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FIRE ANALYSIS REPORT

Mack Lake Fire  
May 5-8, 1980

Mio Ranger District  
Huron-Manistee National Forests

SUMMARY REPORT

Mack Lake Fire, May 5-8, 1980

SIZE: 24,790 acres (1,498 private; 23,292 NFS)

LOCATION: Mio Ranger District, Huron-Manistee National Forests

SPECIFIC CAUSE: Escape of Forest Service prescribed fire.

RESOURCE OBJECTIVES FOR PRESCRIBED FIRE: Critical habitat management for Kirtland's Warbler (endangered species), fuel reduction, site preparation.

ANALYSIS TEAM:

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The Analysis Team thanks the many Forest Service employees, State of Michigan employees, and private individuals that provided information to the Analysis Team.

ANALYSIS TEAM AUTHORIZATION:

5100 Fire Management  
1230 Delegation of Authority

Delegation of Authority


Dale Gorman, Team Leader (Fire Analysis)

As of 0600, May 6, 1980, I have delegated all management authorization to Dale Gorman and persons assisting him in the analysis of the Mack Lake Fire.

My priorities and considerations for you are following:

- (1) Evaluate prescribed burning program on the H-M from these aspects:
  - (a) Are our present methods, organization and actions adequate to keep risk at a reasonable level?
  - (b) Was planning, manpower, equipment and expertise adequate to carry out the prescribed burn according to prescription?
  - (c) Assess accuracy of weather forecasting, interpretation and application.
  - (d) Evaluate actual prescribed burn action in relation to planned action.
- (2) Evaluate present capability of the H-M to organize, mobilize and act in the event of large fast-spreading wildfire:
  - (a) Mobility - Communications (Internally, inter-agency, and externally).
  - (b) Organization - on Forest, in Region.
- (3) Provide recommendation to H-M in regard to:
  - (a) Should prescribed burn be suspended for a period of time to gain more expertise in application?
  - (b) Should prescribed burn be suspended for a period of time in view of the vast acreage of potential habitat resulting from the fire?
  - (c) Reduction of future risk from major wildfire.
- (4) Assess the fuel break program on H-M in relation to:
  - (a) Protection of large blocks of National Forest ownership.
  - (b) Protection of private/commercial development within Forest boundary.

Please provide your analysis within 30 days of the close of your investigation

  
WAYNE K. MANN  
Forest Supervisor

## CONDUCT OF ANALYSIS:

This report is based on information collected and measurements made between 1500 on Tuesday, May 6, and 1200 on Saturday, May 10, 1980. The analysis team has generally observed the entire fire by auto and aircraft. They have walked and observed conditions in detail in the prescribed fire area, escape area, the area at the scene of the fatality, and the Mack Lake subdivision. They have interviewed the fire boss and some of the members of the burning and initial attack crew, members of some VFD and MDNR, property owners at Mack Lake, and listened to concerns of area residents. They have interviewed weather personnel and gathered immediately available weather records. They have examined documents pertaining to the prescribed burn and made during the wildfire. Field measurements have been taken and samples collected and analyzed. Television video tapes and Polaroid pictures of the fire have been viewed. While we have tried to verify all the report's contents, it must be emphasized that parts of the report are based on hearsay and observations after the fact. This report follows guidelines found in Forest Service Manual 5190.

## BACKGROUND:

The Kirtland Warbler's available habitat is critical to survival of species (211 known breeding pairs). Recovery plan developed jointly by Forest Service and Michigan DNR, approved by Director of Fish and Wildlife Service in 1976 identified maintenance and development of 130,000 acres in lower Michigan. To reach established goals through 1984, 3,500 acres of suitable jack pine need to be regenerated annually. Prescribed fire is used as a management tool. With few exceptions, the Warbler has been found to nest only on areas that have been burned. For the period 1964 to 1979 the Forest Service has successfully burned 26 areas totaling 3,960 acres, Michigan DNR 29 areas on 1,664 acres during the period 1977 to 1979. Fire escapes from spotting have occurred on past burns but in each case few acres were burned with minimum loss.

There are other resource benefits derived from management for the species. The jack pine stands are harvested for their timber resource.

## FIRE SITUATION:

Winter of 1979 to 1980 was marked by 35% below normal snow fall, April precipitation was 50% above normal. There are no indications of any drought situation existing at time of fire. Fine fuels were extremely dry for three days preceding the fire. District had controlled fires on April 22 (18 acres) April 22 (152 acres), May 3 (1/4 acre), May 4 (1 acre). The fire weather forecast the day of the prescribed fire indicated a low relative humidity and moderately gusty winds. A weak cold front was forecast to pass through area between 3 to 5 p.m. with wind shift but little change in wind speed, and possible showers. This forecast predicted very high fire danger.

Observations were taken by the burning crew on the fire at 9:45 a.m. A key component of the fire danger at that time was not calculated. The start decision was made by the District Ranger on recommendation of his technical staff, with plans that only a portion of the area would be

ignited and controlled if intensity became too great. The firing crews started a backing fire into the wind at 10:26 a.m. An 11 person crew with one 1,000-gallon tanker and one 125-gallon tanker and a tractor plow were assigned to execute burn. Several spot fires crossed the control line in a logged area but were easily controlled. Between 12:00 and 12:15 another spot fire jumped established control line into standing timber left for aesthetic purposes and burned two acres before it was contained. Another spot fire developed across Highway 33, was controlled, and another torched and crowned, spread 600 feet in six minutes and was declared an escaped wildfire.

#### WILD FIRE

Aggressive action was taken by the limited resources from the prescribed burn. The tractor plow and 1,000-gallon tanker began a flanking action on north edge of fire through dense stand of jack pine. The two units became separated, the tanker going ahead of the tractor plow. The fire turned north and crowned in front of the tractor, but behind the tanker. Tractor operator James L. Swiderski, age 29, Forest Service Biological Technician, attempted to turn north and then ran from the tractor but was likely caught by a second moving crown fire; death was immediate.

One motorcyclist in the area was hospitalized with first and second degree burns and released after three days.

Real and personal property loss is expected to reach \$2,000,000. Suppression and related costs total about \$500,000.

By 1:15 the fire had reached Mack Lake, two miles distant. It covered six miles by 3:30 p.m. Immediate assistance was provided by area volunteer fire departments and Michigan DNR. Sheriff's Department and State Police assisted in emergency services, evacuating the Mack Lake community. A frontal passage altered direction of fire at about 4:30 p.m. and forced evacuation of residents of South Branch, 12 miles distant.

Additional resources, manpower, equipment and overhead were ordered and delivered to Wurtsmith Air Force Base and Saginaw, Michigan. On May 6 resources on the fire included:

	<u>Forest Service</u>	<u>Michigan DNR</u>	<u>Other</u>
Manpower	123	20	24
Tractor	5	5	6
Pumpers	8	6	8
Salvation Army			6
Air Force			4
Local Cooperators			8

#### CONTROL

On the evening of May 5 and early hours of May 6, the fire moved south and east and spread was slowed by hardwood timber types and higher relative humidity. This allowed effective line construction and containment of fire. The final containment with completed line around the fire was at 1800 hours on May 6. The fire was halted about six miles from South Branch and two and one half miles from Curtisville. Final size was 24,790 acres. Fire was declared controlled at 1200 on May 7.

HURON-MANISTEE NATIONAL FORESTS PRESCRIBED BURN FIRE  
Mio Ranger District  
Mack Lake Fire  
May 5, 1980

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## SECTION I - BACKGROUND

### A. KIRTLAND'S WARBLER HABITAT MANAGEMENT

#### 1. Introduction

Our changing environment has left a number of species on the brink of extinction. Congress, in passing the Endangered Species Act of 1973, established as a national goal the conservation of endangered wildlife. Our concern for the environment is our concern for the least of its inhabitants. As Aldo Leopold stated, "The land and the wild things living on it is a community to which man belongs."

The endangered Kirtland's Warbler provides an example of a species whose numbers have been dramatically reduced through the indirect influence of man. The amount of suitable nesting habitat for the Warbler has declined sharply in recent years. Although probably never an abundant species, the Kirtland's recent population decline has caused alarm within environmental groups and throughout a diverse concerned public. The Kirtland's population has reached a minimal threshold, with extinction casting an ever-present shadow on the future existence of this colorful songbird.

The Kirtland's Warbler has been classified as "endangered" under the Federal Endangered Species Act (PL 93-205). This was supplemented by the Michigan Endangered Species Act of 1974, (P.A. 203, 1974) which provided added legal protection to the Kirtland's Warbler.

Rules promulgated under the Endangered Species Act of 1973 called for the establishment of Recovery Teams to assist the Fish and Wildlife Service in carrying out provisions in the Act. In early 1975, a Kirtland's Warbler Recovery Team was named by the Secretary of the Interior to guide efforts in aiding the Warbler. As a result of efforts by the Team, a Kirtland's Warbler Recovery Plan (Byelich, et al, 1976) was prepared outlining steps designed to increase the species population. The primary objective of the Plan is to "Reestablish a self-sustaining wild Kirtland's Warbler population throughout its known former range at a minimum level of 1,000 pairs."

The development of a detailed Habitat Management Plan was a cooperative effort by the Forest Service - U.S. Department of Agriculture and the Michigan Department of Natural Resources (MDNR). Direction for development of the plan was provided by the Kirtland's Warbler Recovery Plan, approved by the Director of Fish and Wildlife Service (10/2/76). The Recovery Plan identifies five major objectives that are (1) maintain and develop 130,000 acres of suitable nesting habitat for the Kirtland's Warbler throughout its former known range; (2) protect the Kirtland's Warbler on its winter grounds and along the migration route; (3) reduce key factors adversely affecting reproduction and survival of the Kirtland's Warbler; (4) monitor breeding populations of the Kirtland's Warbler to evaluate response to management practices and environmental changes, and (5) reintroduce Kirtland's Warblers

into areas in the Upper Peninsula of Michigan, or in other states, in an attempt to establish independent, self-sufficient populations. The Habitat Management Plan implements Forest Service and State responsibilities under Section 7 of the Endangered Species Act (PL 93-205).

Since potential Warbler habitat occurs in significant acreages on both State (Michigan Department of Natural Resources) and Federal (USDA, Forest Service) land and since both these agencies have individual land management functions, each agency has assumed responsibility for developing habitat on its land. The (draft) Habitat Management Plan describes in detail each agency's on-the-ground land management program for the development and improvement of Kirtland's nesting habitat.

