe et al. 1975, Peterson 1976, Mech 1977, Hardwig 1978, Mech and Karns 1978). To date, wolves have been less adversely affected than smaller carnivores that mainly scavenge on ungulate carrion, but they have slowly declined from 41 individuals in 1976 to 25 in 1986 (Cole 1982, and unpublished data). Bald eagles that nest in the park area have low reproductive success in comparison to other Lake States areas where they may be less dependent on ungulate carrion in the late winter and early spring (Grim, unpublished data).

Although adequate habitat for woodland caribou exists in the park (Wetmore, 1980), its reintroduction to the park (U.S. NPS 1977) would only increase Voyageurs' overwinter ungulate biomass by an estimated 19,200 pounds to 42,800 pounds, which is still only 62 percent of the park's pre-1890 level of 69,120 pounds (Cole 1982, 1986). Since they utilize early successional stage plant communities extensively, programs to reintroduce elk and restore moose and deer populations would benefit enormously if the present policy of suppressing all fires is replaced by one that restores fire as a natural ecological
process in the park. Likewise, recovery of the park's depauperate predator and scavenger populations to pre-1890 levels will only occur if reintroductions of caribou and elk are accompanied by a fire management program that creates needed habitat for moose, deer, caribou, elk, moles, deer mice, voles, chipmunks, squirrels, and snowshoe hares.
GOALS AND MANAGEMENT OBJECTIVES

The effects of our present policy of suppressing all fires immediately, as described above, are incompatible with Voyageurs National Park's purpose: "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

These effects are also incompatible with National Park Service Management Policies (U.S. NPS 1978) which state that "the occurrence of natural fire within a given ecosystem is recognized as a potent factor stimulating, retarding, or eliminating components of the ecosystem. Most natural fires are lightning-caused and are recognized as natural phenomena which must be permitted to continue to influence the ecosystem if truly natural systems are to be perpetuated."

The goals for wildland fire management at Voyageurs National Park are to: (1) allow fire to achieve its natural role; (2) use fire to accomplish desired resource management objectives; (3) protect life, property, and resources from unwanted fire; and (4) avoid unacceptable effects of fire and fire suppression.

The objectives for Voyageurs' wildland fire management program are listed below under the applicable fire management goal.

1. Allow fire to achieve its natural role:
   A. Restore natural fire as a dynamic natural ecosystem process in the park's natural and historic zones to the maximum extent feasible.
   B. Restore and perpetuate naturally occurring plant and animal species.
   C. Restore and perpetuate a representative natural mosaic of climax, subclimax and seral forest vegetation and abundance of native wildlife species.

2. Use fire to accomplish resource management objectives:
   A. Enhance and perpetuate the natural occurrence of jack, red and white pines, and black spruce in the park's forest vegetation.
   B. Restore and perpetuate native wildlife species, such as moose, deer, woodland caribou and elk, by maintaining a diversity of different kinds of plant communities.
   C. Restore and perpetuate the distribution and abundance of native carnivores and scavengers, such as the threatened eastern timber wolf and bald eagle.
D. Use prescribed burning in conjunction with other techniques (i.e., seeding or planting of pines, reintroduction of woodland caribou and elk, etc.) where research and monitoring indicate that prescribed natural fire will not restore the natural distribution and abundance of fire dependent plant communities and wildlife species in the park's natural, historic and development zones.

E. Reduce opportunities for large, catastrophic fires, and disease and insect epidemics to spread beyond park boundaries by maintaining a representative natural mosaic of climax, subclimax and seral forest vegetation of different ages.

3. Protect life, property, and resources from unwanted fire:
   A. Use prescribed burns to simulate the effects of lightning-caused fires in areas of the park where there exists a high risk of fire escape beyond fire management unit boundaries that may threaten the lives and/or property of employees, visitors, and neighbors.
   B. Protect from fire important scientific, scenic, historic and prehistoric cultural resources, all retained use and occupancy cabin sites, private lands, and key visitor facilities (campsites, day use sites, docks, bulletin boards, and buildings) in the park's natural, historic, and developed zones.
   C. Suppress (confine, contain, control, or any combination) all natural and human-caused fires in or threatening administrative and visitor use facilities in the park's developed zone.
   D. Prescribe burn and/or mechanically treat the park's development zone to simulate the effects of a lightning fire-maintained natural mosaic of climax, subclimax and seral forest vegetation, fuels and wildlife.
   E. Cooperate extensively with adjacent land management agencies in Minnesota and Ontario in the management of fire and in particular, boundary fires, to the extent possible through obtaining active Memorandums of Understanding.
   F. Provide for the safety of park visitors and employees, private and retained use and occupancy cabin users, and park neighbors during all wildland fire management operations.
   G. Conduct a fire prevention program in cooperation with other agencies to protect human life, physical facilities, cultural resources, and prevent modification of park ecosystems by excessive human-caused wildfire.

4. Avoid unacceptable effects of fire and fire suppression:
   A. Suppress all unplanned human-caused fires in the park's natural, historic and development zones unless prescribed conditions are
present and other management objectives can be achieved.

B. Use minimum impact fire suppression techniques and rehabilitate areas disturbed by such techniques.

C. Predicate wildland fire management in the park on documented data obtained through appropriate investigation, monitoring and research.

D. Improve prescriptions for prescribed natural fires and prescribed burns that will not only be safe but capable of restoring and maintaining park ecosystems; avoid fires of unnatural severity.

E. Train park staff and provide the necessary field experience to conduct a safe and objectives-oriented fire management program; maintain qualifications consistent with fire management responsibilities; and invite cooperating agencies to participate in interagency training.

F. Maintain acceptable air quality in this federal Class I area.

G. Engender understanding, appreciation, and support among park visitors and park neighbors for Voyageurs' wildland fire management program through park interpretation, public information media, and inviting the media, private land owners, public officials, etc. to observe prescribed natural fires and prescribed burns.

H. Eliminate the unnecessary financial burden incurred through unnecessary fire suppression.

I. Reduce to a manageable level the area of the park which will need to be prescribed burned.
Voyageurs' natural and cultural environments and resources are fully described in the Final Environmental Statement for the Master Plan (U.S. NPS 1979) and the introductions to the park's Cultural Resources Management Plan (U.S. NPS 1987a) and Natural Resources Management Plan (U.S. NPS 1987b). For the sake of brevity this descriptive material will not be repeated here. Only resource and use considerations which uniquely affect the implementation of this plan will be highlighted in this section.

Voyageurs National Park is located in the forested lake country along Minnesota's northeastern border with Ontario, Canada. The park is contiguous with the 1.2 million acre Boundary Waters Canoe Area Wilderness and the 1.1 million acre Quetico Provincial Park. Encompassing a relatively undisturbed, pristine ecosystem of 2.7 million acres, these three units make up a substantial part of the proposed Boundary Waters Biosphere Reserve, which would also include Isle Royale National Park in Lake Superior. Although all these units have or are developing wildland fire management programs similar to Voyageurs' (Harjula 1984, Joens et al. 1987), all lightning and unplanned human-caused fires burning on other public and private lands adjacent to the park are routinely suppressed. Prescribed burning in the park's vicinity is used for fuel reduction within clearcuts, site preparation for natural or artificial regeneration, wildlife habitat improvement, maintenance of berry patches, agriculture, and highway and railroad right-of-way maintenance.

This stretch of lake country typifies the Canadian shield region: a land surface shaped by glaciation into an endless system of internal waterways, with a sense of vastness, reinforced by a continuous forest mantle. This area is closer to the true arctic than any other part of the United States, except Alaska. Lake Superior "holds back" the arctic influence, and arctic-induced coolness provides a tension zone between the boreal forest and the northern hardwood forest. The forest mantle consists of dense stands of spruce, fir, pine, cedar, aspen, birch, oak, and ash, which is broken only by numerous beaver ponds, bogs, sand beaches, and rocky cliffs. Although total vertical relief in the park is only 300 feet (1108 to 1408), a complex mosaic of seral, subclimax and climax plant communities exists. Plant community composition is controlled by sharp gradients in nutrient availability, moisture regime, and time since last disturbance (Kurmis et al. 1978, 1979, 1980). This complexity contributes to significant differences in fire behavior and effects with only small changes in horizontal and vertical distance.

Voyageurs National Park encompasses some 219,128 acres, of which about 85,506 are water. The park is dominated by four major lakes: Rainy, Kabetogama, Namakan, and Sand Point. These lakes and their associated islands, small bays, secluded coves, and rocky shorelines provide outstanding opportunities for motorboating, canoeing, sailing, fishing, sight-seeing, picnicking, hiking, camping, photography, and nature study. These lakes are major barriers to the spread of lightning and human-caused fires beyond park boundaries except along the south park boundary and in the vicinity of narrows (American Channel, Squirrel Narrows, Namakan Narrows, Harrison Narrows, and...
King Williams Narrows). Lack of adequate fuelbreaks and lake barriers on lands to the south of Kabetogama and Namakan Lakes will make containment of prescribed fires and wildfires in that area of the park more difficult than on the Kabetogama Peninsula.

Given the tendency for most fires in the border lakes region to move eastward, northeastward, or southeastward (but not westward) because of the prevailing westward winds during fire weather, opportunities for fires to leave the park will be few. Fires in this region will not burn significant areas under most weather and fuel conditions. Yet to achieve significant burns we must work close to that difficult to identify margin for error where a small increase in burning conditions could trigger rapid fire advances and loss of control. There may always to some risk in our region of having fires behave differently than expected because of fuels, fire weather and terrain interactions. But again, fortunately, the geography of Voyageurs is such that fire excursions beyond park boundaries are unlikely and can be prevented by appropriate suppression actions under nearly all circumstances.

All private and retained use and occupancy cabins, and major developed areas within the park are located on the shores of the park's major lakes. The easy availability of large quantities of lake water should ensure that all these cabins and their occupants, and major developed areas and their visitors and employees can be fully protected during prescribed natural fires, prescribed burns, and the suppression of lightning and unplanned human-caused fires. Since 98 percent of the park's recreational use occurs on these lakes or their shorelines, it should also be relatively easy to protect the public from the hazards of fast moving crown fires.

The park's main landmass is the heavily forested Kabetogama Peninsula. Some 75,000 acres in extent, it is predominantly undeveloped and accessible only by water or air. Rainy, Kabetogama and Namakan Lakes are major barriers to the spread of lightning and human-caused fires beyond the Kabetogama Peninsula except at Gold Portage and in the vicinity of narrows (American Channel and Squirrel Narrows). The interior of the peninsula has a number of lakes. The peninsula offers outstanding opportunities for backpacking, hiking, canoeing, fishing, nature study, and photography. What little recreational use that does occur in the interior of the peninsula is concentrated on two short trail systems, the Cruiser Lake and Locator Lake Trails. Since access and use of the interior of the peninsula is so concentrated, it should be relatively easy to protect the public from the hazards of fast moving crown fires.

Although few visitor facilities are currently available within the park, development of visitor centers and contact stations, boat launching ramps, marinas, docks, tour and shuttleboat systems, trails and campsites, concession facilities, and improved road access was approved in Voyageurs' Master Plan (U.S. NPS 1980). Implementation of these development programs has begun and will continue in the future.
FIRE AND ECOSYSTEM INTERACTIONS

This section of the plan describes how the physical and biological characteristics of Voyageurs National Park's ecosystem have been affected by fire, the absence of fire, and fire suppression actions. Fire's historic role, the current potential for fire, and the probable effects of present and future fires on Voyageurs' ecosystem are described.

Fire History

In order to perpetuate ecological processes and preserve natural conditions within Voyageurs, the historic role of fire in establishing and perpetuating the park ecosystem must be understood. Evidence for the historic role that fire has played resides in lakebed sediments, fire-scarred trees, stand origin dates, oral histories of aboriginal peoples, historical sources, General Land Office Survey notes, and fire reports.

Postglacial Period. The pollen records from Voyageurs National Park and the surrounding region show that jack, red and white pine, black and white spruce, balsam fir, white birch, and bigtooth and quaking aspen have dominated the upland forest vegetation in the park during the past 1200 years (Potzger 1953, Wright 1968, Craig 1972, Swain 1973, 1981, Coffman et al. 1980). Probably few areas ever attained the postulated fir-spruce-cedar-birch climax in postglacial times. Pollen analysis shows no change or only short-term changes in the relative percentages of major forest species over the past 1200 years. Due to a cooler climate between 550 and 100 years ago (Little Ice Age), spruce and fir have been increasing while the pines have decreased (Potzger 1953, Craig 1972).

The record of charcoal in lake sediments indicates that fire was an important ecological factor in the forest history of northeastern Minnesota and northwestern Ontario before Europeans arrived, and even before aboriginals migrated to North America (Craig 1972, Swain 1973, 1980, 1981, Alexander 1980). A detailed record of the past 1200 years shows that the average interval between fires in the region is approximately 60-70 years, with a range of about 10 to 100 years. This estimate of fire frequency from charcoal analysis is probably very conservative.

Settlement Period. The record of fire-scarred trees, stand origin dates, historical sources and General Land Office Survey notes has yielded a more detailed description of fire history in the region during the last 400 years than is available through the record of charcoal in lake sediments alone. The nearly universal occurrence of charcoal at the base of the litter and humus layers confirms the widespread extent of past fires. Most areas clearly burned several times in the period of record, but it is often possible to document only the last one to three fires (Heinselman 1973).

On an areawide basis, these records show that significant fires occurred in Voyageurs, BWCA, or Quetico at an average interval of 4.3 years, with a range
of about 1 to 8 years between fires (Heinselman 1973, Woods and Day 1977a, Coffman et al. 1980). Major fire years in the BWCA, marked by fires burning more than 100 square miles occurred at an average interval of 26 years, with a range of about 11 to 42 years between major fires (Heinselman 1973). Most of the total area burned by fires occurred during these major fire years. Eighty-three percent of the area burned prior to 1911 in the BWCA resulted from just nine fire periods: 1894, 1875, 1863-4, 1824, 1801, 1755-9, 1727, 1692, and 1681. About 82 percent of the virgin forest burned every 100 years.

Aboriginal Americans have inhabited the park and surrounding region for at least the last 5000 years. The hunting-gathering adaptations of native Americans involve extensive and detailed understandings of natural phenomena (Lewis 1985). Fire use was a significant and integral part of human-environmental relationships for hunting-gathering peoples. Native peoples are cognizant of a wide range of fire effects, both desirable and undesirable; for people to ignore or be indifferent to fire is considered by them to be foolish in the extreme (Lewis 1985). Hunter-gatherer fire regimes are distinguishable from purely natural ones by the seasonality of burning, the frequency with which fires are set, the intensity of fires, and the selection of preferred sites.

The boreal forest supported relatively small populations of Indian hunters and gathers because resources were widely distributed and few in number. Among Indians in northern Alberta, except for a few fires set in late autumn, all burning took place in the first 2 weeks of spring; the period of summer lightning fires, late July through August, was a most dangerous time for burning (Lewis 1977). Within the boreal forest region, burning entailed the maintenance of grassland habitats, such as small prairies, meadows and sloughs, that make up some 2 to 5 percent of the region. Except for firing windfalls of dead and downed trees, efforts were made to exclude fires from forest stands, this being largely accomplished by burning grasslands while surrounding forests remained too wet to burn. With the exception of some isolated stands of white spruce and pine, the combination of human-ignited and lightning fires enabled the boreal forest region to burn at least once every 100 years (Lewis 1985).

Fire Control Period. Following logging in the early part of this century, fire suppression has been practiced effectively in most of the region. Only four fire periods, 1917-18, 1923, 1936, and 1980 have seen large fires within the park this century and these are typically associated with extreme drought periods (Coffman et al. 1980). With the exception of these four periods, there has not been any other significant fire activity recorded. In a study of MDNR fire records at the Orr District Office, it was found that of 201 fires recorded between 1933 and 1954 within what is now the park boundary, there were 33 lightning-caused fires (16 percent) and 168 human-caused fires (84 percent). None of the 201 fires, except those already indicated as "major", burned over 70 acres. Most fires were extinguished before reaching even 5 acres.

Native Americans in northern Alberta maintain that the mix of habitat types in the boreal forest has changed in the past 50 years (Lewis 1985). Today, previously more diverse environments are dominated by brush and trees and are less productive of preferred resources. Summer lightning fires are accepted
by them as a natural condition of life but, they add, the scale of these disruptions was formerly reduced by their continued and regular use of low-intensity spring fires.

**Fire Potential**

Fire potential is an ecosystem's capability for fire. The traditional concepts of fire risk, fire hazard, and fire danger are incorporated within the concept of fire potential. The important determinants of fire potential are probable fire occurrence, the fire environment, and probable fire behavior. Fire environment refers to the conditions, influences, and modifying forces that control fire behavior. The fire environment is composed of three interacting influences: fuels, weather, and topography.

**Fire Occurrence.** Fires within the park are ignited by either lightning or humans. Almost all of the park's human-caused fires occur during the peak visitor use season (mid-May through early September) and result from abandoned cooking and/or warming fires that escape into the trees. Thunderstorms occur about 25 days per year over northeastern Minnesota, chiefly between April and October. They are usually more frequent in midsummer than in spring or fall, although yearly patterns vary greatly. Duff layers and dry snags are often ignited by lightning strikes, but most such fires are extinguished by rains that accompany the storm, and consequently are never detected by fire control personnel. Occasional storms with little or no precipitation that coincide with drought conditions do ignite fires that grow to significant size. All such fires are quickly extinguished by fire control crews.

Review of fire records since establishment of Voyageurs National Park, reveals that since 1974 a total of 80 fires burned 406.3 acres within park boundaries; 69 percent were human-caused while 31 percent were caused by lightning (Table 1). Twenty-five fires were lightning-caused and burned 355.9 acres. One lightning-caused fire in 1980 is responsible for 81 percent of the total acreage burned by all fires during this 13 year period. The remaining 55 fires were human-caused and burned 50.4 acres. Lightning-caused fire occurrences ranged from 0 to 7 in a year, averaging 1.9 fires per year. Human-caused fire occurrences ranged from 0 to 14 in a year, averaging 4.2 fires per year. The maximum number of fires and acreage burned occurred in 1980 when 21 fires burned 349 acres. The year with the least fire activity was 1985 when 1 fire burned less than 0.1 acre.

**Fire Environment.** Because the park's gently rolling to moderately rugged topography is broken by many lakes, cliffs, rock outcrops, and interspersed bogs and peatlands, the primary mechanism for large fire development is long distance spotting (Roussopoulus 1978). Large fires normally "hop" from ridge-top to ridge-top, sometimes coalescing in the low areas, but often leaving the interjacent lowlands entirely unburned. Lakes are often insufficient barriers to fires of this nature. Spotting distances of one to several miles across water bodies have been observed. Furthermore, the abundance of forested islands on many lakes offers a pathway for consecutive spotting across yet larger waterbodies.

The lack of topographic relief within the park eliminates many of the fire
TABLE 1. Number and causes of wildland fires, and acreages burned in Voyageurs National Park, 1974-1986.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Human-caused</th>
<th>Lightning-caused</th>
<th>Total Fires</th>
<th>Human-caused</th>
<th>Lightning-caused</th>
<th>Total Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>5.0</td>
<td>3.0</td>
<td>8.0</td>
</tr>
<tr>
<td>1975</td>
<td>6</td>
<td>1</td>
<td>7</td>
<td>7.0</td>
<td>0.1</td>
<td>7.1</td>
</tr>
<tr>
<td>1976</td>
<td>6</td>
<td>5</td>
<td>11</td>
<td>5.1</td>
<td>8.1</td>
<td>13.2</td>
</tr>
<tr>
<td>1977</td>
<td>3</td>
<td>2</td>
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behavior characteristics associated with orographic lifting of air masses, upslope and downslope winds, head fires on steep slopes, and elevational zonation of vegetative communities. Wind direction in the region is determined more by synoptic weather than by topographic features, so definite seasonal wind patterns do occur that have a pronounced effect on fire behavior in the park (Sando 1969). The number of days since significant rainfall also has a pronounced effect on fire behavior. Periods of long duration without rain seldom occur in this region but lesser periods of dry weather occur frequently (Sando 1969). Slope aspect affects local microclimates and associated plant communities. South and southwest aspects are snow-free earlier and dry out sooner in the spring and after rainfall than north and northeast aspects. Small local differences in elevation are responsible for significant differences in soil moisture and nutrient levels that are reflected in plant community composition.

Plant communities types, stand age classes, and successional stages, time since last disturbance, and lack of topographic relief in Voyageurs combine to create a vegetation/fuel mosaic that is extremely heterogeneous. Time elapsed since last major disturbance and the type of vegetation present at the time of that disturbance are more important in determining the composition and structure of the park's upland plant communities than differences in local environmental parameters (Ohmann and Ream 1971, Ohmann et al. 1973). Fuel accumulations, spruce budworm outbreaks, blowdowns, and other disturbances related to time since last fire or logging increase the probability that old stands will burn.

Many factors linked to stand maturation and senescence increase the probability that older stands will burn (Heinselman 1973). Total above-ground biomass in living plants increases with stand age, up to some maximum for each first generation postfire forest type. Following crown fires, the fuelbed arrangement is not conducive to fire spread until 100 to 300 years after fire when first generation trees begin to deteriorate and die. Within 50 to 100 years after fire an understory of fir, spruce, or cedar commonly develops beneath the pioneer forest, introducing ladder fuels capable of carrying fire into the crowns of the overstory. These understory species have very flammable foliage. Within 100 to 150 years after fire, balsam fir may increase enough to sustain a spruce-budworm outbreak; once fir mortality from defoliation commences, dead fir adds to fuels.

As the pioneer forest ages, the first generation overstory trees become increasingly susceptible to wind breakage and uprooting; individual trees are felled or, rarely, most of the stand is blown down and adds to fuels. Many pioneer stands contain paper birch which develops loose scrolls and strips of highly flammable bark 50 to 150 years after establishment; wind blown birch bark causes spot fires. Tree diseases, such as heart-rotting fungi and black spruce dwarf-mistletoe, increase with stand age, eventually causing direct mortality and increased susceptibility of living trees to fire. There is a gradual accumulation of litter, duff, and humus on the forest floor as postfire forests mature. All of these factors and others tend to increase available fuels and flammability of forest stands with advancing age.

As first generation stands reach maturity and senescence, the probability of ignition and of a high intensity fire generally increases. Given the
frequency of drought in the region, it is inevitable that all vegetation in
the park will eventually be burned by lightning or human-caused fires. Lightning alone is an adequate source of ignitions to guarantee that all
flammable stands will eventually burn (Heinselman 1973). If fire managers
burned a stand in the spring, summer, or fall they would be simply
substituting a prescribed burn for a lightning fire that would eventually
occur in any case (Heinselman 1973).

Fire Behavior. Fire history records for Voyageurs, BWCA and Quetico indicate
that without fire control measures, large acreages of virgin forest were
burned at rather long intervals when weather and fuels combined to yield
optimum burning conditions (Heinselman 1973). Many fires also burn in years
not marked by a prolonged regional drought. Numerous short-term spring,
summer, or fall droughts occur locally on a regular basis in the park and
vicinity. Today, lightning fires continue to occur during regional or local
droughts on days with high winds. Some of these rather brief droughts set the
stage for fairly large burns. In this non-mountainous terrain, intense ground
fires and crown fires can run many miles and jump large water bodies by
spotting. Once such fires become large, control is difficult, and wind shifts
can threaten lives and/or property in the park and vicinity.

Following a period of dry weather, spring and fall fires burn readily and
spread quickly (Heinselman 1973). This is because the low vegetation is cured
and the fallen needles of conifers and dried leaves of deciduous trees and
shrubs add to surface fuels. The succulent green vegetation of summer is also
absent, eliminating a critical energy absorbing heat sink. Under these
conditions, fires can be spectacular. Crowning in conifers and total kill of
the overstory over large areas are possible if fuels are dry (10-hr time lag
moisture below 9 percent), humidity is below 30 percent and wind speeds exceed
15-20 miles per hour (Haines and Sando 1969, Roussopoulos 1978). The Little
Sioux fire in 1971 was the most recent such fire and approached within about
16 miles southeast of the park near Crane Lake (Sando and Haines 1972). In
mid-May, the Little Sioux fire burned 14,628 acres during a three day period.
Spotting occurred up to 3/4 mile ahead of the flame front.

In spring, wet, frozen soils and organic layers as well as moisture in heavy
fuels usually prevent thorough consumption of organic layers, snags, and
fallen trees. Spring burning conditions may occur between mid-April and early
June. Fall burning conditions can develop early in September or even in late
August in exceptionally dry years. Fall fires have the potential both to move
rapidly and to consume heavy fuels and organic layers. Light surface fires,
causing little injury to fire resistant red and white pines, are also possible
under spring or fall conditions if it is not too dry and the wind not
excessive (Buckman 1964).

Summer fires in most vegetation types require a longer period of dry weather,
and more severe fire weather than spring or fall fires to achieve similar
intensities and rates of spread (Heinselman 1973). But in prolonged drought,
evaporation dries out the litter and humus layers, and these become part of
the fuel. Snags, fallen trees, and other heavy fuels also dry out and may be
consumed. Summer fires are smoldering and slow-moving as these heavy fuels
and organic layers burn with the retardent effect of green undervegetation.
Without control, such fires could burn large areas during prolonged droughts.
Some summer fires will burn into the fall when more rapid fire spread is likely.

Such a fire began about a half mile west of the end of Mica Bay on July 1, 1936, and eventually burned a total of 18,000 acres of timber on the Kabetogama Peninsula. The summer was unusually hot and dry. In July, temperatures reached over 100 degrees Fahrenheit daily for a week. Civilian Conservation Corps crews tried unsuccessfully all summer to control the fires that had originated from the single ignition on July 1. The fire was not completely extinguished until September 28 when about four inches of rain fell and put the fires out. Altogether, about 200 men fought the fires. Changes in wind direction and spotting frustrated control efforts. The fire consumed all vegetation and soil down to bedrock in some places. Jack pine and aspen quickly recolonized the burned area (Coffman et al. 1980).

Some nearly pure conifer stands with only lichen, moss, and heath-shrub undervegetation, such as black spruce-feathermoss, jack pine-black spruce, or red pine types, may burn much the same in spring, summer, or fall because there is little seasonal change in fuel moisture.

The ecological effects of these various types of burns seem to depend on two results of the fire: the extent of crowning and direct overstory kill, and the depth of humus layer consumption, which affects the survival and regeneration of many trees, shrubs, and herbs and determines seedbed characteristics (Heinselman 1973).

**Fire Effects on Vegetation**

Voyageurs National Park and the surrounding region have a natural fire rotation or fire cycle of about 100 years (Heinselman 1973). This was the average time required for fire to burn the total park area prior to the era of fire suppression. While some portions of the park may have experienced a shorter average fire return interval (13 to 38 years), other areas were missed by fire for fairly long periods (400 to 500 years).

The effects of fire on Voyageurs' fire dependent ecosystem are determined by the average fire return interval for a particular plant community. For convenience, the park's vegetation has been subdivided into seven community type fire groups (Ohmann and Ream 1971, Coffman et al. 1980, Kurmis et al. 1980). Each fire group contains forest stands with ground flora, shrub and tree strata similarities, a similar response of tree species to fire, and a similar postfire succession. The fire groups, summarized below, range from exposed bedrock and very dry, thin soil, pine types to very wet, swamp sites with deep, organic soils.