## 2. History of Organized Efforts at Management

In 1957, the first major effort was made at providing breeding habitat for the Kirtland's Warbler. Three areas, in Ogemaw, Crawford, and Oscoda Counties, each comprising roughly 4 square miles, were established specifically as Warbler management units (Radtke and Byelich, 1963; Mayfield, 1963). All three were on state forest land. Portions of two of these areas were planted with jack pine using a special configuration to provide openings within the stand. The intention was to maintain these tracts in three age classes, 7 years apart, by burning and replanting the stands when they reached an age of 21 years. Planting of the third area in Oscoda County was held in abeyance because pines on that area were approaching a commercially harvestable age. Harvesting has not yet occurred on this area, however, since almost one-third of this tract was burned by a wildfire in 1964. The regeneration which resulted because of that fire has provided nesting habitat for the past several years.

In 1960, the Forest Service began working on a management plan for the Kirtland's Warbler. This plan was approved in 1962 and a 4,010-acre tract was dedicated in June 1963. The plan established 10 management blocks of about 320 acres each in the Mack Lake, Oscoda County area. Ultimately, each block was to be grown on a 60-year commercial rotation with 5 years age difference between blocks (Mayfield, 1963).

In addition, in 1973 and 1974, the Huron National Forest cut, burned, and planted areas near Luzerne, Oscoda County; and Tawas, Iosco County, for the benefit of the Warbler.

The decennial census in 1971 showed an alarming decline of 60 percent in the population level of nesting Warblers. This decline initiated a meeting sponsored jointly by the USDA, Forest Service and Michigan Department of Natural Resources. One of the major results of this meeting was the formation of an ad hoc steering committee whose responsibility was to outline needed habitat research, propose restrictions on human activity in nesting areas, initiate a cowbird control program, and locate funding.

Through the efforts of members of this committee, the Department of Natural Resources and the USDA, Forest Service established an official policy with specific points designed to improve the outlook for the Warbler. A policy to treat the best warbler jack pine stands for a period of not less than 5 years for the purpose of improving warbler habitats was adopted. Provisions of this policy included the use of clear cutting followed by prescribed burning. These practices would complete the habitat improvement work. An intensive program was envisioned. (Letter from M.L. Petoskey, Chief, Wildlife Division, DNR, May 5, 1972).

### 3. Nesting Habitat

It became quickly apparent to the early observers of the Kirtland's Warbler that they were always associated with the areas of the northern lower peninsula of Michigan commonly referred to as the "jack pine plains" or "barrens." Residents of the region called this Warbler the "Jack-pine Bird." Subsequent studies of the species have shown it to have an extremely close association with a particular "life community" of the jack pine type.

The breeding habitat of the Kirtland's Warbler is highly distinctive. Nearly all of the nests have been found in jack pine stands 5 to 20 feet in height (8 - 21 years old) which have resulted from forest fire. Fire also maintains the low ground cover that must be just adequate to conceal the nest which is usually imbedded in the soil. Nearly all the pines in the stand must be small, and the occurrence of deciduous trees must be limited. A tract must be at least 80 acres and preferably much larger to attract the Warbler. Ideal breeding habitat consists of homogeneous thickets of small jack pine interspersed with many small openings.

Although it is not completely understood why, the recent burning of a jack pine site prior to its regeneration appears to be a highly significant, if not a necessary factor in the use of a stand for nesting.

Burning may have some subtle effects on the soil and plant community that have yet to be detected. Observations to date show that recent fire has been a factor on nearly all sites where Warblers have been known to nest successfully.

The jack pine stand itself is used for nesting only in a certain stage of development. Warblers will start using a stand when the height of the tree reaches 5 to 7 feet (or at an age of 6 to 14 years with the average being 8). Stands less than 80 acres in size are seldom occupied, and nesting success has been found to improve greatly where "colonies" of Warblers occupy stands 200 acres and larger.

The density of the stand is usually variable, with dense patches and numerous small openings interspersed throughout. Evenly spaced plantations are used but the presence of openings appears to be essential. Common associated tree species in these jack pine stands

are oaks, aspens, cherries, june berries, and other pines. It appears that the Kirtland's Warbler will not use a stand where the density of the deciduous species approaches equity with the pine.

The ground vegetation consists of plants that can survive fire, drought, and thermal extremes. These are mostly low shrubs and deep-rooted perennial herbs. The density varies from sparse areas with bare ground exposed to quite dense patches. In fact, there is usually a mosaic of patches of sedges, patches of shrubs, and patches of grasses and forbs. These Warblers prefer heavier cover for nest sites, with mixed blueberry and grass areas being favored locations. However, nests are occasionally found where cover is poor.

The Kirtland's Warbler will continue to nest in jack pine stands as long as the trees retain relatively dense living branches near the ground. Depending on the density of the trees, the lower branches are lost when jack pine reaches a height from 16 to 20 feet (usually age 21 in Michigan). When this occurs the structure of the habitat is apparently no longer acceptable to the Warbler for nesting.

Kirtland's Warbler nesting habitat is also limited to a specific soil type. With one or two exceptions all nests have been found on Grayling sand soil. This very poor soil is extremely pervious to water. Thus, in addition to supporting the jack pine and the low, sparse ground cover required by the bird, the capacity of Grayling sand to drain quickly during summer downpours may be important in preventing flooding of nests set in the soil.

The ultimate limiting factor on the nesting population is the amount of special habitat required. There is persuasive evidence that the amount of such habitat was at maximum during the brief lumbering period when forest fire were rampant in the pinelands during the 1880's and 1890's. The Kirtland's Warbler also appears to have been at a peak at that same time. This contention is supported by the large number of specimens taken on the wintering ground during that period.

In modern times, forest fire control has greatly reduced the total acreage burned and also the size of individual burns. Currently, only 4,000 to 5,000 acres are suitable for breeding birds. This is a very substantial reduction from the 10,000 to 15,000 acres available in the 1950's and 1960's and is probably the most important reason for the decline in populations of the Kirtland's Warbler.

Using the data obtained from the inventory of potential Kirtland's Warbler breeding habitat, the USFS and MDNR have proposed to incorporate into their forest management plans 130,000 acres. The goal is to reach 36,000 to 40,000 acres of suitable nesting habitat by 1990, which will support and sustain a breeding population of 1,000 pairs. To reach this goal established in the Recovery Plan, approximately 3,500 acres of suitable jack pine would be regenerated annually for the next 7 years (1984), and then 2,800 acres per year on a

sustained basis. (This time frame will be modified in either direction, if necessary, to keep pace with the anticipated expansion of the total Kirtland's Warbler population, or unforeseen situations such as wildfire.)

Most jack pine stands that have been identified as essential nesting habitat are to be managed on a 45- to 50-year rotation. These stands will provide nesting habitat between 5 and 21 years of age. The stands are grown to age 50 for the pulpwood produced for use by the regional pulp and paper industry. The establishment of new stands will normally involve prescribed burning. The surest and possibly quickest, but most costly method will be to clearcut, burn, and plant seedlings. Another method could be to retain seed trees when stands are cut and burn to prepare the site and release seed for natural regeneration. Where natural may not be feasible, mechanical site preparation followed by seeding or planting may be used. This is a silvicultural decision to be determined for each site.

#### 4. Jack Pine Silviculture

The objective of the Kirtland's Warbler Habitat Management Plan is to achieve suitable warbler habitat. An objective of the Huron-Manistee Timber Management Plan is to produce commercial harvests of jack pine. Both objectives can be achieved under a management system that will grow jack pine on a 50-year rotation.

Jack pine is an early successional species, used for a variety of products, including pulpwood, boxes, and rail ties. It is one of a few species capable of growing on grayling sand soils, and producing commercial timber.

The extensive stands of jack pine in Michigan are the result of natural wildfires. The characteristics of jack pine make the species ideally suited to regenerating after wildfire. The serotinous cones remain on the trees until fire melts the resinous bonding material (125° F) releasing the seed. The fire creates an ideal seedbed. Mineral soil is exposed and vegetative competition minimized. Partial shade is provided by the dead standing trees. Temporary fertilization resulting from the burn improves seedling growth.

Extensive research (Cayford, J.H., 1970) has been undertaken on jack pine regeneration following fire.

Jack pine will not regenerate adequately unless special silvicultural practices are undertaken. Regeneration following clear cutting is generally inadequate without seedbed preparation, exposing mineral soil. Machine seedbed preparation is possible, but expensive. To assure regeneration, these sites generally require hand or machine planting.

Clear cutting, even-aged silviculture of jack pine is the normally accepted method of harvesting jack pine. The species requires open sunlight for regeneration. Seed trees have sometimes been left in stands scheduled for prescribed burning.

As an alternative to prescribed burning, ground scarification followed by planting has been used to produce adequate regeneration and to achieve timber management objectives. However, current studies and experiences have demonstrated that fire is required to produce suitable warbler habitat. Research is underway (North Central Forest Experiment Station) which will better define the specific impact of burning on nesting habitat and nesting success.