**Upland Shrub-Lichen Fire Group.** Plant communities in this fire group grow on very dry sites with poor nutrient availability. This fire group is a distinctive mosaic of exposed rock outcrops and intervening patches of shrubs, such as dwarf juniper, juneberry, bush honeysuckle, mountain maple, willow and blueberry. Bare rock outcrops and rock surfaces painted with crustose lichens and fruticose reindeer mosses cover most of the ground, and higher plants grow only in crevasses and depressions where a very thin layer of sandy soil has
managed to accumulate. About 50 years are required for lichen regrowth after fire. The average fire return interval for this fire group is determined primarily by the return interval of the dominant vegetation with which it forms a mosaic.

The upland shrub-lichen fire group is vulnerable to fire because it is exposed and dry. After a fire burns off the vegetation on a rock outcrop, what little soil that remains may be eroded by rain and wind, and the site must once again be colonized by pioneer species. Such a cycle maintains this fire group indefinitely on these sites, as long as fire exerts its influence. However, if soil loss does not accompany fire, a fire-climax community of scrub oak or jack pine may develop.

**Scrub Oak and Jack Pine Fire Group.** Plant communities in this fire group grow on very dry to dry sites with poor to medium nutrient availability. Scrub oak communities are dominated by an overstory of stunted red oak and red maple, with quaking aspen and paper birch present in some stands. Once established, scrub oak communities should be able to perpetuate themselves in the absence of disturbance because red oak and red maple germinate best in soil covered by a thin layer of leaf litter. Fire can remove red maple from such communities but red oak readily resprouts from the base after fire and, once established, will probably persist indefinitely.

Jack pine communities are nearly always found in pure, even-aged stands or occasionally as a codominant with black spruce in stands that regenerated after fire. Although some jack pine stands may persist for as long as 250 years without fire, the average fire return interval for most stands is 50 to 100 years. Besides triggering seed release, fire eliminates shady conditions which jack pine seedlings are intolerant of, burns off litter and humus, and exposes mineral soil which forms an ideal seed bed for conifer seedlings. Jack pine stands in the park originated after major fires in 1864, 1894, 1910 and 1936. In the absence of disturbance, these jack pine communities will be replaced by more shade tolerant tree species, such as black spruce, white spruce, balsam fir and paper birch. Regular, natural disturbance prevents stands from ever becoming fir-spruce-birch and black spruce-feather moss communities.

**Red and White Pine Fire Group.** Plant communities in this fire group grow on dry to medium moisture sites with poor to medium nutrient availability. Some red and white pine stands often survive intact 200 to 300 years, with a possible maximum for single trees or small groups of 400 to 500 years. Surface fires that scarred trees occurred with an average fire return interval of 23 years (range 13 to 38 years) (Frissel 1973).

Communities in this fire group have been most affected by past fires and logging in the park. Fire climax pine types during the pre-settlement period occupied about 46 percent of the park's total forest area, while today they occupy only about 15 percent of the total area (Coffman et al. 1980). Red and white pine communities are not regenerating in the park due to their exacting silvical requirements (Ahlgren 1959, 1960, 1976, Coffman et al 1980, Kurmis et al. 1980). Although these communities are of fire origin, reintroduction of fire alone into the park ecosystem may not be able to restore the extensive and stately stands of red and white pine, which were a major portion of the
Red pine communities in the park are characterized by a structured, two-layer canopy of mature pines (150 to 250 years old) and younger trees of various species, such as balsam fir, red maple and paper birch. Without future periodic surface fires, as these stands break down 200 years hence, they will be replaced by trees that can germinate on the duff-covered soil and moss, and under the shady conditions that exclude red pine reproduction. Balsam fir, white spruce, and red maple, and possibly some white pine will increase in importance as the red pine canopy breaks down. Even with the presence of periodic fires, red pine communities may continue to deteriorate because: normal seed production begins at about 20 to 25 years of age; the probability of good seed years coinciding with desirable postfire seedbeds is low; trees more than 100 to 200 feet apart experience poor seed production and dispersal; they are shade intolerant and must compete with herbs and shrubs; and extensive areas that served as seed reservoirs in the past have been markedly reduced by logging (Ahlgren 1976).

Like red pine communities, white pine communities are uncommon today, remaining primarily along lakeshores and on islands, where regulations limited timber harvesting, and elsewhere in scattered stands that would have been too young for logging in the early 1900's. White pine germinates more successfully than red pine on very thin litter and is more tolerant of shade, especially in the first few years of development. However, white pine is rarely able to move into existing forest stands, and this slow-growing tree, like red pine, depends on fire to eliminate faster-growing trees competing for light. White pine is further limited by browsing by white-tailed deer and white pine blister rust. Without fire, new stands of white pine are not becoming established in the park and a form of fir-spruce-birch community will eventually succeed white pine in many areas.

Aspen-Birch Fire Group. This is the major fire group in the park. Plant communities in this fire group grow on all but the driest and wettest sites with medium to high nutrient availability. While this fire group occupied only about 20 percent of the park's pre-settlement forest area, today it comprises about 57 percent of the total forest area (Coffman et al. 1980). Past wildfires and logging of pine, spruce and fir created ideal conditions for the establishment of quaking and bigtooth aspens and paper birch by either seeds or suckers following disturbance. After years of timber harvesting, an extensive network of aspen rhizomes has developed in northern Minnesota (Ahlgren 1976), increasing the likelihood that aspen would regenerate disturbed sites. Many of the aspen-birch stands will be deteriorating within the next 20 to 30 years. The average fire return interval for this fire group is between 50 and 100 years. Eventually, in the absence of fire or other major disturbance, these sites will be dominated by a fir-spruce-birch climax. With fire, aspen, birch and pine will be important associates in this fire group.

Fir-Spruce-Birch Fire Group. The balsam fir-spruce-birch community is often considered the climatic climax community in northern Minnesota. It is able to perpetuate itself over many generations in the absence of disturbance because of its shade tolerance. This community also succeeds many kinds of forest in the park on moist, nutrient medium sites when fire, logging and other
disturbances are excluded. This community typically has a dense canopy of balsam fir that includes scattered but ever-present white spruce, paper birch and quaking aspen. Undergrowth may be completely shaded out, leaving only a carpet of balsam fir needles on the ground. More open portions of such stands support balsam fir and white spruce seedlings, and occasional patches of herbs and shrubs, such as mountain maple and beaked hazel. In stands from which fire has been excluded, wind and spruce budworm create openings where fast-growing aspen and birch regenerate and potentially take over entire stands when large areas are disturbed.

White and black spruce, balsam fir, and northern white-cedar are common understory elements beneath the pines, aspen, or birch (Heinselman 1973). In many cases, however, many individuals of these four species are really not much younger than the pioneer overstory species they associate with. These species usually perish in the same fires that destroy the overstory pioneers, in these cases at least, they are caught up in the same fire rotations.

Swamp Hardwoods Fire Group. The uplands hardwood, ash-elm, and black ash communities grow on moist to wet, nutrient rich sites. The uplands hardwood community is rare in the park and is dominated by American basswood and ironwood. The ash-elm community is not common in the park and is dominated by black and green ash and American elm. Black ash communities are found in swales and creek floodplains where the water table is high and soils are organic and poorly drained. Seasonal standing water is normal, but water movements prevent stagnation and ensures a continuous input of nutrients. Black ash forms a pure, uneven-aged canopy with a few scattered white cedar, American elm and tamarack trees in the canopy.

In the absence of disturbance, members of this fire group are climax communities on moist to wet, rich sites. One generation of long-lived black ash may stand for 300 years. Disturbances such as fire, windstorm, drought, or water-logging caused by beaver activity, frequently trigger temporary conversion of a such communities to aspen-birch forest.

Swamp Conifers and Bogs Fire Group. This fire group contains the park's white-cedar, black spruce, leatherleaf bog, shrub carr, and marsh communities.

The white-cedar community is rare in the park. This community is most often found on flat floodplains and in depressions where conditions are wet and intermediate in nutrients. White-cedar forms almost pure stands with an occasional black ash or balsam poplar in the canopy. The dense shade cast by this overstory reduces undergrowth density and diversity. White-cedar is very fire-sensitive and has almost literally been driven to the lakeshores by fire. It is so uncommon on uplands that it is often considered a species requiring high soil moisture and mobile groundwater. But the proof that it can cope with dry sites is that it is sometimes abundant on ridges on certain islands and other sites where fires have been infrequent (Heinselman 1973).

The black spruce community is found in low, wet places where nutrient levels are low due to isolation from groundwater. Black spruce seeds require moisture and a seedbed of mineral soil or moss. On lowlands, the sphagnum moss of nutrient deficient bogs forms a favorable seedbed if conditions are not overly wet. Many black spruce stands in the park originate when seedlings
invade treeless leatherleaf bogs or tamarack bogs as accumulating plant remains provide increasingly dry conditions. The black spruce is the climax community on such wet, poor sites. Crown and surface fires readily kill black spruce. Following low intensity fires, black spruce regenerates from seed in undestroyed, semi-serotinous cones.

Leatherleaf bog communities occupy sites substantially wetter than black spruce bogs; they are too wet for germination of black spruce and other trees. Leatherleaf and bog birch dominate these sphagnum moss bogs. Ground fires readily kill these halfshrubs and sphagnum moss. As site conditions become drier, this community may be invaded by black spruce and tall shrubs.

The shrub carr community occurs on flat lowlands that are substantially richer in nutrients than leatherleaf and spruce bogs. The shrub carr originates when tall shrubs, such as speckled alder and willow, colonize sedge and cattail marshes. Eventually, these sites may succeed to black ash or white-cedar communities. Fire readily removes the above ground biomass of these tall shrubs, and sedges and grasses.

Marshes are semi-aquatic communities and are found in the park's lakes and beaver ponds. Conditions are very wet and nutrient levels are intermediate. The marsh community lacks trees and shrubs and is dominated by continuous growth of cattails, sedges and wild rice except where standing water is deep. Marsh vegetation is readily removed by fire outside the growing season after the plants have dried out.

Fire Effects on Wildlife

An understanding of the role of fire in Voyageurs' ecosystem requires at least a brief look at the interactions between vegetative successions and wildlife habitat. Most of the park's native mammals and birds have habitat requirements that correspond with niches in various postfire successional stages. Wholesale succession of the forest due to fire exclusion is now restructuring the entire system, and gradually eliminating the niches of many formerly abundant wildlife species. The removal of fire from the park would eventually cause a significant loss of wildlife diversity and an overall decrease in wildlife abundance (Heinselman 1973, Apfelbaum and Haney 1986, Cole 1986).

Moose. Large quantities of nutritious browse are required by moose during the long northern Minnesota winter. Proliferation of palatable forage following fire is often responsible for increased moose populations. Postfire sprouters, such as aspen, birch, willow, red maple and pin cherry, are heavily used (Hansen et al. 1973, Peek 1974a, 1974b, Irwin 1975, Peek et al. 1976). Large burns are suitable feeding areas unless the snow is more than 20 inches deep. Two or three years after fire, the regrowth protrudes above the deepest snows, and moose can then forage most of the winter. Moose can utilize larger saplings than can white-tailed deer or elk. Their height of reach is 8 feet and they will break down saplings up to 4 inches in diameter to reach higher browse. Consequently, moose can make better use of the large quantities of browse available within large burns than deer or elk. Moose also benefit from the overhead cover of conifer forests on cold winter nights and browse the
foliage of sapling balsam fir. Thus, a combination of recent burns and adjacent maturing forest near waterways for summer range make a very productive habitat complex for moose.

A widely dispersed, low density moose population is capable of rapidly colonizing the favorable habitats associated with a burn (Peek 1974a). Substantial immigrations of yearling males to burned areas occur within 6 months after a fire (Peek 1974a). Increased levels of nutrition on burns also increase the rate of twinning in moose populations (Franzen and Schwartz 1985). This capability serves an important function as an adaptation to survival in the boreal forest, where mature spruce-fir and jack pine communities produce very little forage for moose, and fires create an abundance of woody browse quite rapidly.

White-tailed Deer. White-tailed deer were less abundant in northeastern Minnesota in primeval times than they are today. A large population increase came with the less intensive logging and increased fire protection that followed the early 1900's (Irwin 1975). Peak populations came between 1930 and 1950. With decreased timber cutting, plus fire exclusion, deer populations have since declined sharply as the forest has matured in the park and vicinity (Cole 1982, 1986). Deer diets are much more highly variable than those of moose; deer will eat grasses, herbs, shrubs, and trees. Deer populations will increase somewhat in response to the large quantities of food available on recent burns. Due to relatively small home range size and limited dispersal of yearlings, deer are not as well adapted to utilize recent large burns as moose. Deer prefer denser cover and lesser snow depth than moose. Although favored browse plants occur on recent burns, deer cannot use large burns effectively because of deep snow and increased chances of predation by the eastern timber wolf. Deer, consequently, feed near the edges of forest openings and do not utilize the forage more than 75 yards from cover. Thus, a combination of recent small burns and adjacent maturing forest make a very productive habitat complex for deer.

Woodland Caribou. Woodland caribou were common in the park and vicinity until 1900 but disappeared by about 1925 (Cole 1982, 1986). Excessive hunting and a regional decrease in the proportion of old stands supporting tree lichens were involved in the elimination of caribou (Heinselman 1973). In winter, caribou subsist on a diet of tree lichens, ground lichens and browse. Some browse plants used by caribou are found in old forests as well as on recent burns (mountain maple, mountain ash, red-osier dogwood, willows, and highbush cranberry). Ground lichens are most abundant on open bedrock ridges which become well covered by lichens 60 to 100 years after fire. Caribou utilize mature coniferous upland habitat more than any other available habitat, except during October, December and January when semi-open and open bogs are used more (Darby and Pruitt 1984). Favorable use of bogs continues until mid-February when snow cover thickness and hardness restrict foraging. Caribou then switch back to sites with more favorable snow cover conditions in mature coniferous uplands, especially rocky ridges with jack pine. Thus, a combination of mature coniferous uplands bisected by semi-open and open bogs make a very productive habitat complex for caribou.

Elk. Elk were present in the park and vicinity until 1900 but disappeared soon after due to excessive market and subsistence hunting (Cole 1982, 1986).
Elk are very general feeders that prefer grassland, shrubland, and recent burns over the mixed forest community. In winter, highest population densities occur on sites that have burned during the past century while lowest densities occur in mature forest (Martinka 1974). They choose aspen-birch over coniferous communities in summer and winter, although conifers may be used for hiding and thermal cover during times of harassment or severe weather. Proliferation of palatable forage following fire is responsible for increased elk populations. Frequent fires that set back succession and retain grasses, herbs, shrubs and aspen will benefit any elk that are reintroduced into the park. Thus, a combination of recent burns and adjacent maturing forest make a very productive habitat complex for elk.

**Ruffed Grouse.** In northeastern Minnesota the ruffed grouse depends heavily on the buds of aspen for winter food, especially on the staminate flower buds of quaking aspen (Svoboda and Gullion 1972). A patchwork of aspen stands of different ages, interspersed with conifers, provides good feeding habitat plus winter shelter. This was the character of the primeval forest. Succession due to fire exclusion is now gradually reducing ruffed grouse habitat in the park, although there is still much good habitat in the younger aspen stands being managed for pulpwood outside the park (Sharp 1970, Heinselman 1973).

**Other Birdlife.** The primeval mosaic of forest age classes and successional stages created by fire provided niches for all native land birds (Heinselman 1973). Early communities, the first 23 years after fire, had as high a bird diversity but half the bird density as mature plant communities that developed 100 to 200 years after fire (Apfelbaum and Haney 1986). Intermediate communities developed within 50 years as jack pine and aspen canopies matured and had a third less species, but comparable bird density as early communities. Old-growth communities, 300 or more years after fire, had lower diversity and density than mature communities. Bird species and communities in this region are adapted to fire and in the long-term absence of fire, communities begin to fragment (Apfelbaum and Haney 1986).

**Small Mammals.** Most species of smaller mammals (redbacked and rock vole, deer mouse, masked shrew, least chipmunk and red squirrel) are well adapted to survival during and after fires. Variable topography, low fuel loadings and high moisture contents permit some portions of an area to escape burning entirely or to burn only lightly, especially in depressions and lowland areas. Small mammals either survive within the confines of the burn in unburned areas or in burrows more than 3 inches below the soil surface; escape the fire by emigrating to unburned areas; or die as a result of the fire (Buech et al. 1977). Although fire will not reduce the species diversity of small mammals within a burn, populations are frequently only 15 percent of prefire populations for one or two growing seasons after the burn. As grasses, herbs and shrubs, and trees becomes reestablished on the burned area, small mammal populations will gradually increase to preburn levels. The red squirrel, however, is temporarily displaced by fire because its niche is maturing jack pine, black spruce, and red and white pine stands - all late successional stage communities.

**Snowshoe Hare.** In natural ecosystems, snowshoe hares attain peak populations in young postfire stands, especially of aspen and birch, because of their need for thin-barked woody stems for winter food. Five to thirty years after fire
are the best years for hares (Grange 1965). In recent decades, hares have been nearly absent from the park because of the severe lack of recently burned areas (Cole 1982, 1986). Small, irregularly shaped openings created by fire within 200 to 400 yards of dense conifer cover or shrub thickets provide maximum snowshoe hare habitat in aspen-birch forest communities (Conroy et al. 1979, Wolff 1980).

**Beaver.** Past logging and wildfires in Voyageurs created ideal habitat for beaver that now supports maximum densities. Stands of deciduous trees and shrubs within a few hundred feet of lakes and streams are required by beaver, as well as aquatic roots and tubers. Aspen, paper birch, and willow are favored foods. Cuttings from these trees and shrubs are used for dams, lodges, and winter food caches. In the primeval system, these species were found on burns, but within 70 to 100 years after a fire beaver often fell all of the aspen and birch within reach of waterways and canals (Heinselman 1973). They must then move on to a more recent burn. Fire exclusion is now preventing the regrowth of many aspen-birch stands in the park and a beaver population decline is expected (Heinselman 1973, Kurmis et al. 1980).

**Eastern Timber Wolf.** This threatened species is the largest carnivore in the park ecosystem. Its principal prey are white-tailed deer, moose, beaver, and formerly woodland caribou and elk (Van Ballenberghe et al. 1975, Cole 1982, 1986). Enough area of early postfire plant communities must exist within a wolf pack's territory to sustain a surplus of the prey species that depend on such communities (deer, moose, beaver, and formerly elk) (Heinselman 1973, Cole 1982, 1986). Formerly caribou were common in mature forests, thereby giving the wolf available prey in both old and young stands. But today, old stands contain few prey animals, and the wolf is not as common as it was prior to 1890 (Mech 1973, 1977, Mech and Karns 1978, Cole 1982, 1986). Pack sizes are also decreasing. Further declines in the park's wolf population will continue if fire exclusion continues, especially if caribou and elk are not soon reestablished within the park and vicinity.

**Other Predators and Scavengers.** As with the park's wolf population, the sizes of the remainder of the park's predator and scavenger populations (coyote, red fox, wolverine, Canada lynx, bobcat, fisher, pine marten, raven, jays, chickadees, and bald eagle) have been dramatically reduced below pre-1890 levels by human intervention into Voyageurs' ecosystem (Cole 1982, 1986). An inadequate area of early postfire plant communities exists to sustain a surplus of the prey species that depend on such communities (ruffed grouse, snowshoe hare, beaver, deer, moose, and formerly elk). In the past, these predators and scavengers were sustained through the winter by scavenging on wolf kills (Mech 1966, 1970).

Whenever wolves leave a large carcass, either temporarily to go off and rest or permanently upon abandoning the kill, a wealth of food becomes available to smaller birds and mammals. Some of these animals, such as crows, ravens, jays, and red squirrels, are poorly adapted for killing other animals themselves. Thus, it becomes more efficient for them to spend most of their time gleaning bits and pieces of leftovers from the abandoned kills of predators. Other species, such as foxes, coyotes, bobcats, fishers, and bald eagles, are only part-time scavengers. Most of the time they prey on other animals themselves, but they do rely on scavenging on wolf kills to hold them
over while their own prey is scarce or unavailable. But today, old stands contain few prey animals for wolf packs to kill, and those animals that are killed are fully consumed by the pack, leaving little food for scavengers. Further declines in the park's predator and scavenger populations will occur if fire exclusion continues, especially if caribou and elk are not soon reestablished within the park and vicinity.

**Black Bear.** The black bear is omnivorous and thus can find food in many habitats in the park and vicinity. Fruit producing plants are important to the long-term population health, reproduction, and survival of black bears in northeastern Minnesota (Rogers 1976, 1977). But the important berry producing shrubs, such as blueberries, raspberry, Juneberries, and cherries are most abundant 2 to 20 years after fire (Heinselman 1973). Thus, recent burns are important habitats for bear. In primeval times, bears undoubtedly frequented burns during berry season, but today there are no recent burns within the park. Raspberries are an exception because they also abound in openings in spruce budworm killed fir stands. As with most species, optimum habitat for bears is a mosaic of early successional and mature plant communities (Irwin and Hammond 1985). Advancing forest succession and continued fire exclusion will eventually result in a reduction in the park's black bear population.
FIRE MANAGEMENT UNITS

This section of the plan describes Voyageurs' three fire management units: fire suppression, prescribed natural fire management, and conditional fire management. Each unit has a unique set of fire management objectives that can be met by a specific prescription. The park's fire management units are delineated on the map in Figure 1. The decision flow chart for evaluating lightning-caused fire starts occurring in each unit against prescription criteria is contained in Figure 2. Fire management unit boundaries may be altered with the approval of the Superintendent.

The boundaries of the park's fire management units are natural barriers that prevent fire spread or at least provide a reasonable chance for fire containment. These units are delineated based on the presence of large expanses of open water, interior lakes, beaver ponds, wetlands, stream channels, major changes in vegetation/fuel types, and roads that will contain fires within unit boundaries. Due to a lack of topographic relief and the extreme heterogeneity of the vegetative mosaic in Voyageurs, no fire management units have been delineated specifically to coincide with any of the community type fire groups described above.

Fire Suppression Units

Voyageurs' fire suppression units exist to provide intensive protection for human life and property within and outside park boundaries. Such units surround the park's development zones at Black Bay Narrows, State Point, Kabetogama Lake Visitor Center, Kabetogama Narrows, Ash River resorts, Hoist Bay, and Kettle Falls. Also incorporated in such units are all: developed campsites and day use sites; docks and bulletin boards at trailheads; private lands; and private and retained use and occupancy cabin sites. Only the fire suppression units surrounding the park's developed areas are delineated on the map in Figure 1. The remainder of these units are too small and numerous to include on a map of this scale. These units are delineated in detail on Voyageurs' Land Acquisition Status Maps that are located in the Chief Park Ranger's Office and in the Lakecountry and Backcountry Site Management Plan Environmental Assessment (U.S. NPS 1987c).

The areas incorporated in fire suppression units are of a size to assure protection and, where possible, are within natural geographic barriers to fire spread. For areas not afforded the protection of natural fire barriers, a buffer zone of up to one mile has been established in some instances. The size of units around private land, cabin sites, campsites, day use sites, and trailheads will remain flexible to permit a variety of responses to protect life and property at these sites during ongoing fires. Under most circumstances, it will be possible to fully protect cabin sites, campsites, day use sites, and trailheads by soaking all structures and the forest canopy and fuels in the immediate vicinity of these sites with water pumped directly from a lake.
The number and total acreage of fire suppression units in the park will decrease as additional private property is acquired and as retained use and occupancy cabin leases expire (U.S. NPS 1986). The number of such units will increase as new campsites, day use sites, and trailheads are developed in the future. Overall, however, the total acreage of such units will be significantly less in the future than today. As private property is acquired and leases expire, these fire suppression units will generally assume the designation of the fire management unit with which they are contiguous.

All lightning and human-caused wildfires originating from within or that threaten a fire suppression unit from outside will be suppressed (confined, contained, controlled, or a combination). Mechanical fuel manipulation and prescribed burning will be used to reduce fuels, and maintain vegetative mosaics and wildlife habitats that approximate natural conditions and ecosystem processes within fire suppression units. Where appropriate, stands of red and white pine will be maintained in the vicinity of park developed areas to create fuelbreaks that will reduce the intensity of some fires entering these areas. Periodic prescribed understory burning and planting of red and white pine will reduce the volume of ladder fuels in the understory and promote the establishment and maintenance of open stands of red and white pine. A crown fire reaching this pine type fuelbreak will, under some circumstances, drop to the ground and become less intense and easier to control. The prescriptions used for prescribed burning within the park's fire suppression units are the same as those used for prescribed burning within conditional fire management units (Table 4).

**Prescribed Natural Fire Management Unit**

Voyageurs' prescribed natural fire management unit is designed to maximize the area within the park in which natural fire is a critical ecological process that perpetuates and maintains a fire dependent park ecosystem. All lightning-caused fires in this natural fire unit, regardless of origin, will be allowed to burn in the unit at any time of the year and under almost all weather conditions unless they threaten human life, private property, private or retained use and occupancy cabin sites, major park developed areas, developed campsites and day use sites, trailheads, cultural or archaeological resources, endangered or threatened species, to escape from the management unit, to violate air pollution control laws and regulations, or to violate other resources management objectives (see the decision flow chart in Figure 2).

The cause of all fires within the prescribed natural fire unit will be determined in order that the proper management decisions can be made. All natural fires will be monitored daily or more frequently in order to maintain current information on fire size, location, rate of spread, intensity, and potential threats which might require suppression action.

Human-caused fires originating within or from outside the prescribed natural fire unit will be routinely suppressed except where such fires pose no risk to the resource or public safety and where the environmental impacts of suppression would outweigh possible adverse effects of the fire. For example, it may be appropriate to allow a human-caused fire to burn if an approved
prescribed burn plan exists for the area in which the fire will burn and all prescription parameters are met (Table 4). In some situations, the adverse environmental impacts from suppression, such as firelines, tree felling, or aerial application of fire retardants, might be greater than possible adverse impacts of the human-caused fire.

No fires will be ignited by management in the natural fire unit, with the following exceptions. Certain fires may be ignited in conjunction with suppression efforts (confine, contain, control, or any combination). Should continued research and monitoring demonstrate that this program is not encouraging the regeneration of red and white pine stands, or creating critically needed winter habitat for moose, deer, caribou and elk, then active steps may be taken to regenerate these stands or habitat through a combination of prescribed burning and/or tree planting. If it is determined that any threatened or endangered species is critically fire dependent and that fire exclusion has so adversely affected the critical habitat of that species so as to endanger its existence, then active steps may be taken to restore that habitat through prescribed burning. The prescriptions used for such prescribed burning within the park's prescribed natural fire management unit are the same as those used for prescribed burning within conditional fire management units (Table 4). The objective of such a program would be to duplicate the frequency and intensity of natural fires by setting carefully prescribed fires in times and places when safety and control can be assured.