#### 5. History of Prescribed Burning to Regenerate Jack Pine Stands that Produce Kirtland's Warbler Habitat

Since it is apparent that Kirtland's Warblers nest almost exclusively in jack pine stands that have regenerated after an area has burned, it has been concluded that prescribed burning to prepare a site for jack pine regeneration is necessary where selected jack pine areas are to be managed so as to produce nesting habitat for this species. The well-documented history of Warbler nesting based on thousands of observations very strongly supports this conclusion. The use of prescribed burning to create habitat was begun in 1964 with a prescribed burn on the Mack Lake Kirtland's Warbler Management Area. Historically, prescribed burning for this purpose has proven to be effective in producing nesting habitat. The few spot fires or line jumps that occurred were quickly controlled. The following is an account of the Kirtland's Warbler prescribed burn from 1964 through 1979:

a. Huron National Forest

Table 1.--Kirtland's Warbler Prescribed Fire History

<u>Year/Season</u>	<u>Area</u>	<u>Ranger District</u>	<u>Size (Acres)</u>	<u>Escaped (Acres)</u>
1964/May	Mack Lake (Sec. 3)	Mio	497	3.00
1966/Oct.	Mack Lake (Sec. 2)	Mio	239	
1973/Apr.	Luzerne (Sec. 26 & 36)	Mio	120	
1975/Apr.	McKinley (Sec. 3 & 10)	Harrisville	356	
1975/May	Hunt Creek	Mio	93	
1975/Oct.	Brigg Road	Mio	213	
1976/Aug.	Gray Creek #1	Tawas	60	
1976/Aug.	Gray Creek #2	Tawas	32	3.00
1977/Apr.	Gray Creek #3	Tawas	69	10.00
1977/May	Hunter Lake	Mio	147	
1977/May	Davidson Road	Tawas	55	
1978/May	Warbler II	Harrisville	245	12.00
1978/May	Eldorado	Mio	61	30.00
1978/Aug.	Doe Road	Tawas	148	
1978/Aug.	Warbler I	Harrisville	151	
1978/Aug.	Kennedy	Tawas	66	
1978/Sept.	Oscoda	Tawas	66	
1978/Oct.	Eldorado	Mio	140	
1978/Oct.	Brush Road	Mio	102	
1979/May	Bryants Landing	Harrisville	208	
1979/May	Warbler I	Harrisville	169	
1979/July	Curtis Road	Tawas	280	
1979/Sept.	Mt. Pindus	Mio	78	0.25
1979/Sept.	Mt. Pindus	Mio	39	
1979/Sept.	Hunt Creek	Mio	58	0.10
1979/Sept.	Short Road	Tawas	268	
TOTAL --	26 Prescribed Burns	--	3,960	58.35

b. Michigan Department of Natural Resources

The Michigan Department of Natural Resources has completed 29 prescribed burning projects for the Kirtland's Warbler since 1976, involving a total of 1,664 acres. (Information provided by Region II, MDNR.) These projects were completed without a major loss. On 6 - 7 of the projects, fire escaped the prescribed fire line, but in each case was confined to 1 - 2 acres, with minimal loss. The following lists the MDNR prescribed burning projects for the Kirtland's Warbler.

Table 2.--Kirtland's Warbler Prescribed Burning History - MDNR

<u>County</u>	<u>Date</u>	<u>Location</u>	<u>Size (Acres)</u>
Crawford	1977-7/7	T27NR1W	200
	7/8	T27NR1W	30
	8/9	T27NR1W	30
	July	T25NR4W	80
Kalkaska	1979-9/21	T25NR5W	200
Montmorency	1979-6/26	T32NR2E	40
Ogemaw	1979-7/12	T24NR1E	56
	1978-8/3	T24NR1E	55*
	8/10		19
	5/22		92
	5/22		34
	5/24		48
	5/24		50
	1976-9/30	T24NR1E	86
	9/30		43
	10/11		37
	10/11		91
	8/17		50
	8/17		68
	Oscoda	1979-9/26	T28NR1E
8/8			15
7/10			40
7/11			11
7/18			45
7/19			30
6/19			37
4/24		T27NR2E	28
4/24			4
1978-9/26		T27NR2E	45
TOTAL --			1,664

\*The MDNR reports accomplished burn acreage by individual blocks. The Forest Service reports accomplishments by total area.



c. Prescribed Burning Projects

Table 3.--Summary Kirtland's Warbler

	<u>Number</u>	<u>Years</u>	<u>Size (Acres)</u>	<u>Escape (Acres)</u>
Michigan Department of Natural Resources	29	1976-79	1,664	6 - 14
Forest Service	<u>26</u>	1964-79	<u>3,960</u>	58.35
TOTAL	55		5,624	

In addition to prescribed burning efforts for the Kirtland's Warbler, the Michigan DNR and Forest Service have completed a number of other prescribed burning projects to achieve other wildlife and forest management objectives.

B. CRANE LAKE PRESCRIBED BURNING UNIT PLAN

1. Introduction

The joint Forest Service - Michigan Department of Natural Resources Habitat Management Plan (draft) defines the methods for protecting and improving designated critical nesting habitat for the survival of the Kirtland's Warbler and for compliance with the provisions of Section 7 of the Endangered Species Act, as amended.

All potential breeding habitat in Michigan on the State and National Forest (and on adjacent private lands) has been identified. Following field examination and stand data analysis those stands that were believed to be suitable and manageable for nesting habitat were proposed as critical habitat. Contiguous stands or stands in close proximity were grouped into Management Areas. Twenty-three areas, involving 130,000 acres, have been established, 16 on State forests and 7 on the National Forests. Each area is divided into Management Units containing between 1,000 and 2,000 acres of suitable habitat. Each unit has been subdivided into five timber harvest blocks, with each block containing some 200 or more acres of contiguous stands of habitat.

2. Mack Lake Area

The Mack Lake Area has been the center of Warbler nesting activity on the Huron National Forest for more than 25 years. Recent Warbler use in the area began with the Mack Lake Fire that burned more than 16,400 acres in 1961 by 1946. Warblers soon occupied much of the burned acreage. The State established three management areas in 1957 and the Forest Service followed suit in 1961 by establishing the original Mack Lake Kirtland's Warbler Management Area (KWMA)

encompassing 4,010 acres of jack pine. Most of the original KWMA has been preserved as the Mack Lake Unit.

The Mack Lake KWMA currently supports most of the Warbler nesting population found on National Forest lands. In 1978, a total of 35 singing males were found in the Mack Lake area. In 1978, Warblers were found in Section 2, 3, and 12, T25N, R3E, and Section 7, T25N, R4E. The Warbler nesting density reached its maximum level at this time. Since then, nesting use has declined due to the relatively advanced growth condition of the jack and red pine regeneration.

The Mack Lake Area includes 10,420 acres of National Forest land proposed for classification as "Critical Habitat" under the Endangered Species Act. An additional 785 acres of private land could provide suitable habitat.

### 3. Prescribed Burning Unit Plan

#### a. Preplanning

The Crane Lake Burning Unit area was identified in the joint Forest Service - Michigan DNR Habitat Management Plan (draft). The draft plan proposes preparing the Crane Lake Unit for age class changing through a commercial timber sale and prescribed burning. The sale was awarded to Lakewood Forest Products (Contract No. 04-988) on September 7, 1977. The sale was closed October 24, 1978. All but 10 acres (Compartment 177, Stand 10) of the 210 acres needed for critical habitat received a regeneration harvest. The jack pine trees were full tree logged (the stem and branches skidded to a landing for processing) and the tops returned to the harvest area in piles as the tree skidder returned for more trees. The purpose in scattering the tops was to distribute the jack pine slash to provide a fuel source to help carry a fire through an area of light fuels.

The silvicultural prescription for the stands along M-33 in this area were modified for aesthetic reasons at the suggestion of a forest landscape architect. The recommendation was to defer areas of stands 25 and 26 on ridge tops to break the line of vision of motorists traveling M-33. (Input by Forest Landscape Architect, January 5, 1976.)

It is not certain who prepared the prescribed burning plan as it was never signed by the preparer. The plan was, however, reviewed in 1978 by the Mio District Ranger and the Huron-Manistee National Forests' Fire Control Staff and approved by the Deputy Forest Supervisor. Changes made in the plan resulting in differences between planned and actual were implemented without review or approval. (See Crane Lake Prescribed Burning Unit Plan, Appendix A.) The three objectives of the prescribed burning unit plan are fuel reduction, site preparation, and Kirtland's Warbler habitat improvement. The suggestion to leave patches of standing trees along the west side of M-33 for aesthetics was incorporated into the plan and shown on the map attached to the plan. M-33 was shown on the map as the east side burning unit boundary.

A later visit to the area as part of a visual management review along M-33 resulted in a recommendation that open harvest areas along M-33 with advance regeneration also be excluded from the prescribed burn. The decision to implement these recommendations resulted in the need to build a fire control line for the prescribed burn area west 200 feet or more from M-33. (See map Figure 1 for final control line locations.)

The east control line used on May 5 was located and constructed in 1979 and redone with minor changes to straighten it out in April of 1980. Construction was by tractor-mounted plow and resulted in a band of exposed soil approximately 4-6 feet wide. This control line passed through a variety of fuels and terrain. In places the line was located through open cutover, in other places, near standing timber. Evidence in the form of burnt slash piles showed some concentrations of slash in the proximity of the line. Sections of the line crossed ridge tops on the side slope facing the fire. It was at one of the side slope locations (26% slope), below standing jack pine with a bracken fern ground cover that spot fire 7 started and took off. In some places several plow lines were present-- the result of demonstrations on line construction. Apparently, the main control line was reviewed several times, once during an on-site Forestwide training session on April 11 and 12, 1979, (S-110 Basic Fire Orientation and S-190 Introduction to Fire Behavior). The location of the east control line near heavy ground fuels and slopes immediately above the line contributed to the quick spread of the fire once it jumped the line at those locations.

Prior to ignition, Burning Unit 1 of the Crane Lake Unit was subdivided into three parts--1A, 1B, 1C. Unit 2 was also divided into two smaller areas. The reason for this was to confine the burning to smaller areas, each separated by a drivable road. Two 300-gallon rubber bladder tanks of water were also added to the burning plan equipment on Monday morning and filled with water prior to the burn. The Prescribed Burning Fire Boss took this action so water would be available on-site for refilling tanker units in use on the prescribed burn. The original plan was to place and fill the two 300-gallon tanks on Sunday, but a wildfire late Sunday changed this plan. The act of getting the tanks out Monday delayed the starting of the prescribed burn about 1 hour. The Fire Boss delayed ignition until the 6x6 used to fill the two rubber tanks was refilled with water and ready for action on the prescribed burn.

b. Comparison of Prescribed Burning Unit Plan Desirable and Actual Conditions Day of Burn (See Appendix A)

Item Number  
Form  
R9-5100-23

	<u>Prescribed Burning Unit Plan</u>	<u>Actual</u>
1.	Objective: Fuel reduction, site preparation, Wildlife habitat	Same
2.	Prepare for planting	Same
3.	Burn small fuels less than 1" in diam.	Burned 1/2" and smaller, all slash in piles consumed.
4.	Area description (See Burning Unit Plan)	Same
5.	*Burning Conditions	
		AFFIRMS**
		Forecast
		1400 5/4-Mio
		Obs
		1400 5/5-Mio
	Air Temp	45 <sup>o</sup> + 71 80
	Rel. Hum.	25-50 <sup>o</sup> 40 24
	Wind Direction	W NW NW
	Wind Speed	5-10 16 18
	Day Since Rain	2-5 5 5
	Fuel Sticks (10 hr)	9-15% 12% 9%
	BI (C Fuel Model)	33 39
	Q Fuel Model	15-30 69 79
	*Also see Item 23 (0945 on-site readings)	
	Special Weather Forecast - Yes	Yes, 5/5/80, Monday 0900, Appendix B
6.	I&E Steps	
	a. Article in Paper	Yes
	b. Contact Landowners	Yes
7.	Preparation of Area	
	a. Single Plow Furrow	Line moved west of
	b. M-33 - 2 chains	M-33 200 feet or more
	FR 4467 - 30 chains	
	c. No snag felling	
8.	Firing	
	a. Start Time	Mid-afternoon 1026
	b. Hours to Complete	3 to 5 2 hrs. to Escape
	c. Method	Back fire against wind then head fire when burn out zone is provided Same