**Conditional Fire Management Units**

Voyageurs' conditional fire management units attempt to strike a balance between restoring and perpetuating fire dependent ecosystems and protecting life and property within and beyond park boundaries. Ecologically, the conditional and prescribed natural fire management units are identical. The conditional units, however, are located in areas where the risk of fire escape beyond park boundaries in the spring, summer and fall is high. Both natural and prescribed fires will be allowed to burn within a pre-determined set of parameters. When conditions are not within these parameters, fires will be suppressed (confined, contained, controlled, or a combination). This program is designed to be objectives-oriented and information-based while affording maximum flexibility to the fire manager.

Many lightning-caused fires originating within or from outside these units will be allowed to burn in these units at any time of the year when they remain within prescription (Figure 2 and Table 4) unless they threaten human life, private property, private or retained use and occupancy cabin sites, major park developed areas, developed campsites and day use sites, trailheads, cultural or archeological resources, endangered or threatened species, to escape from the management unit, to violate air pollution control laws and regulations, or to violate other resources management objectives. Those lightning-caused fires originating within or from outside these units that are outside of these prescriptions will be suppressed (confined, contained, controlled, or a combination) except where such fires pose no risk to the resource or public safety and where the environmental impacts of suppression would not be commensurate with possible adverse effects of the fire.
Unplanned human-caused fires originating within or from outside conditional fire units will be routinely suppressed except where such fires pose no risk to the resource or public safety and where the environmental impacts of suppression would outweigh the possible adverse effects of the fire. For example, it may be appropriate to allow a human-caused fire to burn if an approved prescribed burn plan exists for the area in which the fire will burn and all prescription parameters are met (Table 4). In some situations, the adverse environmental impacts from suppression, such as firelines, tree felling, or aerial application of fire retardants, might be greater than possible adverse impacts of the human-caused fire.

A prescribed burning program will be implemented within conditional fire units to encourage regeneration of red and white pine stands and critically needed winter habitat for moose, deer, caribou and elk. To the maximum extent possible, this program will simulate the effects of the park's natural fire rotation or cycle on ecosystems within unit boundaries. The objective of this program will be to duplicate the frequency and intensity of natural fires in times and places when safety and control can be assured.

Prescribed burns will be ignited in designated burn units (Figure 1) within specified weather and fuel moisture parameters (Tables 4 and 5). These prescriptions may be refined as deemed necessary by the Terrestrial Research Biologist and Resource Management Specialist. The Research Biologist may, with approval from the Regional Director, ignite fires on research plots for this purpose. Prescribed burning may be carried out anytime from early April through late October or early November (Table 5). The months of July, August, and October are the best months for prescribed burning and will conflict least with wildfire control activities (Sando 1969). Depending on the burn objectives, either singly or in combination, headfires, backfires, flank fires, spot fires, ring fires, chevron fires, and pile and windrow fires will be used (Mobley 1973, OMNR 1981).

Priorities for prescribed burning will be determined by the length of time since previous burn, current fuel loading and vegetative conditions, topographic advantage, and by personnel and logistical requirements. Meadows, sloughs and stream courses within a burn unit will be scheduled for burning very early in the spring because they will ignite while the surrounding forest is still too wet to burn. Once these open areas are burned off, they will act as fuelbreaks for fires that are set in the trees as fuels continue to dry out in the spring. Forest stands on south facing slopes and ridges would then be burned while fuel moisture levels were still high in adjacent stands on other aspects. These burned stands and open areas would in turn act as fuelbreaks for other fires ignited on other aspects as fuels continue to dry out. To the extent feasible, prescribed burns will be conducted with the direct aid and cooperation of the agency or agencies whose lands are contiguous with the burn unit.

The cause of all fires within conditional fire units will be determined in order that the proper management decisions can be made. All prescribed natural fires and prescribed burns will be monitored daily or more frequently in order to maintain current information on fire size, location, rate of spread, intensity, and potential threats which might require suppression action.
As agencies whose lands are contiguous with the park implement new wildland fire management programs, the National Park Service will promote interagency cooperation that will allow fires to burn from one jurisdiction into another, even across the international boundary. In order to minimize the possibility of fire management actions being mistakenly taken outside the park boundary on prescribed natural fires and/or prescribed burns thought to be within a conditional fire management unit, the south park boundary from Crane Lake to Black Bay will be surveyed.
FIRE MANAGEMENT ORGANIZATION AND RESPONSIBILITIES

This section of the plan identifies who is responsible for determining appropriate actions regarding fire in the park; and specifies the level of expertise required of such decisionmakers. The fire management prescriptions and associated decision flow chart described above are only guides for decisionmaking. Decisions regarding fire should rarely, if ever, be automatic. Current technology for predicting fire behavior and associated fire effects is imperfect, and the probability of unanticipated burning conditions is great. Decisions must be based on what a fire is actually doing and what it is likely to do, not on some prefire prediction of what it is supposed to do. The park’s fire management decision systems, consequently, must always include diagnosis by experienced fire and resource specialists.

Fire Management Team and Responsibilities

The Superintendent of Voyageurs National Park is responsible for planning and directing all park activities and programs, and is ultimately responsible for any fire occurring in the park. All fire management has been delegated to the Chief Park Ranger by the Superintendent.

The Chief Park Ranger has the overall responsibility for the planning and implementation of Voyageurs' wildland fire management program. S/he will head the Fire Management Overhead Team, which will plan strategy as documented in this plan. S/he will direct fire closures and restrictions as conditions warrant. S/he will insure that all human-caused fires are investigated. The Chief Park Ranger will designate a permanent employee to be the Incident Commander on a daily basis during the fire season. S/he will be the NIIMS (National Interagency Incident Management System) coordinator for the park and act as the park's representative when memorandums of understanding are made with other agencies regarding fire. S/he will insure that adequate NPS Wildland Fire Qualifications ratings are attained by members of the park staff (see NPS-18, Appendix F, NPS Wildland Qualification System).

Although the Chief Park Ranger has the overall responsibility for planning and executing this program, its successful implementation demands an interdivisional cooperative effort. The major responsibilities assigned to each division are outlined in Table 2.

The Fire Management Overhead Team will be comprised of the Chief Park Ranger, Resource Management Specialist, Resource Management Biologist, Cultural Resource Management Specialist, and Terrestrial Research Biologist. The Assistant Superintendent will also be a member to assure team commitment to park management's concerns and interests. This team will devise strategies for the management of fires in prescribed natural and conditional fire units, in consultation with adjacent land management agencies. This team will evaluate all conditions to determine if a fire is within prescription and meets the resource management objectives of the area. These determinations will be passed on to the Incident Commander along with alternative strategies.
Table 2. The major responsibilities assigned to each division for planning and implementing Voyageurs National Park's wildland fire management program.

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<th>Program Element</th>
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<td>Fire Management Planning</td>
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<td>Fire Management Overhead Team</td>
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should prescriptions and objectives not be met.

The Incident Commander will devise implementation strategies that align with the fire management strategies produced by the Fire Management Overhead Team. S/he will remain aware of fire conditions, present and forecasted fire weather and burning indices, tactical progress and success, and the degree to which the fire meets resource management objectives. When the fire falls outside of acceptable prescription parameters, s/he will either reconvene the Fire Management Overhead Team or revert to a predetermined alternative strategy.

The Incident Commander will be available to coordinate all firefighting activities on the day assigned. S/he will keep informed on the availability of employees if staffing of a fire should be required. S/he will organize initial attack forces and ensure adequate equipment, staffing and transportation is available for multiple fires without crippling basic park operations. S/he will keep the Chief Park Ranger and Administrative Division personnel informed as accelerating needs develop. S/he may attend initial attack operations and should designate personnel to perform necessary headquarters functions in his/her absence.

The Incident Commander will mobilize an initial attack/monitoring team to the fire as soon as possible. S/he may request the dispatcher to initiate personnel callout for the fire or to cover vital park functions that these employees have vacated. In most cases, initial attack and monitoring actions will be provided by ground forces.

Initial attack/monitoring teams for small fires should consist of a blend of qualified personnel and firefighters with limited experience. This will prevent all experienced firefighters from being confined to one fire, and allow the development and training of new fire personnel. In most cases, initial attack/monitoring teams should be prepared to attend to all phases of fire operation without additional support. On most fires, two or three persons will be sufficient to comprise an initial attack/monitoring team. Ideally, monitoring teams on prescribed fires should be prepared and qualified to take suppression action on fires to which they are assigned.

Priority callout will include: (1) qualified off-duty personnel when available; (2) available working personnel in Ranger, Maintenance, Interpretation, Administration and Research Divisions; and (3) other park headquarters and visitor center non-critical personnel.

The Incident Commander will request a Fire Overhead Team on project sized fires, after Chief Park Ranger approval, through the Fire Coordinator in the Midwest Regional Office. S/he will see that the Regional Office Dispatcher is notified when any wildland fire reaches Class C size (10 acres) or larger within the park.

The Incident Commander will assign released firefighters to recondition, clean up and stock fire tools and equipment immediately upon their return from a fire. S/he will also verify that all records and reports are accurate and complete, and turned in for higher level review ten days following their return from a fire.
The Park Dispatcher will log all radio traffic concerning fires. S/he will attempt to keep abreast of times, personnel and locations related to ongoing fires. Fire personnel should endeavor to keep the dispatcher current on fire logistics. The dispatcher will assign fire numbers to a fire. When fire reports are taken by phone, the dispatcher should get the following information: (1) location (natural landmarks, township, range and section); (2) size (estimate) and rate of spread; (3) character (vegetation/fuel type, crowning, ground fire, smoldering); (4) topography (flat, hillside, aspect); (5) time the fire was first observed; (6) cause, if known; (7) land ownership (NPS, USFS, MDNR, OMNR, county, corporate, private); and (8) access route.

Before the fire season, the Park Dispatcher will insure that all numbers on the fire related phone list (Appendix C) are up to date. S/he will also obtain from the Chief Park Ranger a current callout list of all available NPS personnel meeting fitness requirements and minimum firefighting qualifications. S/he will maintain the wildfire mobilization clipboard, with current information for the Incident Commander, in the dispatch office.

A Wildland Fire Status Summary will be kept by the Park Dispatcher during ongoing fires. Crews and teams will be kept informed of the status of ongoing fires by the use of a daily Wildland Fire Status Summary broadcast on park net after the morning fire weather forecast. This status summary will also be distributed to all park divisions on a daily basis.

To keep the state apprised of influences to local air quality, the Park Dispatcher will notify the MPCA office in Duluth in the event of a prescribed natural or prescribed burn (see air quality/smoke management guidelines section). This should be during the office hours of the first full day of burning. The office will then be notified every second day while the fire is burning and when the fire is declared out.

The Resource Management Specialist will be responsible for preparing revisions to this plan in consultation with the Fire Management Overhead Team. S/he assists the Chief Park Ranger with implementing the program, is a member of the Fire Management Overhead Team, and may assume assignments on ongoing fires. S/he is responsible for compiling and maintaining a park fire atlas, a fire photographic file, a general photopoint file, and data bases on fire behavior and effects relative to different community type fire groups. S/he will be responsible for training Fire Monitors to insure personnel can capably monitor prescribed fires and document fire environment and effects. S/he will be responsible for coordinating all monitoring of fire behavior, fire effects, and prescriptions. S/he is the primary user of NFDRS, FIRE BEHAVIOR, and related programs on the AFFIRMS and FIREFAMILY systems, the HP-71B calculator, and the NPS Wildland Fire Management Computer System.

The Cultural Resource Management Specialist will bring special knowledge of the park's archeological and historical resources to the Fire Management Overhead Team. S/he will coordinate all activities of fireline archeologists with the Incident Commander. S/he will provide clearances for ground disturbing activities during preparations for prescribed burns and work closely with the Prescribed Burn Boss to protect and preserve cultural resources.
The Rainy and Namakan District Rangers will be responsible for maintaining the fire management equipment in a ready condition at the park's fire caches, and in vehicles and boats. Each will oversee the collection of fire weather data for input to the AFFIRMS system at each of the park's fire weather stations.

Fixed wing aerial reconnaissance will provide the Incident Commander and ground forces with information to size up the fire and direct personnel. The Park Pilot will perform this function as well as deliver personnel and equipment to fires.

The Chief Park Naturalist will be responsible for all calls and inquiries from the news media during ongoing fires. S/he will coordinate the preparation of manuscripts by the park staff about the park's wildland fire management program.

The Administrative Officer will be responsible for procuring people, supplies, and equipment requested by the Incident Commander and maintaining financial records.

The Terrestrial Research Biologist will be responsible for conducting, coordinating, and/or reviewing research on fire effects on Voyageurs' plant and animal communities for evaluating the effectiveness of the fire management program and refining burning prescriptions. S/he is a member of the Fire Management Overhead Team and advises that team on any rare, threatened or endangered species that may be impacted by ongoing wildfires or prescribed fires. S/he will advise the Resource Management Specialist about management options related to fire. S/he will coordinate fire effects and behavior research with similar monitoring conducted by the Resource Management Specialist. S/he will be primarily responsible for the analysis of monitoring and research data related to fire, and for its publication when appropriate. S/he will assist in training park and interagency personnel about fire behavior and effects, and the park's fire research program.

Qualifications and Training

Fire Qualifications. All employees working on suppression or prescribed fire assignments within or outside of Voyageurs National Park will be qualified under the NPS Wildland Fire Qualification System to at least the Firefighter level. Fire Monitoring Teams working on suppression or prescribed fire monitoring assignments inside Voyageurs will have at least one person with a rating of Firefighter or higher, in addition to a Weather and Fire Behavior Specialist (Fire Monitor) II rating (see NPS-18, Appendix F, NPS Wildland Qualification System).

The staff at Voyageurs will be adequately qualified and available to implement this wildland fire management plan. Suppression and prescribed fire capabilities will be maintained in order to implement the management program. To fully implement the plan, there will be at least one employee present in the park with an Incident Commander Multi Resource rating or higher. In the event that there is not an Incident Commander Multi Resource on the staff, the park will revert to full fire suppression in fire suppression and conditional fire management units. However, in the prescribed natural fire management
unit, fires may be allowed to burn where no possibility of escape exists and in other areas where there are total containment possibilities. Otherwise, fires will be suppressed in these units.

**Fire Training.** Priority in fire training will be given to those employees who have wildfire and prescribed fire responsibilities as part of their position function. The park will develop in employees fire behavior management skills, with fire behavior coursework through S-390. The park will have a goal of maintaining one individual on the park's fire staff trained to the Fire Behavior for Managers (prescribed fire applications) or Fire Behavior Analyst (suppression fire applications) level, even though current red carding may not be required. The park will develop to the Single Resource Boss (Crew Boss) qualifications, sufficient permanent park personnel to meet park fire staffing needs for both suppression and prescribed fire applications. The park will develop and maintain as qualified at least one Prescribed Fire Burn Boss II.

The park will maintain a minimum of two certified instructors on the staff to provide adequate seasonal fire training. These instructors should have served successfully in the position being taught, be enthusiastic about teaching, be able to speak and relate well, and meet the instructor's prerequisites.

**Physical Fitness.** Fitness standards adopted by the NPS Wildland Fire Qualification System for specific assignments will be met by all personnel for wildfires and prescribed fires within Voyageurs National Park.

**Interagency Coordination**

A Memorandum of Understanding, a Cooperative Agreement, and participation as a member in Minnesota Incident Command System (MNICS) are in effect regarding fire suppression and prescribed fire management in Voyageurs National Park. Copies of these documents are in Appendix H which begins on page 105. The Chief Park Ranger coordinates Voyageurs' wildland fire management program with other organizations primarily by acting as the park's representative at interagency meetings.

The Memorandum of Understanding is between the Minnesota Department of Natural Resources (MDNR), Ontario Ministry of Natural Resources (OMNR), National Park Service, and the USDA Forest Service. All signatories of this Memorandum of Understanding are responsible for the suppression of fires along the United States/Ontario international boundary. This memorandum requires member agencies to take immediate steps to notify the protection agency on whose land a fire is discovered and also, if necessary, to take immediate steps to fight that fire, organize crews, etc., until the protection agency affected gets its forces on the ground to take charge. Meetings are held biennially to update and revise this Memorandum of Understanding.

The Cooperative Agreement is between the National Park Service and MDNR. That portion of the agreement dealing with wildland fire states that the signatories will cooperate to the extent possible and appropriate in joint actions on fire protection in Voyageurs National Park.

Voyageurs National Park is also a member of NIIMS in the State of Minnesota.
The Minnesota Incident Command System (MNICS) deals specifically with wildland fire management upon all lands within the state and when requested, throughout the United States. The purpose of this organization is to pool all resources, personnel, equipment, etc., of participating members in a united effort to combat natural or human-made disasters. Representative agencies include the MDNR, U.S. Bureau of Indian Affairs, USDA Forest Service, U.S. Fish and Wildlife Service, and National Park Service. Meetings are held with participating members on a quarterly basis each year.

MNICS operates with three Interagency Overhead Teams. These teams manage large fires anywhere within the state. These overhead teams consist of 21 positions except when some positions are asked to be deleted by the requesting agency because of the availability of qualified personnel locally. The MNICS Task Force recently approved the cooperative use of resources on prescribed burning. When planning a large or complex prescribed burn in Voyageurs, the park will consider the use of a MNICS overhead team to manage the burn. This practice will enhance training and experience opportunities while promoting increased interagency coordination and cooperation.
WILDFIRE MOBILIZATION

Wildfire mobilization includes all the operational procedures needed to carry out the wildfire management component of Voyageurs National Park's wildland fire management program. Actions included in wildfire mobilization include: fire prevention, presuppression, emergency presuppression, fire behavior prediction, step-up manning plan, fire detection, fire suppression, minimum impact fire suppression and rehabilitation, and fire records and reports. Prescribed natural fire mobilization and prescribed burn mobilization in Voyageurs include all the actions described below in addition to those actions described in subsequent sections of this plan.

Fire Prevention

Fire prevention includes all activities designed to reduce the number of human-caused wildfires that occur in Voyageurs. The objective of each fire prevention program is to minimize preventable fires within the park's fire management units. All fire prevention messages will explain the differences between human-caused wildfires and prescribed fires with respect to impacts on park ecosystems. All NPS and concession employees will possess a comprehensive understanding of this plan so that they can communicate to park visitors and neighbors the complementary programs for fire prevention and the use of prescribed fire. Major fire prevention activities include:

A. Pertinent signs, posters, and notices will be posted on park bulletin boards, and at visitor centers, developed campsites and day use sites, and neighboring resorts.

B. Pertinent messages will be included in park publications, such as the park folder and newspaper, camping and hiking brochures, nature trail guides, and a site bulletin describing Voyageurs' wildland fire management program, and news releases to local and regional media.

C. Pertinent messages will be included in visitor center exhibits, interpretative talks, and NPS and concession orientations for new and returning employees.

D. A slide/tape or video tape program will be developed that describes Voyageurs' wildland fire management program for use in visitor centers or for loan to educational or nonprofit groups.

E. Pertinent messages will be included in informal contacts between uniformed NPS employees and park visitors and neighbors.

F. Pertinent messages will be included in informal contacts between concession/commercial use license employees and park visitors and neighbors.
G. Programs at local schools will emphasize fire's natural role in park ecosystems and the prevention of human-caused wildfires.

H. Wood fires will be restricted to metal firegrills at developed campsites and day use sites.

I. Prior to the opening of fishing season in mid-May, the area around each firegrill will be cleared of encroaching vegetation, and branches overhanging firegrills will be limbed.

J. Patrols by park rangers, particularly during the evening, will enforce compliance with the policy of restricting wood fires to developed sites and with any open burning restrictions that may be in effect due to high fire danger.

K. Open burning at retained use and occupancy cabin sites, and on private lands within the park will require the permission of the appropriate District Ranger or the Chief Park Ranger.

L. Power lines will be checked for tree clearance from lines by local power companies and deficiencies corrected.

M. Any restrictions deemed necessary during periods of extreme fire danger will be publicized on radio and television, and in local newspapers.

N. Formal annual fire/safety building inspections will be conducted by the park's Safety Officer. The Chief Park Ranger and the Facility Manager will clear up any hazards identified during such inspections as soon as possible.

The MDNR Division of Forestry, the Chippewa and Superior National Forests, Bureau of Indian Affairs, and Voyageurs National Park have implemented a joint program that defines four classes of restrictions on open burning for northern Minnesota (see Appendix E). The rationale for this approach is to reduce confusion among their various using publics by having the same restrictions apply on all federal lands as on state lands in northern Minnesota.

Restrictions implemented within Voyageurs National Park will be accomplished via a Superintendent's Closure. The closure will be displayed in such locations and manner as to reasonably bring the restrictions to the attention of the public. News releases will also be made informing the public of the restrictions.

**Presuppression**

Fire management builds upon presuppression. Presuppression includes those things that are done in advance of fire occurrence to insure the ability of Voyageurs' fire management organization to initiate effective action, whether that is suppression (confine, contain, or control) or the evaluation and decision process for prescribed fire. Presuppression activities include: recruitment, training, planning and organization, maintaining fire equipment,
and procuring equipment and supplies. The objective of presuppression is to have a well trained and equipped fire management organization to suppress wildfires. Presuppression activities are covered by normal park operating funds.

The fire season in Voyageurs National Park begins on April 24th and extends through September 27th. These dates represent the first and last week, respectively, in which fire numbers are greater than or equal to 10 percent of peak fire activity in the park and vicinity (Haines et al. 1975). The beginning and ending dates of fire season may be modified to adjust to an early or late winter, an early or late spring, or lack of snowcover during an unusually dry winter.

Prior to and during the fire season, the following presuppression actions will be taken to ensure adequate fire preparedness. The responsible positions for meeting specific target dates are in parentheses.

**September 28 through April 25** (Chief Park Ranger, District Rangers). Qualified fire management personnel will be recruited and trained. On the job training will be conducted by the Chief Park Ranger and District Rangers. Fire management correspondence courses will be used to upgrade the skill levels of the park staff.

**January 1 through April 23** (Chief Park Ranger). All fire qualified permanent personnel will take the step test or the 1 1/2 mile run. Seasonals in all divisions who can be available for fire duty should be tested as they enter on duty; arrangements will be made by their particular supervisor.

**April 1 through September 27** (District Rangers). Fire weather stations will be set up and operational by April 1 and readings taken until the fire season ends in the fall. Ten to 14 days of readings must be taken before fire weather forecasts are given by AFFIRMS.

**April 23** (Resource Management Specialist). A cadre of fire monitors (with a minimum of Firefighter qualifications) will be available. Their training will include operation of belt weather kits, fuel typing, calculating rates of spread, estimating flame length and recognizing factors that contribute to blow-up conditions.

**April 23** (District Rangers). Inventory of all fire and fire-related equipment will be complete and a copy of the inventory sent to each agency with which the park has an agreement for interagency coordination and cooperation. Fire packs will be given to employees most likely to be called to fire duty. Ten packs will be reserved in the Fire Cache for other available fire personnel as needed.

**April 24 through September 27** (District Rangers). Fire equipment and supplies will be maintained in serviceable condition and in constant readiness. District Rangers and Area Rangers will be responsible for the servicing and first echelon maintenance of fire equipment assigned to their respective areas. Defective or worn out items will be replaced. A list of the supplies and equipment by location is contained in Voyageurs' normal presuppression inventory in Appendix D. Fire fighting equipment is located at fire caches
where NPS boats are docked or contract aircraft are moored so that, in the event boats or float planes are used, the equipment will be readily available.

April 24 through September 27 (Park Dispatcher). During fire season, all RM&VP personnel and key fire overhead will provide the Park Dispatcher with their availability during off duty hours. Each employee subject to fire duty will have a fire pack available for immediate use.

April 24 through September 27 (Park Pilot). A fixed-wing aircraft will be on contract to assist in implementing the fire management program. The aircraft will be used for aerial reconnaissance following lightning storms, transporting personnel, equipment and supplies to fires, and aerial reconnaissance of ongoing fires. Additional aircraft are available through the Superior National Forest, MDNR, and OMNR (see Appendix C).

April 24 through September 27 (District Rangers). Helipads at park headquarters, Rainy Lake and Kabetogama Narrows maintenance areas, Kabetogama Lake Visitor Center site, and Crane Lake Ranger Station will be mowed through the season to allow safe helicopter landing during emergency operations. Windsock and helipad fire extinguishers will be located prominently in adjacent buildings. These will be placed at the helipad prior to helicopter use. Windsock placement will be well away from the landing area.

June 15 (Chief Park Ranger, District Rangers). Fire training for seasonal employees will be completed.

November 1 through November 15 (District Rangers). After the fire season ends, all equipment will be winterized. Worn out or missing equipment will be replaced.

Voyageurs' nine fire caches are located at: park headquarters (International Falls), Bohman Airways (Rainy Lake), Rainy Lake Visitor Center maintenance area, Ludwig residence (Kawawia Island), Kettle Falls (Namakan boathouse), Kabetogama Narrows (building at NPS gas dock), Voyageurs Park Lodge (Kabetogama Lake), Kabetogama Lake Visitor Center maintenance area, George Sprague's residence (Sand Point Lake), George Scott Seaplane Base (Crane Lake), and Crane Lake Ranger Station. Each of these caches is equipped with: a fire pump, 700-1000 feet of 1 1/2 inch fire hose, and hose nozzles, adapters and couplings, etc.; and enough tools to equip a five man crew with shovels, pulaskis, axes, backpack pumps and other necessary fire fighting equipment. The above equipment is also located on two ranger patrol boats in the Rainy District and on four boats in the Namakan District (see Appendix D). The Superior National Forest's Ely Fire Cache is available for backup (see Appendix C).

**Emergency Presuppression**

Emergency presuppression describes actions taken to provide extra coverage during extreme or unusual fire danger caused by strong and/or dry winds, dry thunderstorms, or prolonged local or regional drought. Appropriate activities for Emergency Presuppression funds (Primary Work Element 343 (PWE 343)) include hiring of emergency temporary firefighters, placing existing staff on
extended tours of duty, increasing or initiating special detection operations, and leasing initial attack transportation, such as aircraft and helicopters. All of these actions are aimed at ensuring prompt response by adequate forces should fires occur (see NPS-18, Chapter 21, Fire Related Administration).

The park's authority to expend Emergency Presuppression funds from PWE 343 is tied to the NFDRS Burning Index (BI), 90th percentile break point and approval of pre-identified expenditures in Voyageurs' Step-up Manning Plan (Table 3). Authorization to expend PWE 343 beyond the expenditures pre-identified in the step-up plan will be obtained from the Regional Fire Coordinator who will analyze the justification presented. PWE 343 may also be used for daily monitoring of fires within prescribed natural fire units in order to remain cognizant of current fire behavior and potential for making daily suppression/no suppression analyses. The park will establish the budgetary PMP, and do a memorandum to the Y14 file justifying each utilization of an Emergency Presuppression account (NPS-18, Chapter 21, page 9). Emergency expenditures will be initiated by the RM&VP Division with project documentation completed and distributed by the Administrative Division.

Fire Behavior Prediction

Fire behavior prediction in Voyageurs will use several Northern Forest Fire Laboratory System (NFFLS) fuel models (Albini 1976, Anderson 1982, Rothermel 1983, Susott and Burgan 1986). Fuels in the park can best be divided into four broad categories: conifer, mixed conifer/hardwood, hardwood, and wetland species. Live fuel flammability in the park is generally limited to conifer species. These species affect fire spread by torching, spotting and crowning.

Conifer. Conifer stands found in lowland sites (generally black spruce, balsam fir and white-cedar) are best described by fuel model 8 and normally act as a fuelbreak. During very dry years, however, fire spread can occur and organic soils can pose a mop-up problem as well as add to fuel availability. Upland stands of jack pine, red and white pine, and spruce-fir are most flammable while in immature stands. High flammability and the presence of ladder fuels can cause torching and intense crowning, more representative of fuel model 4. In well-stocked mature stands, however, needle litter is the main carrier of fire with less of a fuel ladder in the pine species to carry fire to the crowns; fuel models 8 and 9 are representative. Overmature stands and stands damaged by windthrow or insect infestations can contain large amounts of dead and down fuels and when present on shallow soil sites or during dry years can be susceptible to high intensity fires; best described by fuel model 10.

Mixed Conifer/Hardwood. Mixed conifer/hardwood stands include aspen, birch, spruce and fir in any combination. Depending upon fuel loading, stands of mixed conifer/hardwood are represented by fuel models 8 or 10. Surface and/or crown fires can occur in any of these types. Spruce-fir areas provide ladder fuels with low-hanging branches and birch bark provides the ideal vehicle for spotting long distances. Periodic insect infestations create jackpots of dead aerial and surface fuels. Mop-up efforts can be hampered by the heavy fuels and soil conditions.
**Hardwood.** During the leaf-off period, dead grass, leaf litter and other surface fuels provide the primary means for fire spread in hardwood stands. Increased solar radiation and unrestricted wind movement accelerate the drying of dead and down fuels. Fires are normally surface fires representative of fuel model 2. When hardwood leaves are present, however, surface fuels are generally unavailable due to shading and the resultant higher fuel moistures. At this time, fuel model 8 is more representative.

**Wetland.** Wetland includes such areas as marsh, meadow, slough, stream course, leatherleaf bog, shrub carr, and black spruce bog. Fires rarely occur during the summer unless the water table is low, thus allowing ground fire in the organic soil or surface fire in fine fuels. Cured marsh grasses can support running fire in the spring and fall. For fires burning in marsh, meadow, slough, stream course, leatherleaf bog, or shrub carr communities, fuel models 2 or 3 will be used. For fires burning in black spruce bog, fuel model 9 will be used to predict rate of spread and model 5 to determine reaction intensity as described by Norum (1982).

Valuable references for forecasting prescribed burning weather and predicting fire behavior in the park are Sando (1969), Roussopoulos (1978), Albini (1979), and Brown and Simmerman (1986). Adjustment and adaptation of these stylized fuel models will be necessary before fire behavior can be accurately forecast (Norum 1982, van Wagendonk and Botti 1984, Haines et al. 1986).

**Step-up Manning Plan**

The National Fire Danger Rating System (Deeming et al. 1977) indicates the potential for and severity of a wildfire occurrence. The Burning Index (BI) for NFDRS fuel model G will be used to indicate fire danger in the park. As fire danger increases, the park fire management organization's level of preparedness will increase. Preparedness actions that are defined by manning classes tied to the burning index are contained in the park's Step-up Manning Plan in Table 3. Each of the manning classes in Table 3 is progressive and includes the previous actions.

The burning index ranges in Table 3 were derived from a FIREFAMILY computer analysis of 30 years of data from the Superior National Forest's Ely Fire Weather Station using NFDRS fuel model G. The burning index ranges used for the park and the forest are therefore the same, which will greatly facilitate interagency cooperation. Ely is located 40 miles southeast of Crane Lake in the same boundary waters ecosystem as the park but about 250 feet higher in elevation.

**Fire Detection**

The capability of detecting a wildfire early is the key to all suppression activities in the park and vicinity. All initial reports of fires will be immediately reported to the Chief Park Ranger or that day's Incident Commander. Complete information will be obtained from informants, including their names and addresses, and relayed to the Chief Park Ranger. All reports will be thoroughly checked out. The following detection methods will be used:
TABLE 3. Step-up Manning Plan for Voyageurs National Park. Each of the following manning classes is progressive and includes the previous actions. NFDRS fuel model G was used to develop this step-up plan.

<table>
<thead>
<tr>
<th>Manning Class</th>
<th>Burning Index (BI)</th>
<th>Actions to be Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (I)</td>
<td>0 - 12</td>
<td>Specify normal tours of duty and number of initial attack personnel. Fire Danger Rating notices placed on park bulletin boards, and at visitor centers and local resorts. Normal presuppression operations.</td>
</tr>
<tr>
<td>Moderate (II)</td>
<td>13 - 23</td>
<td>All initial attack equipment ready at all times. Pumpers, pumps, and equipment checked weekly. Initiate an afternoon fixed-wing reconnaissance flight for several consecutive days after a severe lightning storm or a period of unusually heavy visitor use.</td>
</tr>
<tr>
<td>High (III)</td>
<td>24 - 46</td>
<td>Dispatch on duty 0800-1700 hours. Initiate one afternoon fixed-wing reconnaissance flight per day. If the predicted or actual lightning activity level is 4, 5 or 6, automatically move to Manning Class IV. If a high visitation period, such as a holiday or special event, is determined to pose exceptional human-caused risk of wildfires, automatically move to Manning Class IV.</td>
</tr>
<tr>
<td>Very High (IV)</td>
<td>47 - 54</td>
<td>Extend personnel (Incident Commander and four firefighters) work hours as necessary. Initiate two fixed-wing reconnaissance flights per day.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manning Class</th>
<th>Burning Index (BI)</th>
<th>Actions to be Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High (IV) 47 - 54</td>
<td>All RM&amp;VP personnel with fire gear in possession on routine duty. Line up additional personnel as potentially needed for park fire suppression (consider paid standby for these personnel). If lightning activity is present, extend dispatch work hours as necessary. Contact Superior National Forest fire dispatcher in Duluth, MDNR fire dispatcher in Grand Rapids, and OMNR fire dispatchers in Thunder Bay and Dryden and ascertain manning classes and availability of fixed-wing aircraft, water bombers, and helicopters. Notify Midwest Regional Office of manning class status.</td>
<td></td>
</tr>
<tr>
<td>Extreme (V) 55+</td>
<td>Place Incident Commander and two squads on standby (paid). Assure weekend coverage. Close the park to the use of open fires and smoking. Closure of selected areas of the park to all visitor use will be considered. Display Extreme Fire Danger and fire closure notices on park bulletin boards, and at visitor centers and local resorts. Publicize fire danger and fire closures on radio and television, and in local newspapers. Include warnings in all interpretative programs. Notify USFS, MDNR, and OMNR fire dispatchers of park's Manning Class V status.</td>
<td></td>
</tr>
</tbody>
</table>
Aerial Detection Flights. Due to limited visibility from the ground, aerial flights will be the primary means of detecting lightning or human-caused fires in the park and vicinity. When the park's Manning Class is II (Table 3), initiate an afternoon fixed-wing reconnaissance flight for several consecutive days after a severe lightning storm or a period of unusually heavy visitor use. When the Manning Class is III, one afternoon aerial reconnaissance flight will be flown each day. When the Manning Class is IV or higher, two aerial reconnaissance flights will be flown each day. Areas of lightning activity will be checked for 4 consecutive days after the lightning activity. Administrative or other detection flights may meet this requirement when the park's Manning Class is II or III. Additional flights may be made during periods of limited visibility, high fire danger, or after periods of lightning activity.

Fire Detection Patrols. Fire detection patrols over and above regular ground patrols by park rangers on roadways, lakes, and trails will be made during and after lightning activity or any other fire emergency.

Other Agency Detection. The Superior National Forest, MDNR, and OMNR often conduct aerial detection flights over their lands adjacent to Voyageurs National Park. The MDNR also staffs fire lookout towers during critical fire danger periods. Through agreements with the Superior National Forest, MDNR, and OMNR (see Appendix G) their lookouts and fire detection flights will report any fires to the park that are detected on park lands. NPS fire detection flights over our mutual boundaries will do the same.

Other Detection. Other park and concession employees, park visitors, private and retained use and occupancy cabin users, park neighbors, and commercial, charter and private pilots frequently detect and report fires.

In order to establish an effective communications network for reporting fires within the park and vicinity, the business telephone numbers at park headquarters, visitor centers, and ranger stations, and the home telephone numbers of the Superintendent, Chief Park Ranger and District Rangers, and locations of fire caches will be given to: all cooperating fire agencies and cabin owners where fire caches are located; park concessioners; Continental Telephone offices in Orr, Cook, and International Falls; resort owners; Northwest Airlink; Bohman Airways; and Einarson Brothers Flying Service (see Appendices C and D).

Fire Suppression

Suppression includes all actions to extinguish or limit the growth of fires, regardless of the strategies and tactics chosen. All fires in the park that are not classified as prescribed fires are wildfires, and will receive prompt, safe, cost effective suppression actions. Three intensities of suppression strategy are available to fire managers. In order of increasing intensity of actions on a fire, they are: confine, contain, and control. If the initial attack on a wildfire fails, the situation will be analyzed and sufficient strength organized to control the wildfire as soon as possible.

Fire Dispatch. Wildfires reported to the Park Dispatcher will be communicated to that day's Incident Commander. The Incident Commander will be responsible
for initial attack and will determine what type of response is appropriate for a reported fire. If a District or area Ranger takes initial action on a class "A" wildfire, it is imperative that the Incident Commander be promptly advised of the situation and action taken.

The Park Dispatcher will advise the Chief Park Ranger, District and area Rangers, Resource Management Specialist, Cultural Resource Management Specialist, Resource Management Biologist, Terrestrial Research Biologist, and Assistant Superintendent about the fire. The Dispatcher will log all radio and telephone messages concerning the fire, keep a record of personnel and equipment sent to the fire, and log all pertinent times, such as time of fire report, initial at dock dispatch, and when the fire was staffed, controlled, and declared out.

In the event of a major fire or a multi-fire situation, the Incident Commander will assume the dispatch function entirely, set priorities for use of available personnel and aircraft, staffing fires with the highest threat potential first, and will make every effort to place an initial attack/monitoring team or air tanker drop on all wildfires in the shortest time possible. Personnel will be flown into one of the interior lakes by the Park Pilot if the fire is remote from the shore of a major lake.

**Initial Attack.** The Incident Commander will dispatch an initial attack/monitoring team to the fire and determine, in consultation with the Resource Management Specialist, if a fire is a prescribed natural fire or a wildfire that must be suppressed. These forces will be equipped with all required personal protective equipment (PPE), i.e.: hard hats, gloves, 8" lace leather boots with lug soles, nomex shirts and trousers, and fire shelters. Personnel using portable pumps will wear eye protection. Personnel using chainsaws will wear eye protection, ear plugs and chaps. Initial attack forces will stay with the fire until it is declared out or they are relieved by the Incident Commander.

The cause of ignition of every fire will be determined, reported and properly archived using the Wildfire Cause Determination Handbook produced by the National Wildfire Coordinating Group (NWCG) as a guide. If the fire was caused by lightning, the decision making process will follow the decision flow chart in the prescribed natural fire section of this plan (Figure 2). If the fire, on the other hand, was human-caused, the decision making process will proceed as follows.

The Incident Commander will be responsible for all actions taken on the fire from size-up to demobilization. His/her decisions will be accepted and his/her requests serviced as quickly as possible. After arriving on the wildfire, the Incident Commander will inform the Chief Park Ranger of the size of the fire, rate of spread, fire potential, and personnel and equipment requirements. The Chief Park Ranger may relieve or replace an Incident Commander on wildfires for which s/he is responsible. As fire complexity increases, the initial attack Incident Commander will be replaced by a more qualified Incident Commander. Depending upon fire behavior and potential complexity, this second organization may be replaced by another Incident Commander and staff personnel following the guidelines in chapter 10, pages 15 through 19 in the NWCG Fireline Notebook 410-1, or as subsequently revised.
Extended Attack. Planning and preparation for suppression actions within Voyageurs has been done with the goal of establishing a fire management organization and procedures that can control 90 percent of the historical fire occurrence in the park by the park staff. Control of the remaining 10 percent of fire occurrences, however, will require assistance from adjacent cooperating agencies, or regional and national fire organizations as outlined in the park Step-up Manning Plan (Table 3).

If a fire threatens to exceed the initial attack capabilities of the park and local MNICS cooperating agencies, an Interagency Fire Management Overhead Team will be immediately requested by the Incident Commander or Chief Park Ranger through the NPS Midwest Region Dispatcher. The amount and type of assistance needed and requested will depend on the present and expected complexity of the fire situation, and be documented on a Resource Order Form (NFFS-1470). These needs will be identified by completing the Fire Complexity Assessment checklist (NPS-18, Chapter 14, Exhibit 1) when the fire escapes initial attack.

The procedure for managing the transition between Incident Management Teams is found in NPS-18, Chapter 14, Exhibits 2 and 3. The transfer of responsibility for suppression actions on the fire will be done officially ONLY through the execution of a limited delegation of authority by the Superintendent or designated acting alternate.

If the fire escapes initial attack, an Escaped Fire Situation Analysis will be performed daily to accurately describe the current fire activity, and display management objectives and other data pertinent to suppression actions on the fire. This will be performed by both the park staff and the local Incident Commander in charge of the fire at the moment. A similar analysis will be completed daily by the Fire Management Overhead Team to guide subsequent activity throughout the fire. The format and procedures for completing the Escaped Fire Situation Analysis are found in NPS-18, Chapter 14, Exhibit 4.

The USFS Region 9 Fire Cache at the Superior National Forest's Ely Service Center, as part of the National Fire Cache System, is maintained and stocked to meet the resource needs of wildfire suppression activities on 2 project fires within Region 9 for the first 36 hours. When a fire occurs in the park and additional supplies and equipment are needed, a Resource Order Form (NFFS-1470), will be used to request these materials through the NPS Midwest Region Dispatcher. This form is designed to be transmitted verbally over the phone (see NPS-18, Chapter 21, Fire Related Administration).

Minimum Impact Fire Suppression and Rehabilitation

Fire management activities within the park will be carried out in a manner that minimizes impacts to Voyageurs natural and cultural resources. Fire camp facilities, when practical, will be located outside of the park's natural and historic zones. Of primary importance is the need to impart upon suppression forces a "light hand on the land" policy. Suppression forces will choose methods and equipment commensurate with suppression needs and chosen strategy of confine, contain, control, or a combination which least alter the landscape or disturb park resources. This policy is an attempt to take the national
Park ethic into account in fire fighting practices; it is not a reason to relax normal safe firefighting practices. Some examples of minimum impact firefighting include:

A. Use water instead of fire retardent chemicals in bombers.

B. Cold trail the fire-edge when practical.

C. Wetlines, or environmental lines, will be used wherever possible in lieu of handline construction if water and pumps are available. Waterbars will be constructed on handlines on steep slopes.

D. Utilize soaker hose or foggers in mop-up. Avoid "boring" and hydraulic action on shallow soils.

E. Firelines will be kept to the minimum width necessary to allow backfiring or safe blackline to be created. Utilize natural barriers wherever possible to avoid "tunnel effect."

F. If a mineral soil line is needed, utilize fireline explosives whenever possible instead of a bulldozer.

G. Decisions on suppression practices will be made by the Incident Commander. Utilize their creativity.

H. Minimize tree falling. If necessary to fall trees in visually sensitive areas (i.e., trails, portages, lakeshores), utilize "slant cut" technique to face cut away from view, or recut later during rehabilitation activities.

I. Archeological protection measures will be taken to protect cultural resources.

J. Scatter or remove debris as prescribed by the Incident Commander.

K. All firelines, spike camps, or other disturbance in visually sensitive areas will be rehabilitated to maintain a natural appearance.

L. After the fire emergency is over, transport of personnel, equipment, and trash out of the park will be consistent with national park resource management objectives.

Rehabilitation will only be required where the impacts of the fire itself or of the associated suppression actions are significant and can be mitigated. In no case will action be taken in the name of rehabilitation which further compounds the situation. If the minimum impact suppression actions outlined above are used, then only minimal rehabilitation will be necessary. The location of lines to avoid the need for falling and bucking of trees, use of wet lines, use of streams and other firebreaks, all contribute toward that goal. Park management will play an active role in suppression actions to see that this happens. The Delegation of Authority to Incident Commanders and the
Escaped Fire Situation Analysis are key facets in this process.

Fires will not be seeded. Residual seed and sprouting from surviving rootstalks will provide natural revegetation. That is far superior to any introductions from even "native" seeds. Seed bearing materials cut alongside the line can be scattered as a mulch that guarantees indigenous seed. It has been proven that seeding of exotic, aggressive annual grasses depletes critical soil moisture and may actually deter or delay recovery of the native vegetative cover.

Rehabilitation of firelines and other work to control erosion possibilities will commence as soon as possible, even before the fire may be declared out. This is especially important if existing equipment and personnel still on the fireline are not being fully utilized in mop-up operations. The funding of the direct costs of rehabilitation is through the Emergency Fire account, PWE-344 (NPS-18, Chapter 21, Fire Related Administration).

Fire Records and Reports

The following old records presently in Voyageurs will be held in the park as permanent historic resource management records until further notice on their conversion to microfiche records: fire reports (10-400, DI-1201, and TF-1202), fire atlas, fire weather records, fire equipment inventories, historic records, and all other maps or records pertinent to fire management.

A fire situation report will be made each day by 1000 hours to the NPS Midwest Region Dispatcher in all cases where fires have occurred and/or very high or extreme fire danger exists in Voyageurs (Step-up Manning Classes IV and V). The Park Dispatcher will use AFFIRMS (Administrative Forest Fire Information Retrieval and Management System) for communicating these daily situation reports to the regional office.

Daily fire weather records from Voyageurs' permanent and temporary fire weather stations will be entered into AFFIRMS by 1400 hours each day by the Park Dispatcher. All base station readings will provide the daily information required to calculate the prescribed indices under the National Fire Danger Rating System, and fire behavior parameters under the Northern Forest Fire Laboratory Fire Behavior System. All data entered directly into AFFIRMS will be automatically archived on the National Fire Weather Data Library (Finklin 1983, Bradshaw and Fischer 1984). The resultant time series data base of fire weather provides management a powerful foundation to assess the significance of current fire danger in comparison to historic trends using FIREFAMILY (Main et al. 1982).

Each wildfire, and prescribed and research fire within Voyageurs National Park will have an Individual Fire Report (TF-1202) prepared and archived to document the fire. The instruction package for appropriate reporting procedures is found in NPS-18, Appendix E. Additional records that will be archived for each wildland, prescribed and research fire are the Fire Complexity Assessment checklist (NPS-18, Chapter 14, Exhibit 1) and the Escaped Fire Situation Analyses (NPS-18, Chapter 14, Exhibit 4).
PRESCRIBED NATURAL FIRE MOBILIZATION

Prescribed natural fire mobilization includes all the operational procedures needed to carry out the prescribed natural fire management component of Voyageurs National Park's wildland fire management program. Prescribed natural fire mobilization in Voyageurs includes all the actions described below in addition to the wildfire mobilization actions described in the section above. Actions included in prescribed natural fire mobilization include: natural fire prescriptions, fire monitoring, and escaped fire situation analysis. Actions included in wildfire mobilization include: fire prevention, presuppression, emergency presuppression, fire behavior prediction, step-up manning plan, fire detection, fire suppression, minimum impact fire suppression and rehabilitation, and fire records and reports. Air quality/smoke management concerns are discussed in a subsequent section of this plan.

Natural Fire Prescriptions

Fires ignited by lightning in Voyageurs National Park's prescribed natural fire management unit will be allowed to burn unimpeded by suppression efforts if they satisfy the prescription criteria contained in Figure 2 each day. Fires ignited by lightning in the park's conditional fire management units will be allowed to burn unimpeded by suppression efforts if they satisfy the prescription criteria contained in both Figure 2 and Table 4 each day. Fires ignited by lightning in the park's fire suppression units will be confined, contained, or controlled according to the procedures in the wildfire mobilization section of this plan.

Lightning fires that are allowed to burn unimpeded by suppression efforts will be continually monitored and evaluated from the time of discovery until they are declared out to ensure that they remain within prescription. Lightning ignitions that do not satisfy these prescription criteria and ongoing prescribed natural fires, or portions thereof, that exceed prescription will be reclassified as wildfires and confined, contained, or controlled according to the procedures in the wildfire mobilization section of this plan. If they remain within prescription, some fires may be allowed to burn for as long as several months or longer without direct control. It is important that the public understand we are not letting fires burn indiscriminately, but that fires are managed under strict predetermined criteria. The fire monitoring system described below will ensure that these predetermined criteria are met and keep a close watch on a fire's progress.

The decision flow chart for evaluating lightning-caused fire starts in the park (Figure 2) is set up to be used with NFDRS fuel model G. An energy release component (ERC) value of 38 was selected as the cut-off point in this chart. Local experience on the Superior National Forest has demonstrated that beyond an ERC of 38, fire intensity increases dramatically and fires can no longer be confined, contained, or controlled by hand crews. The ERC cut-off point in Figure 2 would be somewhat different with another NFDRS fuel model.
Figure 2. Decision flow chart for evaluating lightning-caused fire starts occurring within Voyageurs National Park's fire management units.

NFDRS fuel model G was used to develop this flow chart.

<table>
<thead>
<tr>
<th>Decision Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision</td>
</tr>
<tr>
<td>Action</td>
</tr>
<tr>
<td>FIRE START</td>
</tr>
<tr>
<td>Lightning-caused fire ——— No ———&gt; Appropriate Suppression Response</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Fire suppression unit ——— Yes ———&gt; Appropriate Suppression Response</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Regional and/or national fire situation stressing interagency resources ——— Yes ———&gt; Appropriate Suppression Response</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Threat to life and property ——— Yes ———&gt; Appropriate Suppression Response within the management unit</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Threat to life and property ——— Yes ———&gt; Appropriate Suppression Response outside the management unit</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Ongoing 10+ acre fires within the park more than 5 ——— Yes ———&gt; Appropriate Suppression Response</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Energy release component (ERC) over 38 for last three days ——— Yes ———&gt; Appropriate Suppression Response</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Existing fire weather and/or fire behavior are acceptable ——— No ———&gt; Appropriate Suppression Response</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Forecasted fire weather and/or fire behavior are acceptable ——— No ———&gt; Appropriate Suppression Response</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Projected fire perimeter location is acceptable ——— No ———&gt; Appropriate Suppression Response</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Continued on next page</td>
</tr>
</tbody>
</table>
Figure 2. Continued: Decision flow chart for evaluating lightning-caused fire starts occurring within Voyageurs National Park's fire management units.

Decision

Continued from previous page

Smoke management conditions ------No------> Appropriate Suppression Response are favorable

Yes

Equipment and personnel ------No------> Appropriate Suppression Response available to allow for an increase in fire size and complexity

Yes

If the fire is burning within ------No------> Appropriate Suppression Response a conditional fire mgmt unit, is it within the prescription parameters in Table 4 ??

Yes

Unit Boundary Threatened ?? ------Yes------> Appropriate Suppression Response

No

Prescribed Natural Fire ------Yes------> Monitor and prepare Escaped Fire Situation Analysis
Fire Monitoring

All prescribed natural fires and prescribed burns, as well as wildfires, will be monitored. Information gathered during fire monitoring is needed to: keep fires within predetermined criteria, know when to take suppression action, protect human life and/or property, and increase our knowledge of fire effects on the park ecosystem. A fire monitoring team will observe the fire, assess its potential and provide a historical record. 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 community composition and structure, etc.). Photographs will be taken. Weather readings will be made periodically with a belt weather kit at the fire site. Forms for recording data will be supplied to monitors. A Fire Monitoring Guide will be developed by the Resource Management Specialist. It will describe in detail all aspects of the park's monitoring program. The guide will be incorporated as a detached appendix to this plan.

Prescribed natural fires that are less than 10 acres in size, not crowning generally, and have low potential for rapid spread may be monitored completely from the air. Fires greater than 10 acres will be monitored from the air and from the ground daily or more often as dictated by fire intelligence, historical record, visitor safety, and prescription refinement purposes. High priority for monitoring will be large fires, multiple fires, unusual weather or fuel situations, and fires that threaten to leave the fire management unit. Any fire, regardless of size, may be monitored from the ground. In some instances where fires may be inaccessible, cursory monitoring may be done from an accessible viewpoint, fire tower or aircraft.

Monitors will be assigned to the fire by the Incident Commander. The Resource Management Specialist will be responsible for coordinating all monitoring of fire behavior, fire effects, and prescriptions. Since the primary purpose of Fire Monitors is to assess fire potential and predict fire behavior, they will remain on the fire until they are relieved of duty or when the fire is declared out. The size of the monitoring crew will be determined by the fire manager and will depend on such factors as fire size, location, resource values at risk, potential of fire to escape the fire management unit, current and predicted fire behavior, and number of fires burning in the park, but will minimally be comprised of two individuals for safety reasons.

Fire monitors will receive training commensurate with the type of fires to which they will be assigned. A monitoring crew will minimally be comprised of two individuals for safety reasons, one of which shall be qualified according to the NPS Wildland Fire Qualification System as a Weather and Fire Behavior Specialist (Fire Monitor) II, capable of operating belt weather kits, fuel typing, calculating rates of spread, estimating flame length, and recognizing factors which contribute to blow-up conditions. If a portion or all of a prescribed natural fire or prescribed burn is declared a wildfire to be suppressed, Fire Monitors should not aid in the operation, except possibly in determining line placement, unless ordered to do so by the Incident Commander or Prescribed Burn Boss; their function is to gather fire intelligence.

Each prescribed natural fire and prescribed burn within Voyageurs will have
all the Fire Monitoring Forms completed by the Fire Monitoring Team prior to, during, and after the fire, archived in the park's fire records.

A long-term program of fire behavior and effects monitoring and research in Voyageurs is described in detail in the fire monitoring and research section of this plan.

Escaped Fire Situation Analysis

As part of the daily report on the actions of a prescribed natural fire within Voyageurs, a formal Escaped Fire Situation Analysis (EFSA) will be made. The EFSA will be written during the first burning period of the fire and then updated each day if conditions change. The purpose of the EFSA on a prescribed natural fire is twofold. It ensures that all necessary evaluations of the fire are completed, and it will also be complete and accurate if the fire must ever be declared a wildfire and the transition to a suppression strategy undertaken. In such an event, a formal EFSA is required of the Superintendent as part of the delegation of authority to the Incident Commander for suppression. The transition will be smoother and more cost effective with an updated EFSA readily on hand. If the transition to suppression is never required, the daily EFSA's will be kept as part of the permanent record of the prescribed natural fire. Instructions for completing EFSA reports are contained in NPS-18, Chapter 14, Exhibit 4.
Prescribed burn mobilization includes all the operational procedures needed to carry out the prescribed burn component of Voyageurs National Park's wildland fire management program. Prescribed burn mobilization in Voyageurs includes all the actions described below in addition to the wildfire mobilization actions described above. Actions included in prescribed burn mobilization include: the park's annual prescribed burn program, prescribed burn plans, prescribed burn units and objectives, burn prescriptions, prescribed burn operations, documentation and reporting, and burn critiques. Actions included in wildfire mobilization include: fire prevention, presuppression, emergency presuppression, fire behavior prediction, step-up manning plan, fire detection, fire suppression, minimum impact fire suppression and rehabilitation, and fire records and reports. Air quality/smoke management concerns are discussed in the next section of this plan.