\* Post calculated with TI-59 Calculator

\*\* Administrative and Forest Fire Information Retrieval and Management System

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R9-5100-23

Prescribed Burning Unit Plan

Actual

9.	Detection Needs	Aircraft and Observer to locate spots	Scheduled - Did not arrive until after escape
10.	Crew Organization		
	a. (Not filled in)		
	b. FB - Ranger		Technician
	SB -		
	CB - YACC Crew w/handtools		3 (only 1 YACC)
	Firing Boss -		
	Forester -		District Ranger
	Wildlife Tech		
	Pumper Boss -		
	Sale Prep Tech		Forester
	Sale Admin Tech		
	Tractor Boss -		
	Fire Tech		Bio-tech
	TSI Tech		
11.	Water Supply Source - Mio		2-300 Gal. Rubber Bladder Tanks on site
12.	Communications		
	a. Mobile - 5		7
	b. Portables - 7		5
13.	Equipment (Not filled in)		One 125 slipon water tanker on 4x4 track One 1,000-Gal on 6x6 truck
14.	Special Precautions to Prevent Fire Escaping -		One tractor w/plow
	a. Tractor and Plow to follow each torchman along the line to put furrow around spot.		One tractor plow unit.
	b. YACC crews with hand tools to 100' outside lines to look for spot fires.		One 3-man hand crew

Item Number  
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R9-5100-23

Prescribed Burning Unit Plan

Actual

15.                   Suppression Plan
- Direct Attack - 2 tractors and power wagon - YACC crews to be diverted if needed.
- One tractor plow unit and one 1,000-gallon tanker unit. No crew
16.                   Patrol and Mop-up
- Power wagon crew to remain until dark. Patrol following day plus mop-up.
- n/a
17.                   Correlation
- DNR in Mio to be informed. Also Sheriff and State Police. Traffic control on M-33. May be necessary when smoke is close to the highway.
- No contact made with Sheriff and State Police. Traffic control requested after there was a problem. MDNR, Mio notified
18.                   Erosion after Burn
- None
19.                   Multiple Use Coordination (Not filled in)
- Forest Staff Officers Review of Camp 177 Prescription & Env. Analysis Report
20.                   Special Evaluation
- a. Wildlife (after)
- b. Prepared by \_\_\_\_\_
- c. Review by DR - James Rogers  
                        6/20/78
- d. Review by FC Staff - C.A. Reedy  
                        6/28/78
- e. Approved by Forest Supervisor -  
                        W.C. Erickson
21.                   Map
22.                   Prior to Burn Checklist
- a. Day Before --  
                        Weather forecast favorable
- Necessary lines constructed
- Adjoining landowners
- I&E work finished
- Until noon
- Unfavorable afternoon
- Yes, previously
- Yes, Tech.
- Yes, New Release
- Attached clipping, also list of radio station contacted.

Item Number  
Form  
R9-5100-23

Prescribed Burning Unit Plan

Actual

22.

a. Continued --

Cooperators notified  
Crews notified  
Equipment ready  
Camera available

Yes, list attached  
Yes  
Yes  
Yes

b. Day of Burn --

Pertinent crew briefing points

Slash along south tip.

Plan reviewed by James Rogers, Dist.  
Ranger 6/20/78; Cliff Reedy, Fire Con-  
trol Staff Officer, 6/28/78; W.C.  
Erickson, Deputy Forest Supervisor,  
6/21/78

23.

Summary and Evaluation Immediately After Burn

a. Date burned - 5/5/80 Time set 10:26am  
b. Rain 4 days since 0.1 inch of rain  
5 days since 0.51 inch of rain

c. Acres burned \_\_\_\_\_  
d. Cost \_\_\_\_\_  
e. Person-in-Charge - Tom Bates  
f. Weather Factors:

	<u>At Start</u>	<u>During</u>
Wind dir. & velocity	W - 10 mph	
Wind behavior	Steady 6-10 mph	
Temperature	74°	
Relative Humidity	37%	
BI	*28-C 58-Q	C-39 at 1400 hrs.

Fuel Sticks 16 at 9 a.m. \_\_\_\_\_

9 at 1400 hrs.

g. The objective

24.

n/a

25.

n/a

\*Post calculated with TI-59 calculator.

#### 4. Execution of the Prescribed Burning Plan

The start decision was made by the District Ranger on recommendation of his technical staff. Weather forecasts received Sunday and early Monday were used in making the start decision. These forecasts came from a National Oceanographic and Atmospheric Administration (NOAA) State Forecast Center, Ann Arbor, Michigan. Forecast temperature (82\*) and wind direction SW-W-NW were within the prescribed parameters. Days since rain (4) was also acceptable. Forecast minimum relative humidity (18-23%) was less than in the prescription. Forecast 10-hour timelag fuel moisture (12) was within acceptable limits. Forecast burning index (69) was more than double the prescribed upper limit. A wind shift to the NW occurring sometime between 3-5 pm was also predicted.

On-site observed weather measurements at 0945 were within the prescribed limits but daily maximums/minimums for wind, humidity, and fuel moisture were 4-6 hours away. The prescribed burning team took the field measurements but did not calculate the Burning Index prior to ignition at 1026 hours. Later calculation by the Mio Ranger Station indicated the Burning Index at time of field observation at 28 for the C Fuel Model and 58 for the Q Fuel Model. The critical fuel and weather factors predicted for the afternoon placed prescribed burn conditions out of accepted prescriptions that had been used successfully in the past.

The prescribed burning team's plan was to complete the burn before the wind shift. The firing technique used was a backing-fire starting at the SE corner of sub-unit 1A as prescribed (Figure 1). The backing-fire technique consists primarily of backing fire into the wind. Fire is started along a prepared base line, such as a road or other form of barrier, and allowed to back into the wind.

Normally, such fire proceeds at a speed of 1 to 3 chains per hour. This technique is perhaps the easiest and safest type of prescribed fire to control. It produces minimum scorch height for underburning and maintains higher temperatures on the soil; works best in heavy fuels. One disadvantage is slow progress of the fire.

A test fire was not used.

As ignition began (Figure 1) and for the first 45 minutes, no particular problems were noted. The fire was contained within the line and was described as "not particularly active." It appears that a 50-foot wide back-burned strip with spotty combustion was completed prior to starting the second firing. After some distance had been covered, several spots (spots 1, 2, and 3 on Figure 1) crossed the line but were easily controlled as they were still in the cutover area.

Firing was stopped while suppression was going on. To be able to burn an area, you must burn on a day when burning conditions are conducive to burning. Thus, spot fires are anticipated and planned for.



**MACK LAKE FIRE**  
 FIRE ORIGIN  
 SCALE: 1" = 300'



- UNIMPROVED ROADS
- CONTROL BURN PLOW LINE
- SPOT FIRE PLOW LINES
- OLD CONTROL PLOW LINE
- DOZER TRAIL
- MOTORCYCLE TRAIL
- PROFILE LINE TERMINALS