The prescribed burning facet of wildland fire management in Voyageurs deals with the refined application of fire. The opportunity for skillful use of fire carries with it the liability of misuse. Park management is responsible for prescribed burns and, given prudent safeguards, can foster their constructive use. Three safeguards will be required to successfully implement a prescribed burn program in the park: (1) prescriptions and burn plans will be written by qualified personnel; (2) they will be reviewed and approved by a designated person qualified to verify the proposal in regard to fire behavior, safety, and defined objectives; and (3) they will be conducted by a qualified Prescribed Burn Boss with go/no go decision authority. To the extent feasible, prescribed burns will be conducted with the direct aid and cooperation of the agency or agencies whose lands are contiguous with the burn unit.

**Annual Prescribed Burn Program**

Prescribed burning will be used each year in Voyageurs' fire suppression and conditional fire management units to achieve resource management objectives approved in this plan. Prescribed burning may be used to achieve approved resource management objectives in Voyageurs' prescribed natural fire management unit. Voyageurs' annual prescribed burn program will be prepared by the Resource Management Specialist with assistance from the Fire Management Overhead Team. This program will consist of all the prescribed burns to be conducted during the year. The overall program will be developed by February 1 and submitted for Regional Director approval by the Superintendent before February 15. Approval of the annual prescribed burn program by region does not constitute final approval of any burn.

All burn units for one season will normally be contained within one area of the park, providing prescriptions can be met. If prescriptions cannot be met, burning will be done in predetermined areas that are in prescription. The Chief Park Ranger will designate a Prescribed Burn Boss for each burn. Each Prescribed Burn Boss will conduct a field reconnaissance of the proposed burn site with members of the Fire Management Overhead Team to discuss special
problems, conditions, objectives, and firing techniques. At the completion of
the reconnaissance, the Prescribed Burn Boss and the Resource Management
Specialist will prepare a prescribed burn plan.

**Prescribed Burn Plans**

The prescribed burn plan is a site specific action plan which describes the
purpose, objectives, prescription, and operational procedures needed to
properly prepare for and safely conduct a fire treatment. A successful
prescribed burn in Voyageurs is one that is executed safely, is burned under
suitable control, accomplishes the treatment prescribed, and serves to attain
the resource management objectives for the area treated. To do so requires
rigorous planning. The factors to be considered and the four-part procedure
to be followed in preparing a prescribed burn plan are contained in NPS-18,
Chapter 18, Prescribed Fire, pages 3 through 11.

**Prescribed Burn Units and Objectives**

Since Voyageurs' fire management program will suppress many of the lightning-
caused fires in the park's conditional fire management units and all lightning
fires in fire suppression units, a supplemental prescribed burn program is
needed within these units to approximate Voyageurs' 100 year fire cycle. The
objective of Voyageurs' prescribed burn program is to duplicate to the maximum
extent possible the frequency and intensity of natural fires during times and
in places where safety and control can be assured. In some vegetation/fuel
types, however, surface fires will substitute for crown fires that once
destroyed whole stands of trees. This program will create and maintain a
mosaic of burned and unburned areas that will approximate natural conditions.
Without a program of supplemental prescribed burns, succession will inexorably
replace Voyageurs' fire-maintained ecosystem with an unnatural mosaic of late
successional stage plant and animal communities.

Voyagers' conditional fire management and fire suppression units have been
subdivided into 41 prescribed burn units (Figure 1 and Table 5). Each burn
unit consists of an area that could be prescribed burned at one time as one
unit. The boundaries of these burn units are natural barriers to fire spread
or at least provide a reasonable chance for fire containment within the burn
unit. These units are delineated based on the presence of large expanses of
open water, interior lakes, beaver ponds, wetlands, bogs, stream channels,
major changes in vegetation/fuel types, and roads that will contain fires
within unit boundaries. In many instances along the park's southern boundary,
fire control lines will have to be constructed prior to burning to prevent
prescribed fires from escaping onto adjacent lands.

Prescribed burns will be ignited in designated burn units within specified
weather and fuel moisture parameters (Table 4). Prescribed burning may be
conducted anytime during the spring, summer, and fall whenever a burn unit is
within prescription. Prescribed burn units will be ignited on a rotational
schedule of about once every twenty years (Table 5). Two units will therefore
be burned each year. The schedule of ignitions in Table 5 will undoubtedly
change in the future as portions or all of some burn units are burned by
lightning and unplanned human-caused fires. Additional factors, such as local
### Table 4. Preliminary prescriptions for prescribed natural fires and prescribed burns within Voyageurs National Park's conditional fire management units, and prescribed burns within the park's fire suppression units (adapted from van Wagendonk 1974).

HARDWOODS (LEAVES ABSENT), BLACK SPRUCE BOG, MARSH, MEADOW, SLOUGH AND STREAM COURSE

<table>
<thead>
<tr>
<th>(NFFLS Models 2 and 3) (NFDRS Models C and N)</th>
<th>Head Fires*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 2</td>
</tr>
<tr>
<td>Air Temperature (deg. F)</td>
<td>30-75</td>
</tr>
<tr>
<td>Relative Humidity (%)</td>
<td>30-65</td>
</tr>
<tr>
<td>Midflame Wind Speed (mph)</td>
<td>0-4</td>
</tr>
<tr>
<td>1-Hour Time Lag Fuel Moisture (%)</td>
<td>6-10</td>
</tr>
<tr>
<td>10-Hour Time Lag Fuel Moisture (%)</td>
<td>8-12</td>
</tr>
<tr>
<td>100-Hour Time Lag Fuel Moisture (%)</td>
<td>10-20</td>
</tr>
<tr>
<td>1000-Hour Time Lag Fuel Moisture (%)</td>
<td>15-30</td>
</tr>
<tr>
<td>Rate of Spread (ft/min)</td>
<td>2-18</td>
</tr>
<tr>
<td>Flame Length (ft)</td>
<td>1.7-4.5</td>
</tr>
</tbody>
</table>

*Backing fires may be used when midflame wind speed is less than or equal to 1 mile per hour.
Table 4. Continued: Preliminary prescriptions for prescribed natural fires and prescribed burns within Voyageurs National Park's conditional fire management units, and prescribed burns within the park's fire suppression units.

LOWLAND BLACK SPRUCE, SPRUCE-FIR, WHITE-CEDAR, ASPEN-BIRCH (LEAVES PRESENT)

<table>
<thead>
<tr>
<th>(NFDRS Model H, NFFLS Model 8)</th>
<th>Head Fires</th>
<th>Backing Fires</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air Temperature (deg. F)</strong></td>
<td>30-75</td>
<td>40-90</td>
</tr>
<tr>
<td><strong>Relative Humidity (%)</strong></td>
<td>30-65</td>
<td>20-40</td>
</tr>
<tr>
<td><strong>Midflame Wind Speed (mph)</strong></td>
<td>4-9</td>
<td>0-4</td>
</tr>
<tr>
<td><strong>1-Hour Time Lag Fuel Moisture (%)</strong></td>
<td>6-8</td>
<td>3-8</td>
</tr>
<tr>
<td><strong>10-Hour Time Lag Fuel Moisture (%)</strong></td>
<td>9-13</td>
<td>5-10</td>
</tr>
<tr>
<td><strong>100-Hour Time Lag Fuel Moisture (%)</strong></td>
<td>10-20</td>
<td>7-12</td>
</tr>
<tr>
<td><strong>1000-Hour Time Lag Fuel Moisture (%)</strong></td>
<td>15-30</td>
<td>10-20</td>
</tr>
<tr>
<td><strong>Rate of Spread (ft/min)</strong></td>
<td>2-3</td>
<td>0-1</td>
</tr>
<tr>
<td><strong>Flame Length (ft)</strong></td>
<td>1.0-1.5</td>
<td>0.4-1.0</td>
</tr>
</tbody>
</table>
Table 4. Continued: Preliminary prescriptions for prescribed natural fires and prescribed burns within Voyageurs National Park's conditional fire management units, and prescribed burns within the park's fire suppression units.

UPLAND JACK PINE, RED PINE, WHITE PINE, AND SPRUCE-FIR

<table>
<thead>
<tr>
<th>(NFDRS Model U, NFFLS Model 9)</th>
<th>Head Fires</th>
<th>Backing Fires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Temperature (deg. F)</td>
<td>30-75</td>
<td>40-85</td>
</tr>
<tr>
<td>Relative Humidity (%)</td>
<td>30-65</td>
<td>20-50</td>
</tr>
<tr>
<td>Midflame Wind Speed (mph)</td>
<td>2-5</td>
<td>0-1</td>
</tr>
<tr>
<td>1-Hour Time Lag Fuel Moisture (%)</td>
<td>6-10</td>
<td>6-10</td>
</tr>
<tr>
<td>10-Hour Time Lag Fuel Moisture (%)</td>
<td>9-15</td>
<td>6-10</td>
</tr>
<tr>
<td>100-Hour Time Lag Fuel Moisture (%)</td>
<td>10-20</td>
<td>8-15</td>
</tr>
<tr>
<td>1000- Hour Time Lag Fuel Moisture (%)</td>
<td>15-30</td>
<td>10-20</td>
</tr>
<tr>
<td>Rate of Spread (ft/min)</td>
<td>2-7</td>
<td>0-1</td>
</tr>
<tr>
<td>Flame Length (ft)</td>
<td>1.4-2.5</td>
<td>1.0-1.2</td>
</tr>
</tbody>
</table>
Table 4. Continued: Preliminary prescriptions for prescribed natural fires and prescribed burns within Voyageurs National Park’s conditional fire management units, and prescribed burns within the park’s fire suppression units.

**MIXED CONIFER/HARDWOODS, OVERMATURE STANDS, STANDS DAMAGED BY WINDTHROW OR INSECT INFESTATION**

(NFDRS Model G, NFFLS Model 10) | Head Fires | Backing Fires |
---------------------------------|------------|--------------|
Air Temperature (deg. F)         | 30-75      | 40-85        |
Relative Humidity (%)            | 30-65      | 20-50        |
Midflame Wind Speed (mph)        | 3-8        | 0-2          |

1-Hour Time Lag Fuel Moisture (%) | 6-10     | 6-10        |
10-Hour Time Lag Fuel Moisture (%) | 9-13    | 6-10        |
100-Hour Time Lag Fuel Moisture (%) | 10-20   | 7-15        |
1000-Hour Time Lag Fuel Moisture (%) | 17-30   | 10-20       |

Rate of Spread (ft/min)          | 3-9       | 0-2          |
Flame Length (ft)                | 3.2-5.0   | 1.7-2.4      |
Table 5. Prescribed burn units and ignition schedule for prescribed burns within Voyageurs National Park's fire suppression and conditional fire management units.

<table>
<thead>
<tr>
<th>Year</th>
<th>Burn Unit No.</th>
<th>Prescribed Burn Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>38</td>
<td>Mukooda Lake</td>
</tr>
<tr>
<td>1989</td>
<td>39</td>
<td>Namakan Narrows</td>
</tr>
<tr>
<td>1989</td>
<td>40</td>
<td>East Kabetogama Peninsula</td>
</tr>
<tr>
<td>1990</td>
<td>23</td>
<td>Moose Bay</td>
</tr>
<tr>
<td>1990</td>
<td>37</td>
<td>King Williams Narrows</td>
</tr>
<tr>
<td>1991</td>
<td>15</td>
<td>Blind Ash Bay East</td>
</tr>
<tr>
<td>1991</td>
<td>2</td>
<td>Gold Portage</td>
</tr>
<tr>
<td>1992</td>
<td>10</td>
<td>Daley Brook North</td>
</tr>
<tr>
<td>1992</td>
<td>16</td>
<td>Kabetogama Narrows</td>
</tr>
<tr>
<td>1993</td>
<td>28</td>
<td>Junction Bay West</td>
</tr>
<tr>
<td>1993</td>
<td>7</td>
<td>Irwin Bay West</td>
</tr>
<tr>
<td>1994</td>
<td>1</td>
<td>Black Bay Narrows</td>
</tr>
<tr>
<td>1994</td>
<td>5</td>
<td>Tom Cod Bay East</td>
</tr>
<tr>
<td>1995</td>
<td>24</td>
<td>Hoist Bay West</td>
</tr>
<tr>
<td>1995</td>
<td>35</td>
<td>Staege Bay</td>
</tr>
<tr>
<td>1996</td>
<td>18</td>
<td>Sullivan Bay South</td>
</tr>
<tr>
<td>1996</td>
<td>20</td>
<td>Ash River East</td>
</tr>
<tr>
<td>1997</td>
<td>36</td>
<td>Northwest Arm Crane Lake</td>
</tr>
<tr>
<td>1997</td>
<td>14</td>
<td>Blind Ash Bay South</td>
</tr>
<tr>
<td>1998</td>
<td>9</td>
<td>Daley Brook West</td>
</tr>
<tr>
<td>1998</td>
<td>3</td>
<td>Tom Cod Bay North</td>
</tr>
<tr>
<td>1999</td>
<td>31</td>
<td>Net Lake East</td>
</tr>
<tr>
<td>1999</td>
<td>25</td>
<td>Hoist Bay East</td>
</tr>
<tr>
<td>2000</td>
<td>17</td>
<td>Sullivan Bay Southwest</td>
</tr>
<tr>
<td>2000</td>
<td>34</td>
<td>Browns Bay</td>
</tr>
<tr>
<td>2001</td>
<td>29</td>
<td>Wiyapka Lake</td>
</tr>
<tr>
<td>2001</td>
<td>22</td>
<td>Moose River East</td>
</tr>
<tr>
<td>2002</td>
<td>13</td>
<td>Blind Ash Bay Southwest</td>
</tr>
<tr>
<td>2002</td>
<td>6</td>
<td>State Point</td>
</tr>
<tr>
<td>2003</td>
<td>26</td>
<td>Junction Bay Northwest</td>
</tr>
<tr>
<td>2003</td>
<td>30</td>
<td>Net Lake West</td>
</tr>
<tr>
<td>2004</td>
<td>8</td>
<td>Irwin Bay East</td>
</tr>
<tr>
<td>2004</td>
<td>32</td>
<td>Spring Lake</td>
</tr>
<tr>
<td>2005</td>
<td>33</td>
<td>Johnson Lake</td>
</tr>
<tr>
<td>2005</td>
<td>27</td>
<td>Wiyapka Lake North</td>
</tr>
<tr>
<td>2006</td>
<td>12</td>
<td>Daley Brook East</td>
</tr>
<tr>
<td>2006</td>
<td>21</td>
<td>Moose River West</td>
</tr>
<tr>
<td>2007</td>
<td>4</td>
<td>Tom Cod Bay South</td>
</tr>
<tr>
<td>2007</td>
<td>11</td>
<td>Daley Brook South</td>
</tr>
<tr>
<td>2008</td>
<td>41</td>
<td>Kettle Falls</td>
</tr>
<tr>
<td>2008</td>
<td>19</td>
<td>Sullivan Bay North</td>
</tr>
</tbody>
</table>

2009    Start the sequence over again from the top
or regional drought, wet weather, and lack of necessary personnel and equipment, will undoubtedly change the sequence of ignitions in Table 5. In order to take advantage of prescribed burning opportunities that may not occur on a predictable annual basis, three or four burn units will be included in Voyageurs' approved annual prescribed burn program even though only two units are scheduled to actually be burned each year.

Normally, all vegetation/fuel types within a burn unit would not be burned every 20 years because each type has a fire cycle or rotation that is either shorter or longer than the park's 100 year average natural fire cycle (Heinselman 1973). Burn units will be further subdivided based on plant community composition and length of time since last fire or disturbance. Nearly pure stands of red and white pine within the unit will be burned by a surface fire about every 20 years. Mixed white pine forests with significant stand components of shade tolerant conifers or hardwoods will be burned by a surface fire about every 40 years. Aspen-birch, jack pine, and upland black spruce stands will be burned by a surface fire about every 80 to 100 years. Since fire intensities will vary considerably within each subunit, fires should maintain a complex mosaic of community types that range in age from 1 to 250 years, with single trees or small groups that may reach 350 to 500 years old. Understory species, such as white and black spruce, balsam fir, and northern white-cedar, will usually perish in the same fires that destroy the overstory fire-dependent pioneers, and in these cases at least they are caught up in the same fire rotations.

Meadows, sloughs and stream courses within a burn unit will be scheduled for burning very early in the spring because they will ignite while the surrounding forest is still too wet to burn. Once these open areas are burned off, they will act as fuelbreaks for fires that are set in the trees as fuels continue to dry out in the spring. Forest stands on south facing slopes and ridges would then be burned while fuel moisture levels were still high in adjacent stands on other aspects. These burned stands and open areas would in turn act as fuelbreaks for other fires ignited on other aspects as fuels continue to dry out. Burning of some individual subunits will be accomplished in one day while others may burn for several days or weeks. Crews and equipment therefore will be required to be onsite several different times during the snow-free season in order to successfully burn a whole unit.

Priorities for burning are determined by the length of time since previous burning, current fuel loading, vegetative conditions, physiographic factors, and personnel and logistical requirements. Initial emphasis will be on burning units where the threat of fire escape beyond unit boundaries is least, such as Moose Bay (23), Mukooda Lake (38), Namakan Narrows (39), and East Kabetogama Peninsula (40). As prescriptions are refined and prescribed burn personnel gain more experience and technical knowledge, burn units will be selected in the vicinity of developed areas, such as Blind Ash Bay East (15), Kabetogama Narrows (16) and Black Bay Narrows (1), where values are high, boundaries are easily defensible and access is good. As still additional experience is gained, burn units contiguous with the park's southern boundary will be selected.
Burn Prescriptions

Prescriptions for prescribed burns within Voyageurs are far more specific than for lightning-caused fires burning within the prescribed natural fire management unit. Prescriptions include acceptable ranges of temperature, relative humidity, wind speed and direction, fuel moisture, fire danger indices, fire behavior parameters, and air quality/smoke management conditions. Monitoring and evaluation for conformance with objectives of prescribed burns will be far more intensive than of prescribed natural fires.

All prescribed burns in the park will be accomplished within the prescriptions contained in Table 4 (adapted from van Wagendonk 1974). These preliminary prescriptions may be refined as deemed necessary by the Terrestrial Research Biologist and/or the Resource Management Specialist. The Research Biologist may, with the approval of the Regional Director, ignite fires on research plots for this purpose.

Fire weather will be recorded by the Prescribed Burn Boss or a designee at least 14 days, and preferably 30 days, prior to the earliest ignition date of the burn. Ten to 14 days of readings must be taken before fire weather forecasts are given by AFFIRMS. A dummy weather station will be established for each prescribed burn so that accurate data for 100-hour and 1000-hour time lag fuel moistures, the energy release component (ERC), ignition component (IC), spread component (SC), and burning index (BI) can be obtained from AFFIRMS. Fuel moisture sticks will also be placed in all characteristic fuel types when the dummy weather station is established.

Prescribed Burn Operations

The Chief Park Ranger will designate a qualified Prescribed Burn Boss for the burn. S/he will also designate an Assistant Prescribed Burn Boss and other Burn Team members as appropriate. Qualified Prescribed Burn Bosses, Assistant Bosses, Firing Bosses, Fire Monitors, and Ignition Specialists will be selected from a list of those certified by the Chief Park Ranger. An effort will be made to develop a highly trained cadre of individuals within each division which will provide the nucleus of the Burn Team and insure professional execution of the program. In order to allow for winter and spring training programs and to provide continuity, permanent and permanent-less-than-full-time personnel will be given preferential treatment for training over seasonal employees.

The Chief Park Ranger will program all budget expenditures from the authorized prescribed burn accounts, and will be responsible for all unprogrammed budget expenditures which may arise in conjunction with prescribed burn operations. The Prescribed Burn Boss will project anticipated unprogrammed budget expenditures needed to carry out a specific prescribed burn, such as overtime or special equipment not available in the park and vicinity, and will submit a budget recommendation to the Chief Park Ranger for approval. Once Prescribed Burn Bosses and Burn Team members are released by their supervisors to be assigned to the burn project, they will be assigned for the duration of the burn, or for such segment of the burn as may be agreed upon in advance. Burn Team members will be paid from their own accounts for regular work hours.
Based on the on-site weather data, the Prescribed Burn Boss will select a proposed ignition date and will schedule all of the personnel and equipment necessary to start the burn at that time. Personnel and equipment needs in excess of those contained in the original prescribed burn plan will be brought to the attention of the Chief Park Ranger.

The Prescribed Burn Boss will supervise all preparation crews involved in pre-burn activities such as line construction and snag felling. The Prescribed Burn Boss will insure that closure and/or informational signs on prescribed burns are properly posted. S/he also supervises ignition, fireline patrol, and mop-up crews. S/he will assemble the Burn Team and notify the Chief Park Ranger and Park Dispatcher that the burn is being started. A test fire will be initiated to determine conditions. If conditions are satisfactory, the burn will be continued. If conditions are not satisfactory, the test fire will be suppressed and the ignition date for the burn rescheduled for another time. The Resource Management Specialist will use data from Fire Monitors on fire behavior and effects to evaluate ongoing prescribed burns and make recommendations to the Prescribed Burn Boss for changes in the operation necessary to achieve the desired project objectives.

Coordination of all prescribed burn activities with other park divisions will be the responsibility of the Chief Park Ranger.

The Chief Park Ranger will notify the Superintendent and Assistant Superintendent at least 24 hours in advance of any planned ignition and again when a prescribed burn is actually ignited.

**Limited or Complete Control Actions**

The Prescribed Burn Boss will initiate limited or complete control actions if a prescribed burn threatens to exceed prescription, to escape predetermined boundaries, to not achieve desired objectives, or to threaten human safety and/or property. The Chief Park Ranger will be notified immediately of any control actions on a prescribed burn. If the escaped fire exceeds the fire management qualifications of the Prescribed Burn Boss, the Chief Park Ranger will assign a suppression Incident Commander with the necessary qualifications to the fire. The Chief Park Ranger may order a prescribed burn suppressed if it threatens human life and/or property, cultural resources, endangered species, to escape from predetermined areas or from the park, or to burn under extreme fire weather conditions. All prescribed burns that are out of prescriptions will be treated as wildfires and suppressed (see wildfire mobilization section of this plan).

Smoke dispersal will be monitored continuously during any prescribed burn. If smoke creates a hazard or nuisance, the prescribed burn will be extinguished.

**Documentation and Reporting**

Each prescribed burn within Voyageurs will have all the Fire Monitoring Forms completed by the Fire Monitoring Team prior to, during, and after the fire, archived in the park’s fire records.
The Prescribed Burn Boss will prepare a final report on the burn for the Chief Park Ranger, including at least the total work-hours and burn costs, a summary of the burn chronology, complete weather and prescription records, and a map of the actual burn perimeter. Other data may be requested by the Resource Management Specialist or Research Biologist. The Chief Park Ranger will then complete all necessary fire reports, forward the reports to the regional office, and keep all fire related records for future use in planning and evaluating prescribed burning operations.

**Critique of the Prescribed Burn Program**

The Fire Management Overhead Team will critique each prescribed burn in the park to determine the effectiveness of the prescribed burning program. A report of the results of the critique will be prepared and submitted to the Superintendent and the Regional Fire Coordinator for review. A post-season critique of all prescribed burns in the park during the year by the Fire Management Overhead Team will determine if objectives were met.
AIR QUALITY/SMOKE MANAGEMENT GUIDELINES

As required by the Clean Air Act, the Environmental Protection Agency has developed National Ambient Air Quality Standards (NAAQS) for six air pollutants: carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, ozone, and particulate matter. These standards must be met in the ambient air; that is, anywhere the public has access. The Clean Air Act gives states the primary responsibility for designing and implementing regulations to assure that NAAQS are met. Minnesota's State Implementation Plan (SIP) outlines the requirements for protecting the airshed of the state. Section 118 of the Act requires all federal agencies to comply with both substantive and procedural portions of all federal, state, interstate, and local air quality regulations.

Voyageurs' wildland fire management program will be coordinated with the Minnesota Pollution Control Agency (MPCA) for procedural requirements, including permits for open burning (see Appendix G). Minnesota Statutes (7005.0700-7005.0810) address opening burning restrictions and permitting requirements within the state. The National Park Service will inform the MPCA office in Duluth of all fire management activities in Voyageurs National Park, as outlined below:

Prescribed Burns - An objectives-oriented prescribed burn will be conducted with the following required measures:

A. A copy of the park's annual prescribed burn program will be sent to the MPCA office prior to the burning season.

B. An MPCA open burning permit will be obtained for each prescribed burn in the park. The National Park Service will comply with all the limitations to burning contained on the back of the permit.

C. Notification shall be given to the MPCA office no more than 24 hours prior to, and preferably on the day of, the ignition of the burn.

D. Notification shall be given to the MPCA office when the burn is declared out.

Prescribed Natural Fires - In the event of a prescribed natural fire, the MPCA office will be notified during the office hours of the first full day of burning. The office will then be notified every second day while the fire is burning and when the fire is declared out. The telephone number for such notifications is (218) 723-4660.

When possible, MPCA Pollution Control Specialists from Duluth will be invited to the park to observe the impacts of Voyageurs' fire management program on air quality and visibility.

The impacts of Voyageurs' fire management program on air quality and visibility will be monitored continuously. The instrumentation at the park's Black Bay Air Quality Monitoring Site will document carbon monoxide, nitrogen
dioxide, sulfur dioxide, lead, ozone, and particulate matter levels prior to, during, and after prescribed natural fires and prescribed burns. The automatic 35mm single lens reflex and 8mm movie photographic systems located at the Kabetogama Lake Visitor Center site will document visibility in the park prior to, during, and after prescribed natural fires and prescribed burns. Eventually, in addition to the photographic systems, the visual resource prior to, during, and after burns will be documented with a transmissometer that measures atmospheric extinction.

Voyageurs National Park was designated a federal Class I area by the Prevention of Significant Deterioration (PSD) sections (160-164) of the 1977 amendments to the Clean Air Act. The PSD provisions assign the Secretary of the Interior the responsibility of protecting Voyageurs' air quality related values from adverse air pollution impacts. PSD regulations, at this time, do not apply to prescribed natural fires and prescribed burns within the park (Haddow 1985).

Section 169A of the Clean Air Act set "as a national goal the prevention of any future and the remedying of any existing impairment of visibility in mandatory Class I Federal areas which impairment results from man made air pollution."

The objective in managing visibility within Voyageurs National Park is to provide visitors the opportunity for a natural visual experience (Haddow 1985). Since smoke from fire is a natural part of northwoods landscape and ecosystem, visitors in Voyageurs will be allowed this visual opportunity. Whether seeing or smelling smoke is enjoyable or not will be determined by the individual park visitor, as other aspects of a national park experience presently are.

Voyageurs smoke management guidelines below are designed to avoid unacceptable smoke levels in the park by using the Best Available Control Technology (BACT):

A. All prescribed burn plans will have clear objectives and will have consider the impacts of the burn on the total environment. Plans will consider trajectory of the smoke plume, identification of smoke sensitive areas, fuel type, mixing of man made pollutants with smoke from prescribed fires, and atmospheric stability.

B. The prevailing wind at the time of a prescribed burn will be away from nearby occupied residences. The location of burning will not be within 600 feet of an occupied residence other than those located on the property on which the burning is conducted.

C. Prescribed burning will be conducted as far away as practical from any highway or public road and controlled so that a traffic hazard is not created.

D. No prescribed burning will be done during pollution alerts or temperature inversions in the park.

E. Any fire allowed by the MPCA open burning permit will be extinguished
within 4 hours of a public announcement by the agency that an air pollution alert, warning or emergency exists. Such burning will cease until a similar public announcement terminating the alert, warning or emergency is issued.

F. Weather information and fire weather forecasts will be used on all prescribed burns to determine smoke dispersal.

G. Test fires will be used on all prescribed burns to confirm smoke behavior.

H. Prescribed burning in sensitive areas, such as major park developed areas, will be done when visitation is low.

I. Backing fires will be used whenever possible to provide for more complete fuel consumption and to lessen visibility problems. Fall fires burning in dry fuels also produce less smoke than spring fires burning in wet fuels.

J. No burning will be allowed within 30 miles of a smoke sensitive area, such as International Falls/Ft. Frances, when the plumes may be expected to enter such areas below the ceiling elevation.

K. No prescribed burning will be permitted (no new starts) when visibility within the park is less than 10 miles.

L. Smoke dispersal will be monitored continuously during any prescribed burn. If smoke creates a hazard or nuisance, the prescribed burn will be extinguished.

Voyageurs' air quality/smoke management guidelines above will be updated and expanded to meet additional state or local air quality requirements as they are promulgated.
FIRE RESEARCH AND MONITORING

All fires in Voyageurs National Park will be managed; hence, there is a need for refined management programs based upon scientific information. The fire research and monitoring performed in Voyageurs will support the fire management program by providing information which is used for making management decisions. The information needed to plan, reintroduce, monitor, and refine the use of fire in the park will be obtained by several means: participation of park staff with fire management experience; searching the scientific literature; contracting studies with universities; requesting assistance from experts and authorities in other NPS units, agencies or academia; and involving independently funded scientists in studies. Much of this information can be obtained by park management without formalized, programmed research studies (i.e., fire monitoring), while some is quite complex and technical (i.e., fire research).

Fire Monitoring

Fire weather will be collected every day between 1300 and 1400 hours at the Kabetogama Lake Visitor Center site base station from April 1 through November 1. Daily fire weather records from Voyageurs' permanent and temporary fire weather stations will be entered into AFFIRMS by 1400 hours each day by the Park Dispatcher. All base station readings will provide the daily information required to calculate the prescribed indices under the National Fire Danger Rating System, and fire behavior parameters under the Northern Forest Fire Laboratory Fire Behavior System. All data entered directly into AFFIRMS will be automatically archived on the National Fire Weather Data Library (Finklin 1983, Bradshaw and Fischer 1984). The resultant time series data base of fire weather provides management a powerful foundation to assess the significance of current fire danger in comparison to historic trends using FIREFAMILY (Main et al. 1982). Additional fire weather information will be obtained from the National Weather Service office at the Falls International Airport.

In addition, fire weather for prescribed burns will be recorded by the Prescribed Burn Boss or a designee at least 14 days, and preferably 30 days, prior to the earliest ignition date of the burn. Ten to 14 days of readings must be taken before fire weather forecasts are given by AFFIRMS. A dummy weather station will be established for each prescribed burn so that accurate data for 100-hour and 1000-hour time lag fuel moistures, the energy release component (ERC), ignition component (IC), spread component (SC), and burning index (BI) can be obtained from AFFIRMS. 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. Fuel moisture sticks will be placed in all characteristic fuel types.

All prescribed natural fires and prescribed burns, as well as wildfires, will be monitored. Information gathered during fire monitoring is needed to: keep fires within predetermined criteria, know when to take suppression action, and
protect human life and/or property. A fire monitoring team will observe the fire, assess its potential and provide a historical record. 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 community composition and structure, etc.). Photographs will be taken. Weather readings will be made periodically with a belt weather kit at the fire site. Forms for recording data will be supplied to monitors. A Fire Monitoring Guide will be developed by the Resource Management Specialist. It will describe in detail all aspects of the park's monitoring program. The guide will be incorporated as a detached appendix to this plan.

The impacts of Voyageurs' fire management program on air quality and visibility will be monitored continuously. The instrumentation at the park's Black Bay Air Quality Monitoring Site will document carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, ozone, and particulate matter levels prior to, during, and after prescribed natural fires and prescribed burns. The automatic 35mm single lens reflex and 8mm movie photographic systems located at the Kabetogama Lake Visitor Center site will document visibility in the park prior to, during, and after prescribed natural fires and prescribed burns. Eventually, in addition to the photographic systems, the visual resource prior to, during, and after burns will be documented with a transmissometer that measures atmospheric extinction.

Fire Research

Refine Burning Prescriptions. A few prescribed natural fires and prescribed burns will be intensively studied for several decades to provide detailed information on fire effects in the park's major vegetation/fuel types. This program will expand upon the field monitoring described above by documenting vegetation structure and fuel loading on permanent plots prior to, immediately after, and in subsequent years (Ohmann and Ream 1971a, van Wagtendonk et al. 1982). Fire behavior observations made on these permanent plots will permit fire managers to make more refined predictions of the effects of different fire intensities on the park's plant and animal communities. Observations from these plots will also permit the park to improve fire behavior prediction by adjusting and adapting the stylized fuel models in the Northern Forest Fire Laboratory Fire Behavior System to Voyageurs' vegetation/fuel complexes (Norum 1982, van Wagtendonk and Botti 1984, Haines et al. 1986).

Reestablish Red and White Pine Stands. Communities in Voyageurs' red and white pine group have been most affected by past fires and logging in the park. Fire climax pine types during the pre-settlement period occupied about 46 percent of the park's total forest area, while today they occupy only about 15 percent of the total area (Coffman et al. 1980). Red and white pine communities are not regenerating in the park due to their exacting silvical requirements (Ahlgren 1959, 1960, 1976, Coffman et al. 1980, Kurmis et al. 1980). Although these communities are of fire origin, reintroduction of fire alone into park ecosystems may not be able to restore the extensive and stately stands of red and white pine, which were a major portion of the northwoods virgin forest in pre-settlement times. Additional research will be conducted to determine if restoration of fire alone to park ecosystems is
adequate to increase regeneration of these species or whether other cultural techniques, such as tree planting, are necessary for successful reestablishment.

**Restore Absent and Declining Native Wildlife.** The exclusion of fire from fire-maintained climax, subclimax and seral forest vegetation, in conjunction with logging, market and subsistence hunting, and trapping, have dramatically altered the composition, distribution and abundance of Voyageurs' wildlife communities (Cole 1982, 1986). Hunting eliminated woodland caribou and elk from the park, and severely reduced the size of the moose population. The park's progressively maturing forests have severely limited the availability of critical winter habitat for white-tailed deer and moose (Cowan et al. 1950, Irwin 1975). Consequently, the size of the park's deer population has declined dramatically in recent years while the moose population has been unable to recover from low numbers.

The elimination of caribou and elk, the low moose population, and the recent dramatic decline in white-tailed deer numbers have resulted in a 66 percent reduction in the park's pre-1890 overwinter ungulate biomass (Cole 1982, 1986). This severe reduction in the overwinter food supply has dramatically reduced the size of the park's predator and scavenger populations. Predators and scavengers that were once abundant are now absent (wolverine), exist in remnant numbers (Canada lynx, bobcat, pine marten), or are less abundant than previously (threatened gray wolf and bald eagle, coyote, red fox, raven) (Mech 1973, Van Ballenberghe et al. 1975, Peterson 1976, Mech 1977, Hardwig 1978, Mech and Karns 1978).

Although adequate habitat for woodland caribou exists in the park (Wetmore, 1980), its reintroduction into park ecosystems (U.S. NPS 1977) would only increase the overwinter ungulate biomass by an estimated 19,200 pounds, to 42,800 pounds, which is still only 62 percent of the park's pre-1890 level of 69,120 pounds (Cole 1982, 1986). Since they utilize early successional stage plant communities extensively, reintroduction of woodland caribou and elk, and the recovery of moose and deer populations to pre-1890 levels will only succeed if fire is restored as a natural ecological process in the park. Likewise, recovery of the park's depauperate predator and scavenger populations to pre-1890 levels will only occur if reintroductions of caribou and elk are accompanied by a fire management program that creates needed habitat for moose, deer, caribou, elk, moles, deer mice, voles, chipmunks, squirrels, and snowshoe hares, beaver, and ruffed grouse.

Additional research will be conducted to determine if restoration of fire alone to park ecosystems will increase overwinter ungulate biomass to pre-settlement levels and thereby restore the park's depauperate predator and scavenger populations, or whether other measures, such as reintroduction of woodland caribou and elk, are necessary for successful restoration of Voyageurs' native wildlife. Once caribou and elk are reintroduced, the focus of the research would be to determine if the restoration of fire and extirpated ungulates to park ecosystems will increase overwinter ungulate biomass to pre-settlement levels and thereby restore the park's depauperate predator and scavenger populations.
PUBLIC SAFETY

Fire can be hazardous and must be given very high priority during certain conditions. The Park Safety Officer will be assigned to all large wildfires and prescribed natural fires, and all prescribed burns. Employees responsible for any wildland fire management action will never subordinate human lives to other values. Assuring visitor safety will take priority over fire suppression and monitoring activities. All key fire management personnel are issued the National Wildfire Coordinating Group Fireline Handbook 410-1. Consistent, accurate monitoring and evaluation of fire behavior in the park will provide the basis for developing contingency plans, contacts, and briefings that ensure public and personnel safety.

Although fires are a natural part of Voyageurs National Park, they have not been part of the visitor's experience because of our past suppression policies. Ideally, through education and experience, natural fires will become accepted as part of the risk associated with a national park visit, just as high winds, isolation and lightning storms are now. Following are Voyageurs' public safety considerations:

A. The major visitor use is concentrated along shorelines near developed and undeveloped campsites and day use sites, and portages.

B. All use of private and retained use and occupancy cabins by park neighbors is concentrated along shorelines.

C. There is relatively limited use of the park's trail systems.

D. The opportunities for visitors and neighbors to escape a large, fast moving fire may be limited along a trail. For those using portages and campsites, day use sites, and cabins along shorelines, opportunities for escape are readily available.

E. Some individuals will approach a prescribed natural fire or prescribed burn and may even attempt suppression action.

F. Certain areas will be closed when the risk to visitors, and private and retained use and occupancy cabin users is deemed unacceptable.

G. Any time human life is endangered, all necessary means will be taken to warn or evacuate visitors, and private and retained use and occupancy cabin users.

H. Visitors will frequently ignore warnings or are unaware of potential dangers and thus wander through burning areas.

I. The public generally has not perceived any direct threats to their safety from prescribed fires in national parks.
The Chief Park Ranger will inform other divisions of all potentially hazardous natural or prescribed burns in the park. The Public Information Officer and Assistant District Naturalist will then coordinate public notification efforts within and outside the park. The extent of public notice will depend on the specific fire situations. The information actions to be considered:

A. Initial attack/monitoring team members will determine the proximity of visitors and neighbors to the fire, inform them of potential hazards, and aid in their evacuation if necessary.

B. When a wildland fire is in progress, information listing location, behavior, expected dangers, areas to avoid, and precautions to be taken will be posted on park bulletin boards and at visitor centers and distributed to resorts. Interpretative specialists will be utilized to inform the public of dangers as well as interpret the role of fire in natural areas.

C. A fire safety brochure that describes travel and evacuation precautions, entrapment procedures, and fire survival procedures in vehicles and buildings will be developed for distribution to park visitors and neighbors (Mutch and Davis 1985) (see Appendix F).

D. When the hazards of a wildland fire are high, signs on trails leading into the fire activity area will be posted. Trails, campsites, day use sites, and cabin sites will be closed if deemed necessary by the Fire Management Overhead Team, and as approved by the Superintendent. The Prescribed Burn Boss will insure that closure and/or informational signs on prescribed burns are properly posted.

E. Visitor use will be limited or prevented near wildland fires and potentially affected areas. NPS personnel will patrol the perimeter of fires burning along the lakeshore to inform visitors and neighbors about the role of fire in a natural area, explain the risks associated with approaching too close to a fire, and enforce visitor compliance with area closure orders.

F. A Wildland Fire Status Summary will be kept by the Park Dispatcher. Crews and teams will be kept informed of the status of ongoing fires by the use of a daily Wildland Fire Status Summary broadcast on park net after the morning fire weather forecast. This status summary will also be distributed to all park divisions on a daily basis.

G. News articles will be written and released to local newspapers, radio, and television stations.

H. If a park information "hot line" is installed, it will be updated by the Park Dispatcher whenever new information is available on fires in progress.

I. The Chief Park Ranger will notify the following agencies of government about fire activities in the park: Koochiching and St. Louis County Sheriffs and County Commissioners, Federal Aviation Administration, National Weather Service, MDNR, OMNR, and Superior National Forest.
J. Burned over areas will be posted at the trailhead if potential hazards exist. Campsites, day use sites, and cabin sites will remain closed until all hazard trees are removed. The public will be informed of hazards and appropriate safety precautions associated with travelling through or camping in burned over areas.
The National Park Service has a long and proud tradition of fire suppression within units of the National Park System and, until very recently, supported a philosophy that all fires must be controlled as quickly and as completely as possible. These traditional values concerning fires, particularly looking at the tremendous success of the Smokey Bear Program, have largely been accepted by the general public; so much so that to change these policies may cause confusion and non-acceptance by some.

Disseminating information about fire's natural role and effects is an important step in establishing public support for such programs (Stankey 1976, McCool and Stankey 1986). Voyageurs' wildland fire management information program will be factual, straightforward, and aimed at many different audiences. The following guidelines will be followed:

A. The Chief of Interpretation (Public Information Officer) will be kept informed daily by the Chief Park Ranger of management actions, and the status of fires in the park.

B. Ecological concepts upon which the wildland fire management program is based will be incorporated into information handouts, selected books written about the park, and wayside and visitor center exhibits.

C. Information handouts explaining the fire management program will be prepared and periodically updated. During periods when management fires are burning, these handouts will be distributed to visitors: at park information boxes and visitor centers; and by NPS field personnel during informal contacts out in the park.

D. The fire management program will be incorporated into appropriate interpretative talks, walks, automatic slide and/or videotaped programs, the park newspaper, the park safety brochure, the park camping and hiking brochure, and wayside and visitor center exhibits. Particular attention will be given to these activities when fires are conspicuous from visitor centers.

E. During ongoing fires, news articles will be written and released to local newspapers, radio, and television stations.

F. Articles will also be written about Voyageurs' fire management program and released for publication in statewide, regional, and national periodicals.

G. Public information outlets for neighboring land management agencies will be provided with fire management information, particularly when ongoing fires are burning in the park.

H. To effectively answer visitor questions, every NPS and concession
employee in the park will be made aware of the wildland fire management program and the status of ongoing fires.

I. The Lake States Interpretative Association will make relevant, factually accurate sales publications that address fire's role in natural areas available to visitors at its sale outlets.

J. The wildland fire management program will be discussed in informal contacts with all divisions, park concessioners, park neighbors, and park visitors.

K. Signs notifying the public about ongoing prescribed natural fires and prescribed burns, area closures, dense smoke, or other special situations will be placed along roadways, and at visitor centers, boat launching ramps, trailheads, campsites, day use sites, and resorts.
Voyageurs National Park's archeological and historical resources are a limited, fragile, and nonrenewable part of the environment that must be protected; when disturbed, the scientific information they provide is often lost forever. Public concern for cultural resources protection and preservation is contained in numerous pieces of legislation that have been passed since the Antiquities Act in 1906. Great care will be taken during fire suppression and prescribed fire activities in Voyageurs not to destroy important archeological and historical resources. Although a complete ground survey and inventory with detailed maps of sites, features, and environmental data are the best sources of cultural resources information for fire management planning, archeological and historical site surveys in the park are still incomplete. Completion of these surveys is therefore of the greatest importance.

Fire management activities that disturb the ground in any way, such as fireline construction using hand tools or heavy equipment, in Voyageurs National Park will use paraprofessional and professional archeologists working in cooperation with firefighters and preburn preparation crews to prevent needless cultural resource destruction. We cannot forget that during a wildfire the highest priorities are safety and controlling the blaze; therefore, if the fireline cannot be diverted, cultural resources may have to be sacrificed. In most cases, however, damage can be averted. During fire suppression, prescribed fire, and rehabilitation activities (Anderson 1985):

A. Resource base maps showing archeological and historical site locations will be given to archeologists and fire bosses on the firelines.

B. When numerous cultural resources are threatened by a fire, archeologists will be present to help mitigate the impacts of fire suppression and rehabilitation on cultural resources.

C. Priority will be given to monitoring heavy equipment, especially bulldozers and graders, through all aspects of the suppression and rehabilitation efforts.

D. Archeologists serving on a fire as technical specialists do not have to hold a current red card to perform their specific advisory duties.

E. Line archeologists will be equipped with appropriate standard firefighting safety equipment.

F. Special flagging will be used to identify archeological and historical sites.

G. A photographic record will be kept of all archeological materials uncovered during fire suppression and rehabilitation activities.

H. The Cultural Resources Management Specialist will coordinate all activities of line archeologists with fire bosses.
During the first three years of implementing this plan, the Fire Management Overhead Team will critique each wildfire and prescribed natural fire over 10 acres in size and every prescribed burn within two weeks after the fire is declared out to determine the effectiveness of Voyageurs' wildland fire management program. In addition to the members of the overhead team, the critique should be attended by the Incident Commander and/or Prescribed Burn Boss, District Rangers, and other staff members with special knowledge or interest in the particular fire.

The critique will document for future reference any recommendations on changes in fire procedures, prescriptions to achieve different fire effects, or needs for additional training to increase program effectiveness and efficiency. A report of the results of each critique will be prepared and submitted to the Superintendent and the Regional Fire Coordinator for review. Once this program becomes fully operational, the overhead team will continue to critique all prescribed burns and a random sample of the park's wildfires and prescribed natural fires.

Voyageurs' wildland fire management program will be reviewed on an annual basis to determine the necessity for revisions by the Resource Management Specialist with input from other members of the park's Fire Management Overhead Team. Specific information and documentation needed to make this review include: Individual Fire Report (TF-1202), Fire Complexity Assessment checklist, Escaped Fire Situation Analyses, Fire Monitoring Forms, and individual fire critiques.

The Fire Management Overhead Team may submit recommendations to the Superintendent for the following courses of action: (1) changes in fire management unit boundaries; (2) inclusion of a portion of a conditional fire management unit into the park's prescribed natural fire management unit; (3) changes in the rotational schedule for prescribed burn units - such changes may be necessitated by the failure to burn one or more units at the designated time; (4) adjustments to the burning prescriptions as we refine our knowledge of fire behavior and effects in the park's vegetation/fuel types; and (5) changes in operational procedures for fire management. If no recommendations are forwarded to the Superintendent, then the program will be executed as stated in this plan. Proposed plan revisions will be forwarded to the Regional Director for review and approval and will be incorporated within this plan as an appendix for that year.
CONSULTATION AND COORDINATION

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

Steve Botti, Resource Management Specialist, NPS, Yosemite N.P., CA
Citizens' Council on Voyageurs National Park, International Falls
Crane Lake Volunteer Fire Department
Dr. Miron Heinselman, Adjunct Professor, University of Minnesota, Minneapolis
International Rainy Lake Board of Control, Hull, Quebec
Island View Volunteer Fire Department
Kabetogama Lake Volunteer Fire Department, Ray
Koochiching County Land and Forestry Department, International Falls
Minnesota Department of Natural Resources; State, Region II, and International Falls Offices, and the Kabetogama and Pine Island State Forests
Minnesota Incident Command System (MNICS) Task Force Coordinator, St. Cloud
Minnesota Pollution Control Agency, Duluth
Minnesota State Historic Preservation Office, St. Paul
Ontario Ministry of Natural Resources; Atikokan and Fort Frances Districts
St. Louis County Land Department, Duluth
U. S. Army Corps of Engineers, St. Paul
U. S. Fish and Wildlife Service, St. Paul
U. S. Forest Service, Superior National Forest; Forest Supervisor's Office and LaCroix Ranger District
U. S. National Park Service; Voyageurs N.P., Midwest Regional Office, and Boise Interagency Fire Center Staffs
Dr. Jan van Wagtendonk, Research Scientist, NPS, Yosemite N.P., CA
Voyageurs National Park Association, Minneapolis
APPENDICES


International Falls, MN. 7 p.


APPENDIX B: DEFINITIONS

Aggressive attack - usually follows fire discovery immediately and with sufficient force to effect control at the earliest possible time with minimum acres burned.

Confine - to restrict a fire within boundaries that are either predetermined (pre-attack planning) or determined during the fire.

Contain - to surround a fire with a fireline, or firelines if spot fires exist, for the purpose of checking the fire's spread.

Control - to put a fire out by fireline construction, burning out, cooling hot spots, and other actions that remove any threat of subsequent fire escape.

Delayed attack - attack does not immediately follow discovery.

Escaped fire - wildfires that cannot be successfully controlled by initial attack forces and prescribed fires that escape prescription and burn as wildfires.

Escaped fire situation analysis - an analysis of alternative suppression strategies for either confining, containing or controlling a wildfire.

Fire management unit - a distinct part of park or wilderness that can be recognized and mapped from its external features.

Fire dependent or fire maintained ecosystems - an ecosystem can be called fire dependent or fire maintained if periodic perturbations by fire are essential to the functioning of the system.

Fire evaluation - the process of examining and appraising fire monitoring information.

Fire monitoring - the act of observing a fire to obtain information about its environment, behavior, and effects for the purpose of evaluating the fire and its prescription.

Fire prescription - a written statement defining the objectives to be attained, and the conditions of temperature, humidity, wind direction and speed, and fuel moisture, under which a fire will be allowed to burn. Generally expressed as an acceptable range of the various indices, and the limit of the geographic area to be covered.

Modified attack - is less than aggressive attack.

Natural - in accordance with and determined by nature; untouched by the influences of aborigines or pre-Europeans, and modern civilization and society.
Natural fire - any fire of natural origin, i.e. caused by lightning or volcanic activity. In a broader context, the role fire played in the evolution of an ecosystem. This means fire has influenced natural selection, ecosystem structure, and distribution of plant and animal populations.

Prescribed burn - a fire deliberately ignited by land managers within a fire prescription in order to achieve predetermined resource management objectives; a form of prescribed fire.

Prescribed fire - skillful application of fire to natural fuels under conditions of weather, fuel moisture, etc., that will allow confinement of a fire to a predetermined area and at the same time will produce the intensity of heat and rate of spread required to accomplish certain planned benefits to one or objectives of silviculture, wildlife management, grazing, hazard reduction, etc. Its objective is to employ fire scientifically to realize maximum net benefits at minimum damage and acceptable cost.

Prescribed natural fire - fire of natural origin, i.e., caused by lightning or volcanic activity, which is allowed to burn under prescribed conditions; a form of prescribed fire.

Scheduled prescribed fire or planned ignition - a fire ignited by the manager at a predetermined time.

Unscheduled prescribed fire or unplanned ignition - a fire that is ignited as a result of an act of God or unauthorized human activity. The time of such ignition is not known in advance.

Wildfire - a free-burning fire; all fire other than prescribed fire that occurs on wildlands.