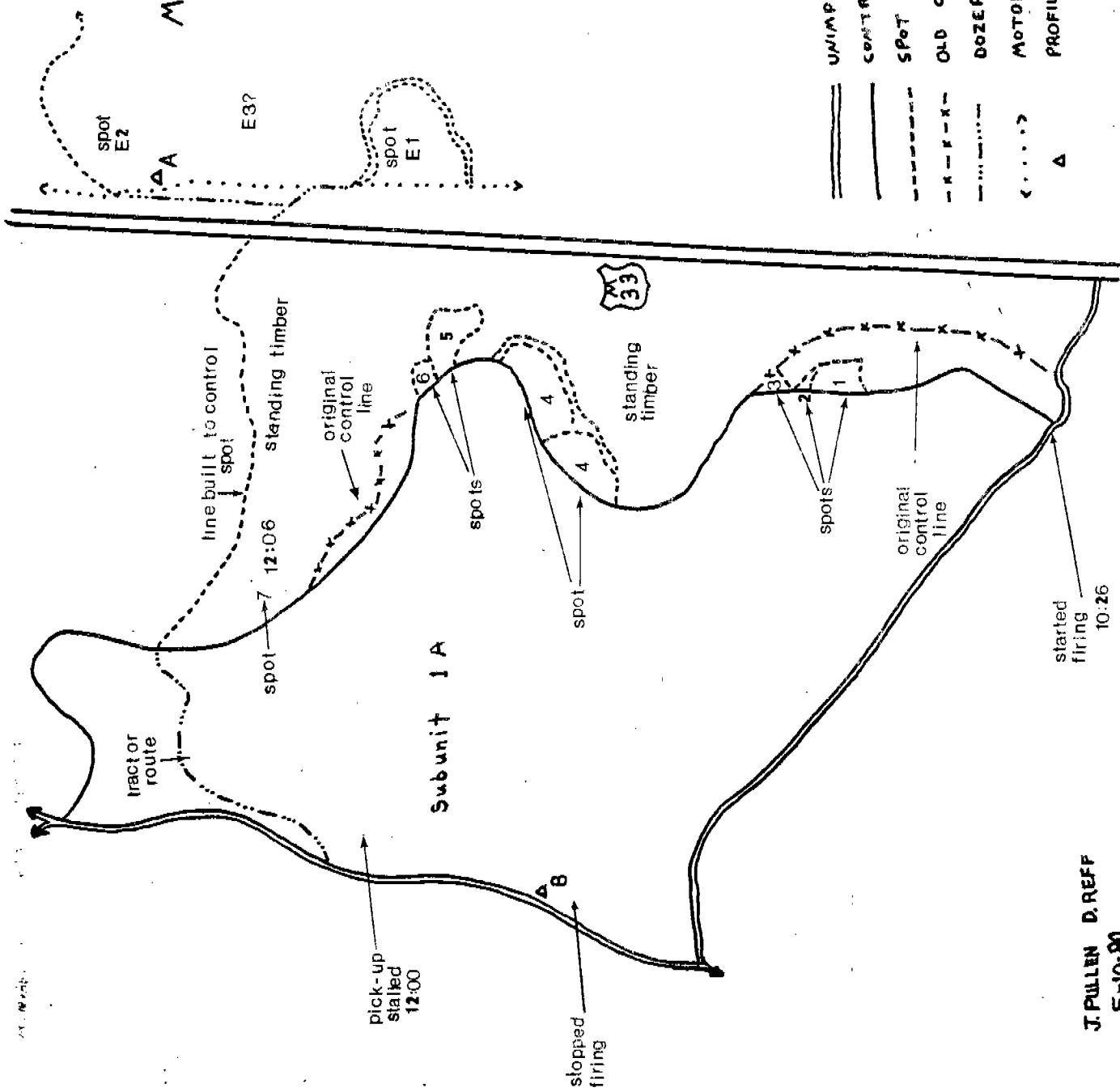


Figure 1

J. PULLEN D. REFF  
 5-10-80

The ignition of the backing-fire was proceeding at about 1,300 feet per hour (2,000 feet in 1½ hours). A perimeter fire with the wind was being coordinated with the backing-fire. It was the opinion of the Fire Boss and fire crew that either sub-unit 1A or 1B could be burned depending on the prevailing wind. The strategic plan was to burn small blocks on the east side of the Crane Lake unit to make a wider control line. By starting with small units, it was felt the burning could be stopped and secured with short notice. If the afternoon weather had stayed favorable for burning, a secure control line would be established for firing the remaining acreage of Unit 1 and all of Unit 2. The vegetation was a transition stage and the District staff anticipated difficulty in getting the area to ignite due to the amount of new green ground vegetation so they wanted to start early in the day. Seven to ten days before May 5, a crew working on improving the fire line found ice still existing in the shade of slash piles.

After the spots 1, 2, and 3 were controlled, ignition resumed. A fourth spot occurred on a ridge of standing timber left for aesthetic purposes. Fuel types were different here and the spot proved more difficult to control. The spot spotted another fire and more than one plow line was needed for control. Spots 5 and 6 occurred in a second finger of the cut-over area which was to be left unburned. These were easily controlled. A seventh spot jumped into the northern most aesthetics strip of standing timber. At the point of escape, the control line was located near standing jack pine below the crest of a ridge facing the fire and the wind. A 2-acre fire that burned into the standing timber between the planned area and Highway 33 eventually spotted across the highway. The tanker crew estimated winds at the ridge top to be 20 mph during the time of escape. No dust or fire whirls were observed. The crew expressed considerable surprise at how fast the fire was moving at this time. When spot fire 7 escaped (1206), the dozer was away from the control line assisting the 4x4 which was stalled in the burn area and threatened by fire. When spot fire 7 was reported to the tractor operator, it took the tractor approximately 4 minutes to return to the fire line and start action on the escaped spot.

Spot fire 7 happened about 1½ hours after the prescribed burn had been started. During this time of the prescribed burn very little material greater than ½ inch in diameter was consumed. Almost no duff was consumed and char depth was ¼ to ½ inch.

The District Ranger feels the proximity of jack pine slash piles to the east prescribed burn line may have contributed to the fire's escape. The slash piles did contribute to some of the early spot fires and most likely caused at least one of the spot fires (E-1) east of H-33. Because of the heavy concentration of fuel in the slash piles, they each created a small convection column that carried burning embers into the air.

### C. FIRE BEHAVIOR ANALYSIS

#### 1. Fire History

The distribution of wild fire sizes for a 17-year period, 1960 to 1977, on the Huron National Forest is listed in Table 4.

Table 4.--Fire Size Class Distribution for the Huron-Manistee National Forests

<u>Class</u>	<u>Size</u> (Acres)	<u>Number</u>	<u>Percent</u>
A	0 - 1/4	261	37.7
B	1/4 - 9	350	50.6
C	10-99	72	10.4
D	100-299	5	0.7
E	300+	4	0.6
	TOTAL	692	100.0

The distribution listed on Table 4 is typical of eastern forests. The vast majority of fires are small and easily controllable. While problem fires do occur with some regularity, major fires several thousand acres in size are rare events, occurring perhaps once every 10 to 50 years (Table 5). There is no reason to believe, however, that they will not continue to occur.

If we assume that fires under 100 acres in size are not a major concern, we are left with nine wild fires of consequence in 17 years, or one every two years. The relative infrequency of large fires coupled with a rapid turnover of District personnel (complete turnover in about 3 years) does preclude the opportunity to gain experience with large wild fires on the Forest.

In April 1946, 16,400 acres of jack pine burned in the Mack Lake area. Records from that fire are not readily accessible. Some 4- to 5-inch diameter jack pine which had originated in 1915 were scarred by the 1946 fire but survived. A sampled tree was 9 inches in diameter at the time of the Mack Lake fire.

The record for the State of Michigan, Department of Natural Resources contrasts markedly with that of the Huron-Manistee National Forests. During the 16-year period from 1964 to 1979, there were a total of 17 crown fires in jack pine that burned in excess of 175 acres each. These fires were in the four-county jack pine area (Crawford, Oscoda, Roscommon, and Ogemaw) immediately surrounding the Mio Ranger District. There were eight fires in the 175- to 999-acre class (average size = 536 acres) and nine fires in the 1,000- to 5,000-acre category (average size = 3,195 acres). Clearly, the State has had considerable experience with crown fires in jack pine.

The seasonal distribution of the occurrence of jack pine crown fires (Figure 2) discloses a very pronounced peak during the second week in May and lesser peaks during mid-April and the end of July. Whatever the critical conditions are that control jack pine crowning, they clearly prevail with some regularity during the second week in May. Historically, 41 percent of the sample of crown fires occurred during that week and they burned 58 percent of the total area.

JACK PINE CROWN FIRES OVER 175 ACRES  
 BY WEEK (MICH. D.N.R. - 4 COUNTY AREA)

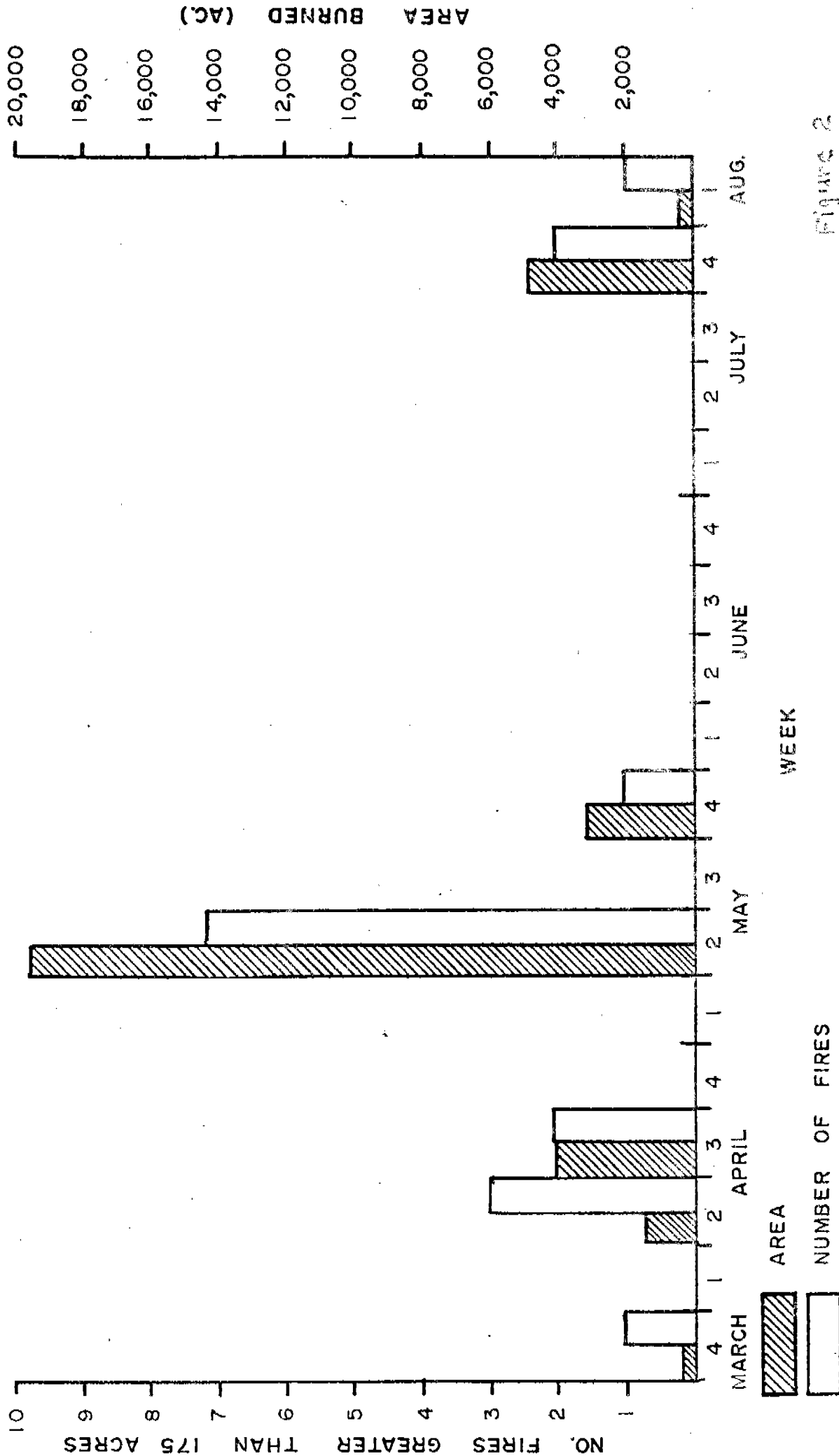


Figure 2



0.29 inches (4.2 percent) above normal. These values indicate that near normal soil moisture conditions existed at the time of the fire. Almost no rain (0.01 inches) fell in September 1979. This deficit (-3.16 inches) roughly coincided with the onset of dormancy. Whether this deficit had any effect on the winter foliar moisture is not known.

In general, there is no indication of a drought situation existing at the time of the fire. In fact, outward signs (later confirmed by the behavior of the fire) were that deeper and larger fuels were relatively moist. The Palmer (drought) index was near normal, indicating neither surplus or deficit of ground moisture.

Although total precipitation was nearly normal, winter snowfall was only 65 percent of normal (54.2 inches observed vs. 84.0 inches normal). Although a deficit was recorded during most months, the major shortfalls were early in the winter: November (42 percent), December (38 percent), and January (72 percent). This resulted in a deeper than normal frost layer which might have had two effects: decreased absorption of subsequent precipitation due to runoff from the frozen soil and decreased foliar moisture due to an inability to absorb moisture from the frozen soil. Whether either of these effects, in fact, occurred is not known.

b. Antecedent Weather

During the week preceding the fire, 0.68 inches of rain fell (on April 29 and 30) at the Mio Forest Service Station. No precipitation was recorded on May 1-4. Temperatures during the week of April 29 - May 4 averaged 8°F. above normal. The observed daily maximums on May 2 - 4 were: 75, 78, and 80°F. Of possible significance, relative humidities on those same three days were 28 percent, 22 percent, and 19 percent. Note that on the last two days (May 3 and 4 - Saturday and Sunday) the fine fuels would have dried markedly relative to their state on Friday, May 2.

Further information concerning the antecedent weather can be obtained by examining the behavior of the Burning Index (BI) and Fire Load Index (FLI) during the month preceding the fire. A graph of the two indices is presented for National Fire Danger Rating System (NFDRS) fuel model C (Figure 3) and Q (Figure 4).

There is, in fact, such strong correlation between both indices and both fuel models in this sample that to know any of the four is to know virtually all of the information contained in all of them. Given the possible confusion associated in keeping track of four numbers, there seems to be merit in suggesting that only one index be used for as wide a variety of decision making as possible, should this similarity be generally prevalent.

Tracing the BI for model Q through April, we see that the month started in the high range, dropped to nil for one day, recovered to moderate, and fell to nil for several days. On the 16th, the

FIG. 3

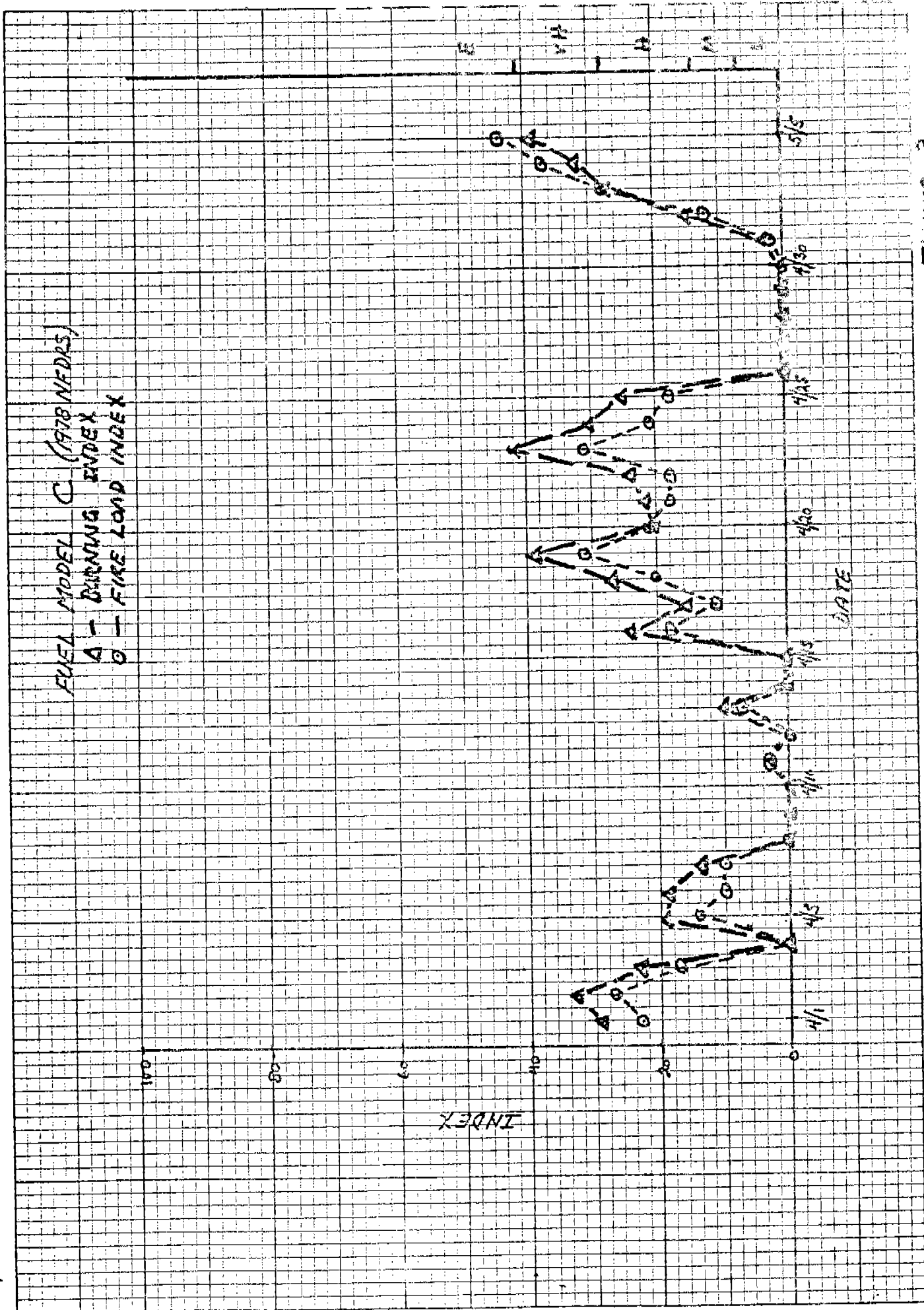


Figure 3





BI jumped from nil to the low end of high in one day. The BI remained in the high range for 10 days, after which it again fell to nil in one day due to rain. After 4 days, the index again rose dramatically to the upper end of the high range over a span of 4 days. This is the point at which the Mack Lake fire occurred. The pronounced characteristic of the BI for April and early May is a strong bimodal distribution. That is, 43 percent of the days were high, 40 percent nil or very low, and only 17 percent moderate. One can assume significant practical management problems associated with pronounced daily changes of a planning index.

c. Forecast for May 5

Two forms of weather forecast information were available at the Mio District headquarters: (1) computer output through the AFFIRMS System (Table 6) and (2) a special fire weather forecast issued by the Ann Arbor Fire Weather Forecast Office (Table 7). A discussion of forecast quality is given in Appendix C.

Table 6.--AFFIRMS Forecast for May 5, 1980

Temp.	RH	Wind Speed	Wind Dir.	1-Hr.	10-hr.	SC	ERC	BI	IC
71	40	16	NW	7	12	20/33	9/27	33/69	34/32 (C/Q)

Table 7.--Fire Weather Forecast for Mio (Issued at 8:45 am to the Supervisor's Office in Cadillac from Ann Arbor)

Time	Temp	RH(%)	Conditions		Clouds	Prec
			Wind Speed (MPH)	Wind Dir.		
1000	64	35	6-10	SW-W	20% Cu	
12-1400	72-76	23	10-15/20 G	SW-W	30-40%	
15-1700			10-15/20 G	W-NW (shift)	Front	30% chance
max/min	82	18-23		W		of showers
1,000 ft.+			15-25			

The AFFIRMS forecast, made on Sunday, the 4th, by Ann Arbor for May 5 at Mio, predicted 40 percent relative humidity. This value was apparently taken from the National Weather Service (NWS) guidance forecast by one of the forecasters on the Sunday shift. According to the fire weather forecaster, the NWS relative humidity guidance is generally too high for fire weather stations. It corresponds to values recorded at first order stations such as Houghton Lake, Flint, and Alpena. This is substantiated by a recorded minimum relative humidity of 35 percent at Houghton Lake on May 5.

d. Observations on May 5

Three forms of observational data were available at the Mio Ranger District office on May 5: (1) 0945, measurements at the burn site (Table 8); (2) a hygrothermograph at District headquarters (Table 9); and (3) 1400 Forest Service observations (Table 10).

Table 8.-- Observations at the Burn Site - May 5, 1980

<u>Time</u>	<u>Dry Bulb</u>	<u>Wet Bulb</u>	<u>RH</u>	<u>Wind Speed</u>	<u>Wind Direction</u>
0945	74		37%	10	W
1045(Approx)	82	63	34%	Not recorded	

Table 9.--Hygrothermograph Trace - Mio District Office - Forest Service - May 5, 1980

	<u>T i m e</u>															
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Temp. F.	57	65	75	80	82	83	82	81	77	71	65	60	57	53	52	50
RH %	0	80	28	23	21	22	22	26	37	46	55	56	50	51	54	56

Table 10.--1400 Observations at Mio - May 5, 1980

	<u>Temp. F.</u>	<u>RH %</u>	<u>Wind mph</u>	<u>1-hr.</u>	<u>10-hr.</u>
Forest Service	80	24	18	5	11
Michigan DNR	84	22	15	3	8

Further evidence of the state of the weather is given by 1400 observations at the Michigan Department of Natural Resources Mio office (Table 10) and wind data from the Houghton Lake National Weather Service office (Table 11). Note that these data are not directly available at the Mio District (Forest Service) office.

Table 11.--Wind Data from Houghton Lake - May 5, 1980

	<u>T i m e</u>										
	8	9	10	11	12	13	14	15	16	17	18
Speed mph	05	08	07	12	08	10	15	18	15	17	17
Gusts mph							25	28	25	30	28
Direction	SW	SW	W	SW	W-	W-	W-	W	W-	NW	NW
					SW	NW	NW		NW		

The slightly lower RH at the MDNR office was reported to be typical suggesting that the Forest Service office values could be slightly high because of the station location.

At Lansing, Michigan, between 1300 and 1400, 1 percent of the observations show relative humidity values under 20 percent. Between the hours of 1200 and 1700, 3 to 8 percent of the observations show relative humidity values under 30 percent dependent upon the specific hour.

The Mio fire weather station had been inspected on April 1 and was found to be in good working order (Appendix D). Thus, readings can be considered reasonably accurate. <sup>1/</sup> The Mio Forest Service observation has a lower RH and higher temperature than that predicted through AFFIRMS. Note, however, that the predicted and observed BI does not differ markedly. The observed data (site, hygrothermograph, and Mio Forest Service observation) all agree quite well with the special fire weather forecast. One noteworthy feature is the extremely rapid drop of RH between 9 and 10 am (Table 9). This was the time of the first on-site observation. The burning crew noted that the wind "picked up" around noon. This agrees with the special forecast.

Documentation shows that gusts recorded at the Houghton Lake station began reaching 25 mph about 1400 DST, with gusts above 23 mph until about 2100. The high gust for the period was 32 mph. It blew from the northwest, occurring at 1728 DST.