Wildland fire management - all activities related to the prevention, control or use of fire burning through vegetation under specific prescriptions for the purpose of achieving fire management objectives.
APPENDIX C: FIRE RELATED TELEPHONE NUMBERS

Personnel, Overhead, Equipment and Supplies

Voyageurs National Park Fire Cache Locations

<table>
<thead>
<tr>
<th>Location</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park Headquarters (International Falls)</td>
<td>(218) 283-9821</td>
</tr>
<tr>
<td>Bohman Airways (Jackfish Bay, Rainy Lake)</td>
<td>(218) 286-5211</td>
</tr>
<tr>
<td>Rainy Lake VC and Ranger Station (Black Bay Narrows)</td>
<td>(218) 286-5259</td>
</tr>
<tr>
<td>Ludwig Residence (Kawawia Island)</td>
<td></td>
</tr>
<tr>
<td>Kettle Falls Hotel - Chuck Williams (Namakan boathouse)</td>
<td>(218) 374-3511</td>
</tr>
<tr>
<td>Kabetogama Narrows Info. Station (NPS gas dock)</td>
<td>(218) 374-3221</td>
</tr>
<tr>
<td>Voyageur Park Lodge (Kabetogama Lake)</td>
<td>(218) 875-2131</td>
</tr>
<tr>
<td>Kabetogama Lake VC Maintenance Area</td>
<td>(218) 875-3811</td>
</tr>
<tr>
<td>Kabetogama Lake VC and Ranger Station</td>
<td>(218) 875-2112</td>
</tr>
<tr>
<td>George Sprague Residence (Sand Point Lake)</td>
<td></td>
</tr>
<tr>
<td>George Scott's Seaplane Base (Crane Lake)</td>
<td>(218) 993-2341</td>
</tr>
<tr>
<td>Crane Lake Ranger Station</td>
<td>(218) 993-2481</td>
</tr>
</tbody>
</table>

Minnesota Department of Natural Resources

<table>
<thead>
<tr>
<th>Location</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Dispatcher (Grand Rapids)</td>
<td>(218) 327-4436</td>
</tr>
<tr>
<td>Kabetogama State Forest Headquarters (Orr)</td>
<td>(218) 757-3274</td>
</tr>
<tr>
<td>Kinmount Forestry</td>
<td>(218) 757-3489</td>
</tr>
<tr>
<td>Pine Island State Forest Headquarters (Little Fork)</td>
<td>(218) 278-6651</td>
</tr>
<tr>
<td>Rainer Forestry</td>
<td>(218) 286-3334</td>
</tr>
<tr>
<td>Hibbing Fire Tanker Base (water bombers/airplanes)</td>
<td>(218) 262-5241/2/3</td>
</tr>
<tr>
<td>No flights after 8:00 PM</td>
<td></td>
</tr>
<tr>
<td>Air Officer Bruce Humrickhouse</td>
<td>(218) 326-0311 ext. 229</td>
</tr>
</tbody>
</table>

Superior National Forest

<table>
<thead>
<tr>
<th>Location</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Dispatch Office (Duluth)</td>
<td>(218) 720-5388</td>
</tr>
<tr>
<td>Superior National Forest Headquarters (Duluth)</td>
<td>(218) 720-5323</td>
</tr>
<tr>
<td>LaCroix District (Cook)</td>
<td>(218) 666-5251</td>
</tr>
<tr>
<td>Seaplane Operations (Ely)</td>
<td>(218) 365-6185 after hours</td>
</tr>
<tr>
<td></td>
<td>(218) 365-6187</td>
</tr>
<tr>
<td>Fire Cache (Ely)</td>
<td>(218) 365-6185</td>
</tr>
</tbody>
</table>

Ontario Ministry of Natural Resources

<table>
<thead>
<tr>
<th>Location</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Frances Fire Dispatcher</td>
<td>(807) 274-5337</td>
</tr>
<tr>
<td>Atikokan Fire Dispatcher</td>
<td>(807) 597-2733</td>
</tr>
<tr>
<td>Thunder Bay Fire Dispatcher</td>
<td>(807) 475-1415</td>
</tr>
<tr>
<td>Thunder Bay Regional Service Center</td>
<td>(807) 475-1405</td>
</tr>
<tr>
<td>Dryden Fire Dispatcher</td>
<td>(807) 937-4402</td>
</tr>
</tbody>
</table>
Other Cooperating Associations

- International Falls Fire Department (218) 283-9151
- Kabetogama Volunteer Fire Department (218) 875-2121
- Island View Volunteer Fire Department (218) 286-3535
- Crane Lake Volunteer Fire Department (218) 993-2787 or (218) 993-2368

Minnesota Incident Command System (MNICS)

- Northern Fire Center (Grand Rapids) (218) 327-4436
  Home Phone, Carson Berglund (218) 326-3033
- St. Paul Fire Control Center (612) 296-5971
- MNICS Coordinator (St. Cloud) (612) 255-4277
  Home Phone, Jeff Haas (612) 255-1091

Assistance from Regional and National Organizations

- Midwest Region Fire Coordinator Ben Holmes (Omaha) (402) 221-3475
  Home Phone (402) 334-1954
- Interagency Fire Dispatch USFS Zone 9 (Milwaukee) (414) 291-3690
  FTS 362-3690
- Boise Interagency Fire Center - Logistics Desk (208) 334-9400
  FTS 554-9400
  FTS 554-9830
- Boise Interagency Fire Center - NPS Office (208) 334-9453/4
  FTS 554-9453/4

Fire Weather

NOAA National Weather Service Office

- Falls International Airport (218) 283-4615

Air Quality/Smoke Management

Minnesota Pollution Control Agency

- Bob Beresford (218) 723-4660
  Pollution Control Specialist
  320 West Second Street
  Duluth, MN 55802
## APPENDIX D: NORMAL PRESUPPRESSION INVENTORY

### FIRE CACHE LOCATION

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Rainy District</th>
<th>Namakan District</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) HAND TOOLS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Double bit ax</td>
<td>12</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Single bit ax</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Council tool</td>
<td>30</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Brush hook</td>
<td></td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>McCloud</td>
<td>5</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Pulaski</td>
<td>5</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Shovel</td>
<td>5</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Shovel rake</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B) PERSONNEL SAFETY EQUIPMENT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canteen/water bottle</td>
<td>2</td>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>Chaps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ear plugs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire shirt</td>
<td></td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>First aid kit</td>
<td>2</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Hard hat</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Headlamp</td>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Batteries, D-cell</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C) PUMPS AND HOSE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Backpack pump</td>
<td>8</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Gorman Rupp pump</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Pumper, 200 gal</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Waterous pump w/tool kit</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Gas can, 5 gal</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Gas can spout</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Fol-Da-Tank, 1000 gal</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Appendix D: Normal Presuppression Inventory (Continued)

### Fire Cache Location

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Rainy District</th>
<th>Namakan District</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suction hose</td>
<td>1</td>
<td>1</td>
<td>1  4</td>
</tr>
<tr>
<td>Hose, 0.75&quot; x 200' hardline</td>
<td>1</td>
<td>1</td>
<td>1  1</td>
</tr>
<tr>
<td>Hose, 1.5&quot; x 25' unlined</td>
<td></td>
<td>1</td>
<td>1  1</td>
</tr>
<tr>
<td>Hose, 1.5&quot; x 100' lined</td>
<td>3  8  3  2</td>
<td>9  5  3  5  11  3</td>
<td>7  85</td>
</tr>
<tr>
<td>Hose, 1.5&quot; x 100' unlined</td>
<td>6  3  2  2</td>
<td>1</td>
<td>1  1</td>
</tr>
<tr>
<td>Assorted valves &amp; connectors</td>
<td>2  4  2  1</td>
<td>1</td>
<td>1  1</td>
</tr>
<tr>
<td>Assorted nozzles</td>
<td>2  4  2  1</td>
<td>1</td>
<td>1  1</td>
</tr>
<tr>
<td>Clamps &amp; spanner wrenches</td>
<td>3  2  5  2</td>
<td>1</td>
<td>1  1</td>
</tr>
</tbody>
</table>

**D) Power Equipment**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Rainy District</th>
<th>Namakan District</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain saw</td>
<td>1</td>
<td>1</td>
<td>1  1</td>
</tr>
<tr>
<td>Metal files</td>
<td>2</td>
<td>1</td>
<td>1  3</td>
</tr>
</tbody>
</table>

**E) Miscellaneous**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Rainy District</th>
<th>Namakan District</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backpack</td>
<td>1</td>
<td>1</td>
<td>1  1</td>
</tr>
<tr>
<td>Pack frame</td>
<td>8  7  4</td>
<td>1</td>
<td>1  1</td>
</tr>
<tr>
<td>Sleeping bag</td>
<td>8  7  4</td>
<td>1</td>
<td>1  1</td>
</tr>
<tr>
<td>Torches, case</td>
<td>2  4  2  1</td>
<td>1</td>
<td>1  1</td>
</tr>
</tbody>
</table>
APPENDIX E: INTERAGENCY OPEN BURNING RESTRICTIONS

CATEGORIES

In order to maintain a degree of standardization between the State of Minnesota and various Federal agencies also concerned with regulations affecting open burning, the following classes of regulations are established. The Department of National Resources, the United States Forest Service (Chippewa and Superior National Forests), the United States Department of Interior (National Park Service, Voyageurs National Park and Bureau of Indian Affairs) will adhere to the classes listed below, to maximum extent possible considering the various agencies statutory authorities and existing conditions.

All wildfire related laws, rules and regulations shall remain in effect unless until changed or modified by the issuance of burning restrictions through the Commissioner's Office of the Department of Natural Resources, the Forest Supervisors office of the U.S. Forest Service, the Minneapolis office of the Bureau of Indian Affairs or the International Falls office of the National Park Service.

Before issuing or modifying restrictions of a Class III or IV nature, the above agency heads or their delegates shall consult with each other concerning the intent of their actions, possible effects, the area included, public reaction, restriction needs, interagency coordination (to be done by initiating agency), news releases, and other areas of concern. Class III and IV regulations will be on a county basis when ever possible. A common agreement as to the content of restrictions and counties included will be the goal of this consultation.

When any closure order or restriction is issued or modified which is of a Class III or IV category all other agencies named in this agreement shall be mailed a copy of the closure order.

CLASS I - NORMAL REGULATIONS

1. Unrestricted burning permits issued under local authority with limitations commensurate with local conditions.
2. Special permits are allowed.
3. No restriction of recreational fires.
4. No restrictions on smoking.
5. Prescribed burning allowed.

CRITERIA

FIRE DANGER: Low to moderate
RISK: Low to high
STATUS: All firefighting resources available.
CLASS II - CONTROLLED REGULATIONS

1. Restricted burning permits, authority still under local control.
2. Special permits are allowed.
3. No restrictions on recreational fires.
4. No restrictions on smoking.
5. Prescribed burning allowed.

CRITERIA

FIRE DANGER: Moderate to high
RISK: Low to high
STATUS: Up to 25% of firefighting resources committed.

CLASS III - RESTRICTED REGULATIONS

NOT UNDER LOCAL CONTROL

1. No burning permits issued.
2. No open burning (cooking fires allowed in a designated fire receptacle designed for such use and associated with a residence or dwelling).
3. Recreational fires - not allowed, except gas and propane fired campstoves, grills and similar devices are allowed. No charcoal permitted.
4. Use of fireworks and explosives within municipalities shall be under control of the municipalities.
5. No welding, acetylene torches or other such devices with open flame allowed in forest areas except under special permit.
6. No restrictions on smoking.

CRITERIA

FIRE DANGER: Moderate to extreme
RISK: Moderate to high
STATUS: Up to 50% of firefighting resources committed.
CLASS IV - RESTRICTED REGULATIONS

1. No burning permits issued.
2. No open burning - including cooking fires associated with residential areas.
3. No recreational fires including propane and gas fire devices.
4. No outdoor smoking.
5. Travel or entry on public lands may be restricted.
6. Recreational activities may be restricted.
7. Industrial operations may be restricted.

CRITERIA

FIRE DANGER: High to extreme
RISK: High
STATUS: Up to 50% or more firefighting resources committed.

Robert Rehfeld 1/25/82
Forest Supervisor
Superior National Forest

James Brewer 1/5 Jan 82
Forest Supervisor
Chippewa National Forest

Jose A. Zuni 1/23/82
Bureau of Indian Affairs
Minneapolis Area Office
Acting Area Director

Raymond Hitchcock 11/10/81
Minn. D.N.R., Director
Division of Forestry

Joe J. Cayou Date
Park Superintendent (Acting)
Voyageurs National Park
APPENDIX F: FIRE SAFETY BROCHURE

WILDLAND FIRE HAZARDS:
SAFETY AND SURVIVAL PRECAUTIONS
FOR RECREATIONISTS AND HOMEOWNERS

FIRE EXPOSURE

Since recreational and residential use of wildlands is increasing, the general public needs to be prepared to safely encounter prescribed fires that may have been allowed to burn in national parks and wildernesses or wildfires. This brochure presents information about fire hazards, fire behavior, and survival principles to help recreationists and homeowners prevent injury and death.

There are five possible ways in which people can be injured or killed by fire:

- The body's heat regulation mechanism fails
- The body is burned
- The lungs are seared by superheated gases
- People are overcome by smoke and suffer from lack of oxygen
- People are poisoned by carbon monoxide or other toxic gases.

FIRE BEHAVIOR

The science of fire behavior describes how fires burn in relation to the controlling factors of fuel, weather, and topography. No two fires are exactly alike, as there are almost infinite combinations of fuel, weather, and topographic situations. A cardinal rule of fire safety is to base all actions on current and expected behavior of fires. Will the fire spread slowly or quickly? Will it remain on the ground or burn into the crowns of shrubs and trees? Or will wind currents carry burning embers beyond the main fire, causing the fire to burn hotter, faster, and producing new fires in unexpected places? Several early warning factors help signal the onset of "hotter" and "faster" burning conditions:

Fuel
- Flashy fuel (dead grass or long pine needles)
- More fuel
- Drier fuel
- Dead fuel
- Aerial fuel (combustible material suspended in the crowns of high shrubs and trees).

Weather
- Faster winds or sudden changes in speed and direction
- Unstable atmosphere (indicators: gusty winds, dust devils, and good visibility)
- Erratic and strong downdraft winds from towering cumulus clouds and dry thunderstorms
- Higher temperatures
- Drought conditions
- Lower humidities.

Topography
- Steeper slopes
- South- and southwest-facing slopes
- Gaps or saddles
- Chimneys and narrow canyons.

Fire Behavior
- Burning material rolling downhill and igniting fuel downslope
- Spot fires occurring ahead of main fire
- Individual trees "torching" out
- Shrubs or trees burning in a crown fire
- Smoldering fires over a large area
- Many fires starting simultaneously
- Fire whirls causing spot fires and erratic burning
- Intense burning with flame lengths greater than 4 feet
- Smoke column dark and massive with rolling, boiling vertical development
- Lateral movement of fire near base of steep slope.

Extreme caution should be used when moving downhill toward a fire that can suddenly burn swiftly uphill. Also, care should be used when there is unburned fuel between you and fire, or when walking in difficult terrain, darkness, or unfamiliar country.

The first step a person should take upon encountering a wildland fire is to review the principles and warning signals, sizing up the situation in terms of fuel, weather, and topography factors and observed fire behavior. After making an estimate of its probable direction and rate of spread, travel routes can be planned that avoid life hazards.

TRAVEL AND EVACUATION PRECAUTIONS

The following rules have been adapted from the "Ten Standard Orders" for firefighters to remind people of safety precautions while traveling near fire or evacuating from fire hazards:
1. Choose a leader at the outset who gives clear instructions and maintains control of the group.
2. Continuously observe changes in speed and direction of fire and smoke to choose travel away from fire hazards.
3. Plan an alternate route in case fire suddenly changes direction and threatens you.
4. Keep aware of fire movement while traveling to avoid entrapment.
5. Be alert, keep calm, think clearly, and act decisively to avoid panic and to avoid injury by rolling or falling debris.

ESCAPE AND ENTRAPMENT PROCEDURES

In some instances there may be no chance to avoid a fire. When entrapment is probable, injuries or death may be avoided by following these procedures:

1. Do not panic. If fear becomes overwhelming, judgment is seriously impaired and survival becomes a matter of chance.
2. Do not run blindly or needlessly. Unless the path of escape is clearly indicated, do not run. Move away from the flanks of the fire, traveling downhill where possible. Conserve your strength.
3. Enter the burned area. Do not delay. If escape means passing through the flame front into the burned area, do so when flames are less than 3 feet deep and you can see clearly through them. Cover exposed skin, take several breaths, and move through the flame front quickly.
4. Burnout. If unable to enter the burned area, ignite grass and other fine fuels between you and the fire edge. Step into this burned area and cover as much of your exposed skin as possible. This action will not be effective in heavier fuels that burn for a long time.
5. Regulate breathing. To avoid inhaling dense smoke, take shallow, slow breaths close to the ground.
6. Protect against radiation. Shield yourself from heat rays by seeking a shallow trench, crevice, large rock, lake, stream, large pond, vehicle, or building. Don't seek refuge in elevated water tanks. Wells and caves generally should be avoided because oxygen may be quickly used up in these restricted places. Cover exposed skin with clothing or dirt.
7. Lie prone. In an emergency, lie flat with head down on an area that will not burn. A person's chance of survival is greater in this position than if overtaken by fire when standing upright or kneeling.

SURVIVAL IN A VEHICLE

If trapped in a vehicle by fire, the following steps will enhance survival:

1. Do not drive through dense smoke
2. Park away from heaviest vegetation
3. Turn headlights on and ignition off
4. Do not leave the vehicle
5. Roll up windows and close air vents
6. Get on the floor and cover with blanket or coat, if possible
7. Stay in the vehicle until the main fire passes.

While it is frightening to be trapped in a car by fire, it is almost certain doom to attempt escape by running from fire. A few facts may prevent panic:

1. Engine may stall and not restart
2. Convection currents may rock vehicle
3. Smoke and sparks may enter the vehicle
4. Temperature will increase inside the vehicle
5. Metal gas tanks and containers rarely explode.

SURVIVAL IN BUILDING

Fire protection agencies encourage people to evacuate homes and buildings, rather than staying behind to fight the fire. When threatened by an approaching fire, however, people may find a safer refuge in buildings than in the open. Safe refuge in buildings depends on the construction materials and reduction of fuels around the structure. A building usually offers protection during the passing of fire, even if it ignites later, because it shields against radiant heat and smoke. Take the following precautions before fire approaches:

1. Remove combustible items from around the house.
2. Close doors, windows, and vents. Turn on light in each room for visibility in dense smoke.
3. Place water in containers to fight fire. A wet mop can be used to extinguish sparks or embers inside the building.
4. Locate garden hoses so they will reach any place on the house.
5. Use portable gasoline-powered pumps to take water from a swimming pool or tank.
6. If you have a combustible roof, wet it down or turn on any roof sprinklers.
7. Back car in the garage and shut car doors and windows. Disconnect the automatic garage door opener (in case of power failure you could not remove the car). Close all garage doors.
8. Close windows and doors to the house to prevent sparks from blowing inside. Close all doors inside the house to prevent draft. Open the damper on your fireplace to help stabilize outside-inside pressure, but close the fireplace screen so sparks will not ignite the room.
9. Turn off pilot lights.
10. Take down drapes and curtains. Close all Venetian blinds or noncombustible window coverings to reduce the amount of heat radiating into your home.
11. Go inside the house as the fire front approaches.
12. After the fire passes, check inside and outside the house for fires. It may be necessary to exit a burning building following passage of the main fire front.
APPLICATION FOR PERMIT FOR OPEN BURNING

NAME ___________________________ TEL. NO. ______________________ (H)

REPRESENTING ___________________________ ______________________ (O)

ADDRESS ______________________________________________________ (Street, City and Zip Code)

request permission to conduct open burning at ___________________________

in the County of _____________________ Sec. _____ Twsp. ___ Range ___

Distance in feet from nearest occupied residence other than applicant's ____________, For the purpose of ___________________________

This application for open burning can be accomplished in accordance with the conditions listed on the reverse side. The recipient of the permit shall comply with all other state and local laws regarding open burning including obtaining the required permits.

(Signature of Applicant)

LOCAL APPROVAL FOR OPEN BURNING

This permit application is submitted with the knowledge and recommendation of a local fire authority or local governmental authority having jurisdiction where the burning is to be conducted. Any burning conducted under this permit request would be in accordance with MPCA regulations and would not violate local ordinances. Applicant meets 600 foot minimum distance requirement from occupied residences other than those located on the property upon which the burning is conducted.

NAME ___________________________ TITLE ___________________________ TEL. NO. ___________

ADDRESS ______________________________________________________ (Street, City and Zip Code)

INSPECTED BY ___________________________ DATE OF INSPECTION ___________

Equal Opportunity Employer
THIS PERMIT IS LIMITED TO THE FOLLOWING CONDITIONS:

1) The prevailing wind at the time of the burning shall be away from nearby residences.

2) The burning shall be conducted as far away as practical from any highway or public road and controlled so that a traffic hazard is not created.

3) The location of the burning shall not be within 600 feet of an occupied residence other than those located on the property on which the burning is conducted.

4) The burning shall not be conducted within one mile of any airport or landing strip, unless approved by the Director.

5) Oils, rubber and other similar smoke producing materials shall not be burned or used as starting materials.

6) The recipient of this permit or his authorized representative shall be present for the duration of any fire authorized by the permit.

7) Prior notice shall be given to the local fire authority of the time and location of any fire authorized by the permit.

8) Any fire allowed by this permit shall be extinguished within four (4) hours of a public announcement by the Minnesota Pollution Control Agency that an air pollution alert, warning or emergency exists. SUCH BURNING SHALL CEASE until a similar public announcement terminating the alert, warning or emergency is issued.

9) This permit is subject to revocation at the discretion of the Director, a Department of Natural Resources Forest Officer, the local fire authority or the permit issuer if:

   a) A reasonable, practical alternate method of disposal of the material exists;

   b) A fire hazard exists or develops during the course of the burning; or

   c) Any of the conditions of the permit are violated during the course of the burning.

10) Other reasonable conditions the permit issuing authority may impose.
APPENDIX H: MEMORANDUMS OF UNDERSTANDING
N.I.I.M.S. BOARD OF DIRECTORS

CHARTER

I. INTRODUCTION

The National Interagency Incident Management System (N.I.I.M.S.) is the result of a study made by the National Wildfire Coordinating Group, a group comprised of representatives from all Federal agencies having forest and wildland fire responsibilities and two representatives from State Forestry agencies. The Federal Emergency Management Agency also participates. N.I.I.M.S. is a combination of the best features of two tried and tested systems, the typical forestry Large Fire Organization combined with the National Interagency Fire Qualification System and the Incident Command System. Implementation of the N.I.I.M.S. concept is planned to commence in Minnesota on October 1, 1985.

Implementation of N.I.I.M.S. will involve many autonomous agencies, each with its own policies, jurisdictional responsibilities, funding differences and other special abilities and limitations. In order to bring all of these agencies together into an effective association, it is necessary to have an efficient system for decision making, coordination and cooperation.

A number of decisions and agreements will be made over the next few years which will bear significantly on the course of N.I.I.M.S. implementation in Minnesota. These agreements will provide the following:

A. Common terminology for organizational functions, resources and facilities.

B. A modular organization flexible enough to meet greatly varied needs in command, operations, planning, logistics and finance.

C. Integrated communications using special equipment and/or shared frequencies. Includes adoption of "clear text" phrases in place of codes and signals.

D. A predetermined method of developing a unified command to deal with multiagency or multijurisdictional situations.

E. A method of developing consolidated action plans to set incident priorities satisfactory to all agencies with a responsibility to fulfill.

F. Instilling accepted span-of-control procedures to provide for adequate supervision while avoiding a top heavy organization.

G. Standardizing the methods of organizing and committing resources to an incident to simplify management and staff support to them, and to provide for more efficient operation of the resource itself.
II. ADMINISTRATION

Responsibility for administration of N.I.I.M.S. will be vested in a Board of Directors. The Board of Directors shall consist of the representatives of the major emergency and fire agencies who are participating in the N.I.I.M.S. effort. The assignment of an alternate to periodically attend for an agency is acceptable provided that the alternate has been delegated authority to commit his agency in decision matters before the Board. Additional members may be added to the Board as the need arises.

To carry out the N.I.I.M.S. goals and objectives, a decision making process having the following characteristics has been designed for implementing N.I.I.M.S:

A. A "Directors" level for policy decisions.

B. A "Task Force" level which processes information and formulates policy for consideration by the Board of Directors.

C. A "Working Team" level to perform staff work and carry out the decisions processed at the two upper levels.

It is anticipated that the Task Force can assume responsibility in the implementation of N.I.I.M.S. after a period of familiarization. Participation in these groups will give all agencies a voice in the implementation of N.I.I.M.S. In execution of the N.I.I.M.S. program, most field level problems will be identified by the Working Teams or by the Task Force. Once an interagency problem has been recognized by any level of the partnership, the problem must be completely defined by the group perceiving the problem of others, and assigned by either the Task Force or the Board of Directors. The Task Force or Board of Directors may assign the most qualified persons to investigate the problem singly or as a team and recommend alternative solutions. These investigators will report their findings and recommendations to the Task Force and/or Board of Directors for review. The Task Force or Board of Directors will either make an appropriate decision or return the problem to the investigators for further study.

Approval for some Working Team findings can be accomplished at the Task Force level. For example, certain decisions on N.I.I.M.S. terminology, procedures and field actions may be made. In general, recommendations on operational expenditures within overall budget commitments should be made at the Task Force level for their respective agencies. Policy decisions, fiscal commitments, and long range implementation plans will require the Board of Directors' approval, after which such action will be carried out by the Task Force. Board members agree that agency exceptions to Board decisions may from time to time be necessary and that any such agency exceptions to recommendations of the Task Force or Board level decisions will be confirmed in writing.

The goals and objectives as outlined in the Implementation Plan provide guidelines and directions for the decision team.
III. GOALS OF THE BOARD

A. To establish an active, decisive body that will guide the implementation of N.I.I.M.S.

B. To assure that necessary actions are taken to maintain an agreed to N.I.I.M.S. operational capability.

C. To provide an agency commitment.

D. To accept a charter and set policy.

E. To appoint a Task Force composed of representatives of the Board of Directors and other organizations participating in N.I.I.M.S.

F. To establish Working Teams and set objectives for these Teams.

G. To identify barriers to the implementation of N.I.I.M.S. both interagency and by individual agencies, and act to resolve barriers.

IV. OPERATING PROCEDURES

A. The Board of Directors will appoint one of its members to serve as Chairman.

B. The Board will meet at the call of the Chairman. The frequency of meetings and allotted time should be consistent with decisions to be made.

C. Board members will strive for consensus in decision making. Proposed actions will be based upon consideration of common concern for each agency's needs, commitments and capabilities. Decision making will be by majority vote using Roberts' Rules of Order.

V. AUTHORITY

Authority for directing the statewide N.I.I.M.S. program is vested in the Board of Directors.
N.I.I.M.S. TASK FORCE

CHARTER

I. MEMBERSHIP

The Task Force shall consist of a representative from the agencies listed below who has authority to speak for his agency, subject to final policy level approval by his department or agency head:

- U.S. Bureau of Indian Affairs
- U.S.F.S.- Chippewa National Forest
- U.S.F.S.- Superior National Forest
- Voyageurs National Park Service
- Minnesota Department of Natural Resources/Forestry

Other members may be appointed as become necessary. Agency alternates may serve provided they are informed and can speak for their agency.

II. GOALS

1. To provide the Board of Directors with studies, statements, and other recommendations for decision making.

2. To implement within their respective agencies agreements which are adopted.

III. OBJECTIVES

1. Identify problem areas in interagency coordination.

2. To assign working teams to address problems. Functional teams could be as follows:
   a) Communications Working Team
   b) Logistics Working Team
   c) Finance Working Team
   d) Training Working Team
   e) Information Working Team
   f) Operations Working Team
3. To analyze working team reports and forward their recommendations to the Board.

4. To determine geographic and/or jurisdictional areas for implementation and timetables for proceeding.

5. To assist their own and other agencies in the implementation process.

IV. OPERATING PROCEDURES

1. The Chairman shall be for a one year term beginning October 1st, of each appointed year. This appointment shall be made and approved by a majority of the Task Force. His staff shall provide clerical needs of the Task Force.

2. The Task Force shall meet as requested by the Board of Directors or at the request of the Task Force Chairman consistent with the work in progress. Scheduled meetings are expected on a quarterly basis.

3. Depending on the task at hand, the Task Force may function in either a management or staff role.

4. Decision making on development issues, and recommendations to the Board will be by majority vote; recording votes by agencies. The procedure shall be carried out by Roberts' Rules of Order.

V. AUTHORITY

The Task Force functions both in a management and staff role. In a management role, the Task Force formulates policy for N.I.I.M.S. implementation and prepares "action plans" for the Board of Directors decision. In a staff role, the Task Force assists the Board of Directors in all activities which will lead to an orderly implementation of N.I.I.M.S.
N.I.I.M.S. WORKING TEAM

I. MEMBERSHIP

The membership of a working team shall be made up of key specialists from participating agencies who are knowledgeable in this specific discipline and also to assess the effects of the actions under study on their respective agency.

II. GOALS

1. To provide the N.I.I.M.S. teams with detailed expertise in this specific discipline.

2. To be able to identify and solve agency problems associated with the varied details of N.I.I.M.S. implementation.

III. OBJECTIVES

1. To conduct studies necessary to ensure the compatibility of N.I.I.M.S. sub-systems, concepts, and principles with agency operations.

2. To prepare a documentation for use within each agency in N.I.I.M.S. concepts and operations.

3. To provide planning, fiscal, and technical information to the Board of Directors and Task Force for use in long range and day-to-day planning for N.I.I.M.S. implementation.

IV. OPERATING PROCEDURES

1. The working team shall convene as necessary to accomplish their assignments.

2. Each working team will operate as agreed by its members. They will respond to requests for:
   a) Technical expertise.
   b) Fiscal data required for long range planning.
   c) Planning information required to synchronize the implementation of N.I.I.M.S. between agencies.
   d) Internal needs of each agency to assure an orderly transition from "status quo" to N.I.I.M.S.