The frontal system passed through as forecast. The 1300 DST synoptic map shows the weak cold front just north of Alpena, well north of Houghton Lake. (Appendix E-1). By 1600 DST the front was just north of Houghton Lake and passed over that station at 1635. This was about the same time that it passed over the Mio area.

The air ahead of the front was very unstable. The 0700 DST upper wind observation taken on May 5 at Flint, Michigan, shows west winds of 15-25 mph at 1,000 to 4,000 feet. These types of winds can usually be expected to move downward during the course of the day.

### 3. Fuels

#### a. Prescribed Fire Area

The prescribed fire area was a mature jack pine stand that had been logged in 1978. Fuels consisted of scattered immature jack pine and piles of logging slash that had been dispersed over the site. Most of the area was free of slash. Slash quantities were not measured prior to the burn. Based on information published by Brown (1965) an estimated 20 to 25 tons per acre were likely contained in the piles. Surface fuels between the piles were not measured, but appeared to be light (3 to 7 tons/acre). Surface fuels consisted predominately of grass (carex), lichen, bracken fern, sweet fern, blueberry, and 1" to 1½" of jack pine litter and duff. Soils were grayling sand which is subject to rapid drying.

<sup>1/</sup> The hygrothermograph, RH + 5% (RH time was recording about 15 minutes later than actual).

b. Escaped Fire Area

West of Highway 33, cutover areas were interspersed with irregular stands of mature jack pine which were left for aesthetic purposes. Overstory trees were 8" - 10" dbh. The stand also contained mixtures of red and white pine, red oak, and aspen. There was some hardwood brush 1 to 3 feet high (not leafed out). Surface fuels were heavier than in the burn area, due to considerable standing dry bracken fern, in addition to the grass, oak leaves, jack pine litter, and woody material. There was 12.8 tons of measured surface material, and an estimated 5 to 7 tons of class II, III, and IV woody material (1" and larger). Grass was in a transitional state, the aspen had begun to leaf out, and jack pine buds had just burst.

c. East of Highway 33

The fire made its major runs in standing jack pine. There is considerable variance in stand age and density. In the area of the spot fire which escaped, tree heights ranged from 10 to 20 feet with reasonably continuous fuels from the ground. Diameters range from 1 to 4 inches and stand density varied from open areas to 2,500 stems per acre. There were also scattered areas of mature jack pine in the area (40 to 60 feet high). Ground fuels were noticeably light (3 to 5 tons/acre). There was no noticeable cured needle drape in the vicinity of the fire. Grass, lichen, and jack pine litter predominated.

d. Fatality Area

The predominant cover type was sapling sized jack pine 15 to 30 feet tall with diameters from 2 to 6 inches, and stand densities on the order of 1,000 to 2,000 stems per acre. There were scattered open areas and some scattered red oak. Measured surface fuels ranged from 4.9 to 19.6 tons per acre. An additional 3 to 7 tons per acre of 1 inch and larger woody material was also present.

e. The Main Fire Area

Much of the fire area had previously burned in 1946. There were some plantations, but most of the jack pine was naturally regenerated. Reproduction ranged from 2 to 10 feet tall, 1 to 3 inches dbh, and from less than 100 to 3,000 stems per acre. (Stems per acre by ocular estimate). Sapling sized jack pine ranged from 15 to 30 feet tall, 3 to 6 inches dbh and 100 to 2,500 stems per acre. The eastern and southern portions of the fire burned on the ground in predominantly hardwood types. Principal species were aspen, birch, maple, and oak, with scattered white and red pine. Hardwood stands ranged from saplings to mature with generally full stocking. The aspen had begun to leaf out and the maple buds had burst.

f. Fuel Weights

Table 12 summarizes the measured and estimated fuel weights. Measurements were taken in the vicinity of spot #4 and along the ½ mile of plow line which initially attempted to contain spot E-2 (Figure 7). Crown foliage weight estimates are based on data published by Brown (1965) and Walker and Stocks (1975).

Table 12a.--Average Fuel Weights (Tons/Acre)

	<u>Before</u>	<u>After</u>	<u>Consumed</u>
Duff	8.5	6.0	2.5
Grass, shrubs, leaves	1.5	0.2	1.3
Class I Surface (woody)	0.5	---	0.5
Unmeasured Woody *	5.0	3.0	2.0
Foliage *	<u>5.0</u>	<u>---</u>	<u>5.0</u>
TOTAL	20.5	9.2	11.3

\* Estimated

Table 12b.--Range of Fuel Weights (Tons/Acre) (5 Samples)

	<u>Prior to Burn</u>	<u>After Burn</u>
Duff	2.3 - 18.0 )	0.6 - 11.7
Grass, shrubs, leaves	0.2 - 2.7 )	0.1 - 0.4
Class I Surface (Woody)	0.1 - 1.4 ) 3.6 - 19.6	-----
Unmeasured Woody *	2.0 - 8.0**	1.0 - 6.0
Foliage *	<u>1.0 - 10.0***</u>	<u>-----</u>
TOTAL	5.6 - 40.1	1.7 - 18.1

\* Estimated

\*\* Some areas of up to 25 tons/acre of woody material were estimated.

\*\*\* The absolute range is 0.5 to 20 tons/acre. Table 12b values are more typical.

g. Fuel Moisture

(1) Jack Pine Foliage

Van Wagner (1967) and Grieve and Such (1977) present data which indicate that jack pine foliar moisture is at a minimum in early spring. The average jack pine twig and foliage moisture measured 2 to 5 days after the fire was 120 percent with a range of 100 percent to 135 percent (10 samples). This was significantly higher than Van Wagner's spring values (104 percent) and those of Grieve and Such (95 percent). Note that the Mack Lake data were obtained after showers had passed through the area, one day after the main run of the fire. The measurements were, however, significantly lower than published mid-to-late summer measurements (136 percent to 145 percent).

Stashko and McQueen (1974) indicate that 1 to 2 days of high wind and low relative humidities can reduce foliar moisture contents

by as much as 20 percent. Grieves and Such (1977) measured short-term foliar moisture content variations on the order of 10 percent to 40 percent which they attribute to sampling error. It is possible, however, that on porous soils such as grayling sand, foliar moisture losses can be induced on dry, windy days. It is not unreasonable to hypothesize that on the day of the fire, the foliar moisture could have been 5 percent to 15 percent lower than measured subsequently.

Van Wagner states that the difference between spring and summer foliar moisture values can make a 20 percent difference in the energy output of crown fires. Grieves and Such measured jack pine foliar moisture at the time of five wild and prescribed fires in jack pine. Their results suggest that jack pine crown fires are likely at moisture contents of 135 percent or less. They conclude, however, that jack pine foliar moisture is only of secondary importance in crowning. Other conditions such as the state of the surface fuels and wind play a dominant role. High jack pine foliar moisture coincides with the existence of green vegetation during mid-summer. Low foliar moisture coincides with cured surface vegetation in the spring and late summer.

#### (2) Spot Samples

A number of additional fuel moisture samples were obtained one day after the fire, 2 hours after a trace of rain fell.

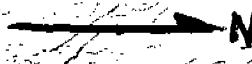
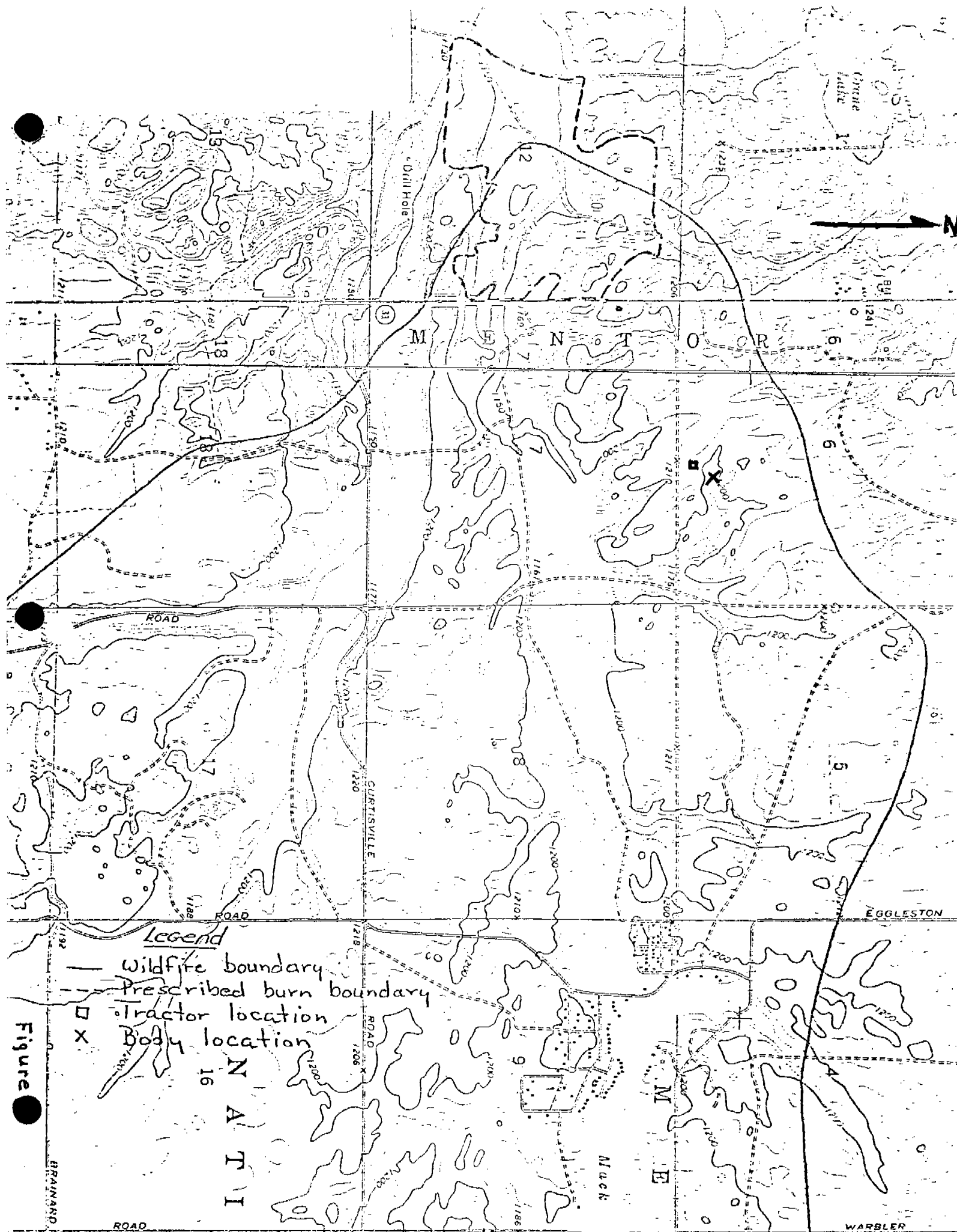
- Blueberry	67 percent
- Lichen	20 percent
- Bracken Fern	19 percent
- Red Pine Needles	91 percent
- 6" punky log	421 percent
- Jack Pine in burned area	90 percent (probably desiccated although still green)

These measurements suggest that on the day of the fire, the flash fuels (grass, lichen, fern) would have been very dry, and the heavy fuels were far too wet to burn.