V. AUTHORITIES

The working team will operate primarily in a staff role to the Task Force or Board of Directors. Actions taken by the working team will be coordinated through the Task Force Chairman to assure that such actions are compatible with the overall N.I.I.M.S. concept. Each working team member must have the authority to commit their respective agencies in technical matters involving the implementation of N.I.I.M.S.

*NOTE: This will serve as a guide to be assigned by the Task Force when a "Work Team" is formed.
AGREEMENT

The undersigned, acting as the MINNESOTA - N.I.I.M.S. BOARD OF DIRECTORS, approve and accept this CHARTER as an instrument to initiate the implementation of the N.I.I.M.S. program in this State. Provided, that nothing herein is intended to require any partner agency to act in any way which is contrary to its legal, fiscal, or policy constraints.

Agency U.S. BUREAU OF INDIAN AFFAIRS
By ____________________________
Date __________________________

Agency VOYAGEURS NATIONAL PARK SERVICE
By ____________________________
Date __________________________

U.S. FOREST SERVICE
Agency CHIPPEWA NATIONAL FOREST
By ____________________________
Date __________________________

Agency SUPERIOR NATIONAL FOREST
By ____________________________
Date __________________________

STATE AGENCY

DIVISION OF FORESTRY
MINNESOTA DEPARTMENT OF NATURAL RESOURCES

By ____________________________
Date __________________________

By ____________________________
Date __________________________
MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding is between the MNICS partner agencies, which are: Minnesota Department of Natural Resources, U.S. Fish and Wildlife Service, U.S. Bureau of Indian Affairs, National Park Service; Voyageurs National Park and St. Croix National Scenic Riverway, U.S. Forest Service; Superior National Forest and Chippewa National Forest.

The purpose of this Memorandum of Understanding is to establish terms and conditions for use of radio frequencies when partner agencies are engaged in mutual aid efforts on incidents.

The Reciprocal Fire Protection Act of May 27, 1955 (PL 84-46) authorizes the U.S. Government to enter into this Memorandum of Understanding.

The following terms and conditions are agreed to:

1. All partner agencies shall follow and adhere to any and all special limitations and exceptions in the license granted for the frequency(s) used. The attachments to this Agreement identify frequencies that may be used and special restrictions that apply.

2. This agreement covers "mobiles, personal portable, and temporary base/control station" use, within the MNICS region.

3. It is the responsibility of the Requesting Agency to authorize use of and to identify the frequency(s) to be used when an order is placed for assistance.

4. A partner agency frequency is to be used only when working with that agency and only within the area of jurisdiction of that agency.

5. For Incident use the "Incident Radio Communications Plan" will identify the frequencies for that Incident.
The following Radio Frequencies are licensed by the FCC under Call Signs KA6951 and KP4714 to the State of Minnesota, Department of Transportation. Minnesota DNR is licensed to use them "In Minnesota & vicinity" with the exceptions noted. MNICS partner agencies are subject to the same limitations. Partner agencies may use the frequencies when responding to incidents in DNR jurisdiction.

<table>
<thead>
<tr>
<th>Radio Frequency</th>
<th>Function</th>
<th>Exception</th>
</tr>
</thead>
<tbody>
<tr>
<td>151.265</td>
<td>Area Net</td>
<td>None</td>
</tr>
<tr>
<td>151.325</td>
<td>Area Net</td>
<td>None</td>
</tr>
<tr>
<td>151.385</td>
<td>Area Net</td>
<td>None</td>
</tr>
<tr>
<td>151.475</td>
<td>Tactical Net</td>
<td>None</td>
</tr>
<tr>
<td>151.190</td>
<td>Parks</td>
<td>None</td>
</tr>
<tr>
<td>151.415</td>
<td>DNR point to</td>
<td>Used by base stations</td>
</tr>
<tr>
<td></td>
<td>point</td>
<td>only</td>
</tr>
</tbody>
</table>

The following Radio Frequencies are licensed by the U.S. Government, NTIA, to the government agencies as listed. The Government Agencies are licensed to use these frequencies to "Manage and Protect" lands under their jurisdiction with the exceptions as noted. MNICS agencies are subject to the same limitations. Partner agencies may use the frequencies when responding to incidents in U.S. Government jurisdiction.

<table>
<thead>
<tr>
<th>Radio Frequency</th>
<th>Function</th>
<th>Exception</th>
</tr>
</thead>
<tbody>
<tr>
<td>34.84 &amp; 171.750</td>
<td>Fish &amp; Wildlife</td>
<td>None</td>
</tr>
<tr>
<td>172.425</td>
<td>BIA</td>
<td>None</td>
</tr>
<tr>
<td>166.900</td>
<td>VNP</td>
<td>None</td>
</tr>
<tr>
<td>164.750</td>
<td>St. Croix</td>
<td>None</td>
</tr>
<tr>
<td>166.325</td>
<td>Grand Portage</td>
<td>None</td>
</tr>
<tr>
<td>169.925</td>
<td>Superior</td>
<td>None</td>
</tr>
<tr>
<td>164.825</td>
<td>Chippewa</td>
<td>None</td>
</tr>
<tr>
<td>168.625</td>
<td>Nat'l Airnet</td>
<td>Emergency Air to Air</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Only</td>
</tr>
<tr>
<td>168.650</td>
<td>Forest Airnet</td>
<td>Air to Ground Dispatch</td>
</tr>
</tbody>
</table>

The following Radio Frequency is licensed by the FCC under Call Sign KH 9726 to the State Fire Departments as "Fire Mutual Aid" for local fire departments. Partner agencies may use this frequency when responding to joint incidents with local fire departments when following the limitations as noted.

<table>
<thead>
<tr>
<th>Radio Frequency</th>
<th>Function</th>
<th>Exceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>154.295</td>
<td>FMA</td>
<td>Aircraft cannot use this frequency when flying over 1500' AGL nor can their power output exceed 10 watts</td>
</tr>
</tbody>
</table>

Authorization to be reviewed by the Fire Frequency Communication Advisory Board at their December 1986 Meeting.

Richard Krogh, Secretary
Fire Frequency Communication
The following is the signature list for the NIIMS Communication Memorandum of Understanding. It is to be signed in consecutive order. After all signatures are secured, please return to:

Robert L. Joens  
MNICS Task Force Chairman  
Superior National Forest  
Box 338  
Duluth, Minnesota 55801

Dennis Gardner  
Date 10/19/85  
Minnesota Dept. of Natural Resources  
Division of Forestry

J. William Eadie  
Date 3/20/87  
Regional Director  
U.S. Fish & Wildlife Service

James O'Neill  
Date 11/7/85  
Area Director  
U.S. Bureau of Indian Affairs

Park Superintendent  
St. Croix Scenic Riverway

Francis Bauer  
Date 11/21/85  
Forest Supervisor  
Superior National Forest

Forest Supervisor  
Superior National Forest

Francis Bauer  
Date 3/11/86  
Fire Frequency Communication  
Advisory Board  
Minnesota Fire Chiefs Association
COOPERATIVE AGREEMENT
BETWEEN VOYAGEURS NATIONAL PARK
AND
MINNESOTA'S DEPARTMENT OF NATURAL RESOURCES

This Cooperative Agreement is between Voyageurs National Park represented by its Superintendent and hereafter referred to as V.N.P., and the Minnesota Department of Natural Resources represented by its Commissioner and hereafter referred to as the D.N.R.

WHEREAS, under the laws of the State of Minnesota the D.N.R. protects and manages natural resources within the state, and carries out actions to accomplish this purpose:

WHEREAS, under laws and treaties passed by the U.S. Congress, V.N.P. is directed to preserve, for present and future generations, examples of the natural environments and native biota of the park, and to carry out actions to accomplish this purpose:

WHEREAS, the Minnesota State Legislature encouraged and concurred with the authorization and purpose of V.N.P., cooperation between V.N.P. and the D.N.R. to accomplish the park's purpose is appropriate, and serves both state and national interests.

NOW, THEREFORE, V.N.P. and the D.N.R. mutually agree:

1. To coordinate their administrative, research and management actions that influence the natural resources and public use of the park.

2. To encourage and facilitate appropriate research on the natural resources and public use of the park.

3. To exchange information on the natural resources and public use of the park.

4. To cooperate to the extent possible and appropriate in joint actions on fire protection, law enforcement, fish or wildlife control, protection of rare, threatened, or endangered species and restoration of native fauna in the park.

5. To enter into working arrangements for the use of lands, buildings, and other facilities owned and operated by either party hereto to the extent possible and document these uses through appropriate permits.
6. To enter into supplemental agreements to this Cooperative Agreement as necessary.

7. To make joint press releases when appropriate.

8. To meet jointly at least once annually before April 30, to review progress under this Cooperative Agreement and to provide for other meetings at various administrative levels for discussion of other relevant matters.

9. That nothing contained herein shall be construed as obligating either party hereto to the expenditure of funds or for the future payment of money in excess of appropriations authorized by law.

10. That nothing contained herein shall be construed as limiting in any way the responsibility and authority as defined by law, of the Commissioner of the Minnesota Department of Natural Resources and the Superintendent of Voyageurs National Park in connection with the administration and protection of resources under their respective administrations.

11. That this Cooperative Agreement shall become effective when signed by the parties hereto and shall continue in force for five (5) years or until terminated by mutual agreement, or by either party upon sixty (60) days' written notice to the other of the intention to do so. Amendments to this Cooperative Agreement may be proposed by either party and shall become effective upon written approval by both parties.

12. No member of, or delegate to Congress, or Resident Commissioner, shall be admitted to any share or part of this Cooperative Agreement or to any benefit to arise therefrom, unless it is made with a corporation for its general benefit.

IN WITNESS WHEREOF, the parties hereto have executed this Cooperative Agreement as of the date last signed below.

Date: JUNE 1, 1979

By
Voyageurs National Park Superintendent

Date: Aug 2, 1979

By
Minnesota Department of Natural Resources Commissioner
UNITED STATES DEPARTMENT OF THE INTERIOR

NATIONAL PARK SERVICE

MIDWEST REGION
1709 JACKSON STREET
OMAHA, NEBRASKA 68102-2571

COOPERATIVE AGREEMENT

BETWEEN

VOYAGEURS NATIONAL PARK

AND

MINNESOTA DEPARTMENT OF NATURAL RESOURCES

COOPERATIVE AGREEMENT NO: CA6820-3-0001

TITLE: Minnesota Department of Natural Resources - Voyageurs National Park Cooperative Agreement

EFFECTIVE DATE: 1983

TERMINATION DATE: September 30, 1988

MINNESOTA DEPARTMENT OF NATURAL RESOURCES

NAME:

TITLE: Deputy Commissioner

DATE: June 16, 1983

NATIONAL PARK SERVICE

NAME: [Signature]

TITLE: Superintendent, Voyageurs National Park

DATE: June 10, 1983

NAME: [Signature]

TITLE: Regional Contracting Officer

DATE: [Signature]
SECTION B

STATEMENT OF AGREEMENT

WHEREAS, the Act of August 25, 1916, 39 Stat. 535, and amendments thereto, 16 USC 1 (1964), declares that the National Park Service (hereinafter known as the Service) shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations by such means and measures as conform to the fundamental purpose of the parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations; and the authorities provided by the Act of August 7, 1964, 60 Stat. 885, 16 USC 17j-2(e); and

WHEREAS, the enabling legislation (Public Law 91-661, January 8, 1971) for Voyageurs National Park (hereinafter known as the Park) mandates that the Service will preserve for the inspiration and enjoyment of present and future generations, the outstanding scenery, geological conditions and waterway system which constituted a part of the historic route of the Voyageurs; and

WHEREAS, the Master Cooperative Agreement between the Park and the Minnesota Department of Natural Resources, signed June 1, 1979, provides for entering into supplemental Cooperative Agreements as necessary; and

WHEREAS, the Federal Grant and Cooperative Agreement Act of 1977 (Public Law 95-224, February 3, 1978) section 6 states that each executive agency shall use a type of cooperative agreement as the legal instrument
reflecting a relationship between the Federal Government and a State or local government or other recipient (e.g., education organization) whenever the principal purpose of the relationship is the transfer of money, property, services, or anything of value to the State or local government or other recipient to accomplish a public purpose of support or stimulation authorized by Federal statute, rather than acquisition, by purchase, lease, or barter, of property or services for the direct benefit or use of the Federal Government; and substantial involvement is anticipated between the executive agency, acting for the Federal Government, and the State or local government or other recipient during performance of the contemplated activity; and

WHEREAS, the Federal Grant and Cooperative Agreement Act of 1977 (Public Law 95-224, February 3, 1978) section 7b states that the authority to make contracts, grants, and cooperative agreements for the conduct of basic or applied research at nonprofit institutions of higher education, or at nonprofit organizations whose primary purpose is the conduct of scientific research shall include discretionary authority, when it is deemed by the head of the executive agency, to be in the furtherance of the objectives of the agency, to invest in such institutions or organizations, without further obligation to the Government, or on such other terms and conditions as deemed appropriate, title to equipment or other tangible personal property purchased with such funds; and

WHEREAS, Minnesota Department of Natural Resources (hereinafter known as the Department) is a State agency organized and maintained to manage the State's natural resources and in doing so is authorized to conduct a program
of education, research and extension designed to benefit all people of the State including owners, operators, and users of recreational areas, and serve as a focal point for the use, conservation, and management of the recreation resources of the State; and

WHEREAS, the Park and the Department are mutually interested in and desire to cooperate on studies of fish and wildlife and environmental management in Voyageurs National Park, and similar areas elsewhere in the State of Minnesota; and

WHEREAS, such studies whether performed and/or financed by the Park or performed and/or financed by the Department or other institutions or persons will be valuable and necessary for the management of the areas and resources under the jurisdiction of the Service and of the State of Minnesota; and

WHEREAS, the Park has, or is able to obtain, qualified personnel to conduct investigations and participate in related programs of the Department as may be desirable; and

WHEREAS, it appears advantageous to both parties to enter into an agreement in order to facilitate desired studies and research programs;

NOW THEREFORE, in consideration of the above premises and in the interest of the mutual advantage in attaining common objectives, the parties hereto desire to cooperate and mutually agree as follows:

1. To consider jointly at such places and at such intervals as may be agreed upon by both parties hereto a general program of research related to fish and wildlife and environmental management in Voyageurs National Park.
2. To develop specific working agreements and plans for investigative activities within the existing programs relating to fish and wildlife, environmental research and management of Voyageurs National Park considered by both parties hereto to have mutual interest.

ARTICLE I

The Department agrees to:

(a) Provide, subject to availability and negotiation, equipment, supplies and services to conduct cooperative fish and wildlife research and environmental management studies in the Park all within appropriation and complement limitations and pursuant to subsequent working agreements; and

(b) Encourage appropriate staff cooperation.

ARTICLE II

The Park agrees to:

(a) Provide scientists within prescribed Service ceiling limitations and in accordance with established personnel regulations, to conduct the cooperative studies and to headquarter them at the Park to collaborate with the Department in developing programs and conducting fish and wildlife research and environmental management studies; and

(b) Allow the Park scientists to serve on appropriate committees, if invited, and to provide consultation services to the Departmental staff working in the fields related to natural sciences, and other scientific matters without charge to the Department; and
(c) Provide reimbursement to the Department under this Agreement for services, equipment, supplies, and materials, when necessary, to support cooperative studies.

ARTICLE III

It is further mutually agreed between the parties:

(a) That neither party will publish any results of joint effort without consulting the other. This is not to be construed as applying to popular publication of technical matter published prior to the effective date of this Agreement. Publication may be joint or independent as may be agreed upon, always giving due credit to the cooperation and recognizing within proper limits the rights of individuals doing the work. In the case of failure to agree as to manner of publication or interpretation of results, either party may publish data after due notice and submission of the proposed manuscripts to the other. In such instances, the party publishing the data will give due credit to the cooperation but assume full responsibility for any statements on which there is a difference of opinion; and

(b) That the results of any cooperative studies may be used for theses in partial fulfillment of requirements for advanced degrees and nothing herein shall operate to delay theses publication; and

(c) That all equipment, materials, and property of any kind purchased from funds provided by the Park (or Service) under the terms of this Agreement and not consumed in the project shall be the property of the Park (or Service) and disposed of as directed thereby; and
(d) The program of the cooperative studies will be reviewed annually by the Commissioner of the Department and the Superintendent of the Park or the designated representative of any of them, to insure continued harmony with objectives and programs; and

(e) That this Agreement may be terminated by either party by giving notice to the other in writing at least 6 months in advance; and

(f) That limitation of expenditures under this Cooperative Agreement shall be determined by specific working agreements entered into under authority of this instrument. Each Agreement shall consist of a memorandum outlining the work to be accomplished followed by a proposal from the Department for accomplishment of the work and accompanied by a cost breakdown for the work. When the work to be accomplished and the work program are mutually agreed upon by both parties, a Reaffirmation Memorandum for each working agreement shall consummate it for obligation of funds; and

(g) That nothing herein shall be construed as obligating either the Department or the Park to expend or as involving either in any contract or other obligation for the future payment of money in excess of appropriations authorized by law and administratively allocated for this work; and

(h) No member of or delegate to Congress, or resident Commissioner, shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit; and
(1) During the performance of this Agreement, the cooperators agree to abide by the terms of Executive Order 11246 on non-discrimination and will not discriminate against any person because of race, color, religion, sex or national origin. The cooperators will take affirmative action to ensure that applicants are employed without regard to their race, color, religion, sex or national origin.
1986.10.09

Al Johnson
Program Manager
North Central Region
Fire Management Centre
P.O. Box 5000
THUNDER BAY, Ontario
P7C 5G6

SUBJECT: Memorandum of Understanding

Attached please find the Memorandum Of Understanding from our September 10, 1986 meeting.
MEMORANDUM OF UNDERSTANDING

Memorandum of Understanding Between the Minnesota Department of Natural Resources, the U.S. Forest Service, Superior National Forest, the Ontario Ministry of Natural Resources and the Voyageurs National Park. As Revised September 10, 1986.

In recognition of the fact that fire is no respecter of National Boundaries, and that from the standpoint of public welfare and good forestry, it is essential that where policy dictates, all fires be brought under as prompt control as possible, regardless of point of origin, it is the intent of the parties of this understanding to outline the course of immediate action that will be taken in suppressing fires occurring along the International Boundary, to wit:

There shall be a "Common Zone" understood to exist for approximately two miles (3.20 km) on either side of the International Boundary, which will be under observation by the affected services. The portion of the International Boundary so affected will be the section from the mouth of the Pigeon River as it enters Lake Superior extending westward to the "North West Angle" in the Lake of the Woods. The "North West Angle" being the junction of the boundaries of the State of Minnesota, U.S.A.; and the Provinces of Ontario and Manitoba in Canada.

In case of an unattended fire being discovered in this common territory, the protection Agency discovering the fire shall take immediate steps to notify the protection Agency in whose area it is, and if necessary, take immediate steps to fight the fire, organize crews, etc., until the protection Agency affected gets its forces on the ground to take charge.

Fires occurring on one side of the line and crossing to the other will be handled by the party first reaching it. The fire will continue to be handled in this manner unless it is desirable to split the suppression action between the Agencies involved. The intent of this understanding is to cover fires which burn against the boundary from either side to the end that control measures will not be abandoned simply because the fire has crossed another territory.

Either agency on being notified of the fire burning in their territory or threatening to cross into it, shall dispatch by first available means, a duly authorized officer to take charge. Payrolls and expenses incident to the fire will be paid by the protection agency responsible for the area the fire is in, on an out pocket expense basis.

Emergency border crossings within the intent of this agreement have been cleared by each side by letter. (References: Canada Department of National Revenue Customs and Excise 4/8/59; Canada Department of Manpower and Immigration 6/8/72; U.S. Treasury Department 2/9/72, 2/21/75, 10/26/81.

Each party waives all claims against every other party for compensation for any loss, damage, personal injury or death occurring as a consequence of the performance of this agreement.

Each protection agency will pay all cost of fighting fire in their respective areas under this understanding. When questions on the settlement of costs occurred come up, arrangements as to who and how payment will be made will be determined by representatives of the respective agencies involved.
The following is a list of the co-ordinating committee for this agreement; and the duties they will perform:

Tom Campbell, Program Manager
Northwestern Region
Fire Management Centre
P.O. Box 850
Dryden, Ontario
PON 2Z5
Telephone: (807) 937-4402

Dr. L. Den, Ontario
Fire Management Centre
500 Lafayette Road
P.O. Box S50
St. Paul, Minnesota
55155-4044
Telephone: (612) 296-5971

Al Johnson, Program Manager
North Central Region
Fire Management Centre
P.O. Box 5000
Thunder Bay, Ontario
P7C 5G6
Telephone: (807) 475-1265

Robert L. Joens
Superior National Forest
P.O. Box 338
Duluth, Minnesota
U.S.A. 55801
Telephone: (218) 720-5387

Joe Cayou, Chief Ranger
Voyageurs National Park
P.O. Box 50
International Falls, Minnesota
U.S.A. 56649
Telephone: (218) 283-9821

1. Prior to April 1st annually, provide each other with the following for dissemination to their service:
   a) List of key personnel by titles, showing means of contact.
   b) List of all possible co-operative detection facilities, both lookout towers and aerial patrols.
   c) Location of manned border ranger stations and name of officer-in-charge.
   d) Boundaries, showing areas of responsibility for all key personnel in (a) above.
   e) Location and times of weather observation, frequencies and times they report by radio or otherwise.
   f) Maps, where they are needed to cover boundary changes, lookout or other protection facilities.

2. Maintain continuous liaison with each other and
   a) Exchange information, technical data and reports etc., covering items of mutual interest.
   b) Provide information on courses, meetings and demonstrations within their respective agency, which if attended by outside personnel would provide mutual benefit.
c) meet and/or discuss and recommend or implement the solution to any mutual problem arising from this memorandum to understanding.

d) set and arrange for the meeting of the agencies of this memorandum of understanding on a biennial basis, or more often if required.

e) keep each other duly informed during times when forest fire(s) including prescribed fire(s) burning in one agency's area are the source of smoke drifting over another agency's area of concern.

f) Fire Area Planning.

The chairman of the co-ordinating committee shall be the committee member for the agency hosting the next biennial meeting. Biennial meetings are to be held the first Tuesday in March of the meeting year, however, if the host agency wishes to change this date for some reason they may do so by informing all members of this agreement of the change before the March scheduled meeting date. The U.S.F.S., Superior National Forest in 1987, the Ministry of Natural Resources, Northwestern Region in 1989, the Department of Natural Resources, State of Minnesota in 1991 and Voyageurs National Park in 1993.

Contact individuals for all members of this Memorandum of Understanding concerning the biennial meeting are as follows:

For all Canadian Members

Tom Campbell
Fire Management Centre
Northwest Region
P.O. Box 850
Dryden, Ontario
P.O. Box 225
Telephone: (807) 937-4402

For all U.S. Members

Bob Joens
Superior National Forest
P.O. Box 338
Duluth, Minnesota
U.S.A. 55801
Telephone: (218) 720-5307
APPENDIX 1

Reference letters re: emergency border crossings within the intent of Memorandum of Understanding Between the Minnesota Department of Natural Resources, the U.S. Forest Service, Superior National Forest, the Ontario Ministry of Natural Resources and the Voyageurs National Park.

- As revised September 10, 1986
Mr. W.G. Cleaveloy,
Director,
Ministry of Natural Resources,
Environmental Protection Branch,
Toronto 182, Ontario.

Dear Mr. Cleaveloy:

Re: Your file 23-2-1

Thank you for your letter of May 23rd and its attachments, concerning the informal Fire Fighting Agreement which exists between Ontario and various United States fire agencies along the Ontario border.

Since several provinces of Canada are parties to agreements with bordering United States forest fire fighting agencies, this Department has an established policy whereby United States forest fire fighters will be admitted to Canada without documentation or delay during an emergency, provided the Provincial authorities have notified the immigration officials at the relevant Canadian port of entry that assistance from the U.S.A. has been requested.

I note that your agreement provides for the possible entry of U.S. fire fighting crews into Ontario without prior notice to the Provincial authorities. Since the agreement is entirely reciprocal, however, and is designed for the emergency protection of valuable resources, we shall ask our regional headquarters in Toronto to inform all relevant ports of entry that forest fire fighters from the U.S.A. may be admitted without documentation or delay, even though prior notice may not have been received from the relevant Ontario authority.

In all cases it would be appreciated if a responsible Ontario official could, at the end of the emergency, either confirm that all visiting fire fighters have departed Canada or report to the nearest immigration officer any who have not returned to the U.S.A.

Yours sincerely,

J.S. Cross,
Director,
Programs and Procedures Branch,
Immigration Division.
April 23, 1981

Ontario Government Building
435 James Street, South
P.O. Box 5000
THUNDER BAY, Ontario
P7C 5G6

Attention: Mr. R. A. Baxter, Regional Director
North Central Region

Dear Mr. Baxter:

Your letter dated 16 April, 1981, regarding Immigration processing of Fire Management personnel from the United States refers.

Please find attached photostatic copies of 2 pages exerted from our Immigration Regulations 1978. Underlined for your benefit is regulation 19 (1)(j) which replaces the previous procedure outlined in our Operations Manual.

This change was effective upon proclamation of our new legislation on the 10 April, 1978. As I am sure you will note in reading the new regulation, the procedure remains basically unchanged.

As outlined previously we would appreciate whatever notice possible whenever personnel are expected from the United States. However, we will still be prepared to handle emergency situations.

Should any problems occur please do not hesitate to contact me personally.

Yours very truly,

C. C. Gulliver
Manager
Canada Immigration Centre
Room 305 Federal Building
130 South Syndicate Avenue
THUNDER BAY, Ontario
P7E 1C7

CCG: ab

Att.
Attached for your records are copies of our request and the subsequent renewal of Customs Clearance for Canadian Forest Officers to cross and recross the U.S. - Canadian border for duties related to forest fire activity. This clearance expires on September 2, 1984. We have a promise card established to initiate continuance of this clearance in July of 1984.

JACK A. GODDEN
Director of Fire and Aviation Management

Enclosures
1. PURPOSE

This manual supplement renews the privilege of crossing and recrossing the United States-Canadian border by Canadian Forest Officers in performance of their official duties as related to forest fire activities.

2. ACTION

In accordance with a request from the United States Forest Service, Department of Agriculture, Canadian Forest Officers, properly identified, are hereby authorized to cross and recross the borders in districts along the United States-Canadian border, beginning September 2, 1981, and ending September 2, 1984, without reporting to U.S. Customs after each crossing, and without detention of, or the assessment of duty on effects, supplies, or equipment in their possession when such crossing is necessary in connection with fire-fighting activities in the vicinity of the border.

3. AUTHORIZATION LIMITS

This authorization is limited to crossing of the international border made in the course of field operations in the vicinity of the border. Any article brought into the United States under authority of this manual supplement and which is to be retained in this country shall be declared to Customs officers as soon as practicable in order that its tariff status may be determined.

4. SUPERSEDED MATERIAL


File: ENT-1-01 717341 JV

[Signature]
Chief, Entry, Licensing and Restricted Merchandise Branch