#### 4. Topography

##### a. Prescribed Fire Area

The prescribed fire area is rolling with numerous ridges, valleys, and spurs oriented somewhat randomly (Figure 5). A cross section profile along the line of the primary spot across M-33 is shown in Figure 6 (See also Figure 1). Typical slopes are on the order of 25 percent. Elevational differences between the rounded ridges and valley bottoms are about 80 feet. The general elevation for this area is 1,200 feet. There was a predominant east-west valley running along the southern edge of the prescribed fire area. Clearly, highly variable and turbulent winds could be expected in this area. The eastern edge of the prescribed fire was 5 to 15 feet below the ridge top on which standing timber had been left.



Legend

- Wildlife boundary
- - - Prescribed burn boundary
- Tractor location
- X Body location

Figure

N  
A  
T  
I

BRANARD  
ROAD

ROAD

ROAD  
CURTISVILLE  
1206

Drill Hole

Mack

M  
E

WARBLER

EGGLESTON

6

5

6

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b. East of Highway 33

The terrain contrasts with that west of the highway. It is slightly rolling (10- to 50-foot typical elevation), to gentle, to nearly flat. Slopes are on the order of 5 - 20 percent. There are virtually no terrain barriers to fire spread east of Highway 33 other than roads.

5. Fire Behavior

a. The Escape Area

At 1206 (in log), the prescribed fire spotted into standing timber adjacent to and up-slope of the prescribed area (Figure 1, Spot 7, Figure 6). At this time, the prescription was abandoned and wildfire suppression began. Scorch heights in this area were 2 - 6 feet and the fire was moving generally eastward. A plow line attempted to contain the fire between the prescribed burn and Highway 33. About 1215, the fire torched on the western edge of Highway 33 and spot fires were soon noticed east of M-33. The first spot (100 feet away) burned about 3/4 of an acre with 2-4 feet scorched heights, but it was contained. The second spot (E-2, Figure 4, 225 feet away) was noted at 10-15 feet in diameter. The fire was described as "very aggressive" by the fire boss. At this time, a great deal of smoke was reported across Highway 33. The tanker experienced considerable visibility problems. The second spot torched with 25 feet of the ignition point, and crowned within 100 feet. At this point, the fire was essentially lost. What may have been a secondary fire front burned 600 feet in approximately 6 minutes. A possible third spot was reported by the Fire Boss between the two main ones, but further back from Highway 33.

b. The Fatality Area

The tractor/plow unit was reported to have reached the second spot (E-2) within 3 minutes of being called. The driver began plowing line and apparently attempted to circle the fire to the south (Figure 7). The fire likely jumped the plowed line and the tractor turned back north and tied in to a power line and road. The tanker which followed attempted to tie off the spot with water, but was unsuccessful. The tractor resumed plowing just north of the power line, suggesting that the fire had already crossed the power line and road. An estimated 6 minutes had elapsed between the start of the plow line and this point. The lineal distance from the highway was 600 feet, suggesting a spread rate of 100 feet/minute. It is hypothesized, however, that the main fire had already moved east some distance and that this particular involvement was with a secondary front/flank.

The 1,000-gallon tanker with 2-man crew followed the tractor, working on the active northern flank of the fire by spraying water on it. The fire was reported to be on the ground in the vicinity of the plowed line, but torching and crowning could be seen 100 to 200 feet inside the line. "Heavy, roiling black smoke" was described as a turbulent ground fire with 6-inch to 2-foot flame heights. It shifted direction a number of times and there was fingering in a northern direction. The fire was



MACK LAKE FL.

Origin Profile

Scale 1/2" = 40'



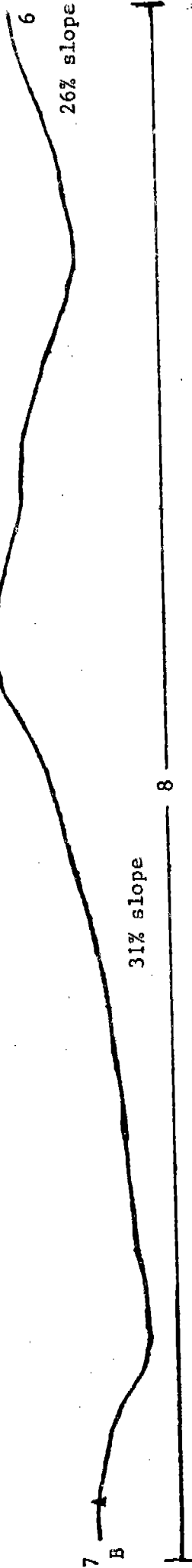
PROFILE AS SEEN FROM SOUTH

▲ Profile Line Terminals

Overall Line Length 1524.80'

Wind →

N ↑



- 1' - Crown Fire
- 2 - Torching
- 3 - Spot Ignition
- 4 - Torching
- 5 - Standing Timber
- 6 - Planned Edge of Prescribed Fire
- 7 - Dirt Road
- 8 - Prescribed Fire Area

J. Pullen D. Reff  
5-10-80

Figure 6

reported to be "very sensitive to wind." A slight change in the wind direction and a hot flank immediately turned into a crowning head." The changes were described as "instant." Fuels were variable-heavy to light. The tanker crew reported that despite traveling at 4-6 mph as they sprayed water, they could not catch the fire.

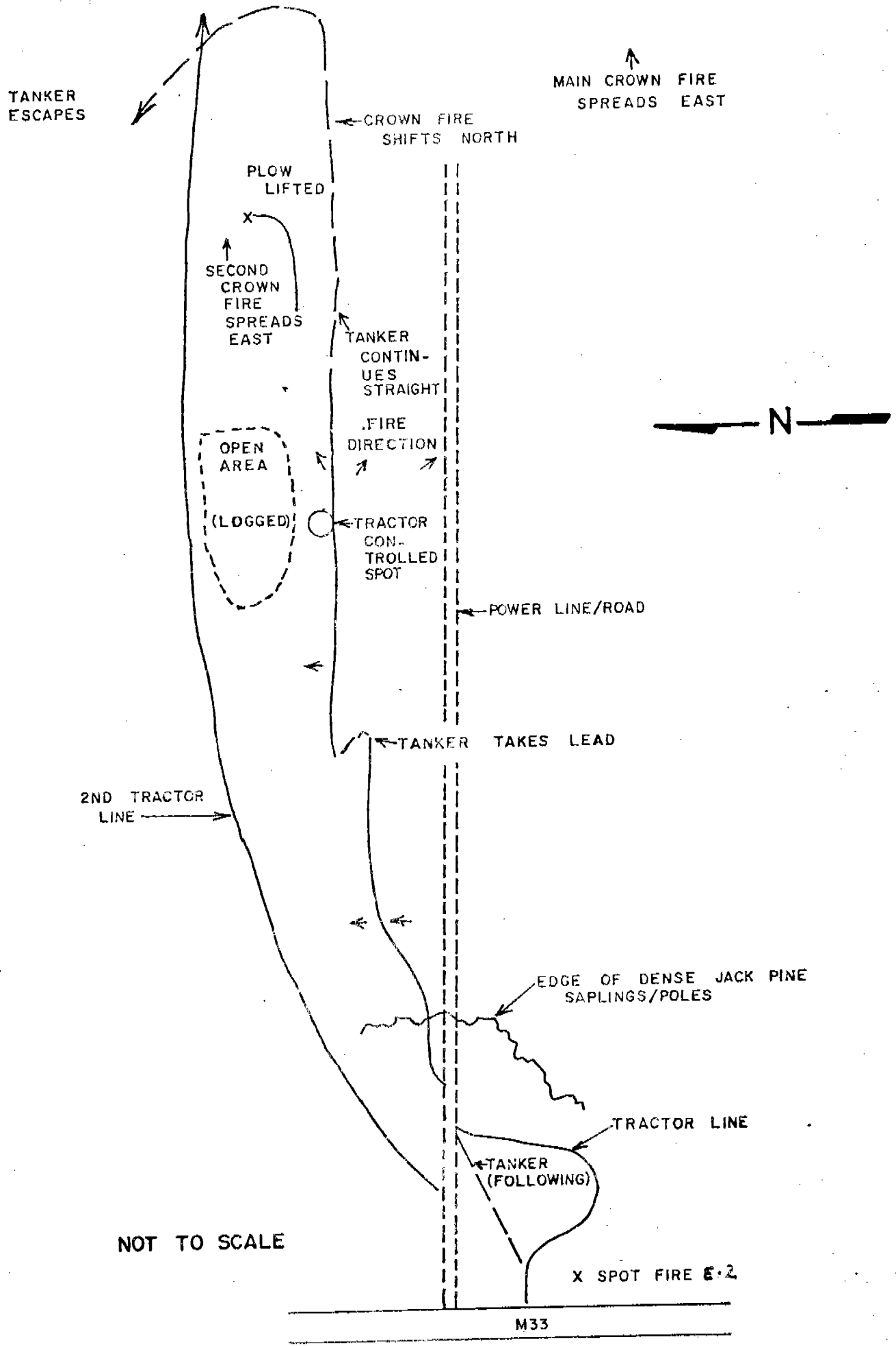
The tractor entered a dense stand of jack pine and small poles, 15-25 feet tall, 2"-6" dbh, and 500-2,000 stems per acre. It remained in this type throughout its efforts. The impact of the water sprayed by the tanker can be seen in an unburned strip of ground fuels 1-4 feet wide where the core of the spray landed. Also, there is a strip of uncrowned jack pine 25-50 feet wide on both sides of the plow/spray line. The tanker clearly wet the fuels sufficiently to knock down the crown fire. At no point, however, did the line hold. It can be noted that the fires spread 50-75 feet on the ground, north of the line, before it crowned again. Some torching on the north edge of the line was also noted.

Shortly after the tractor and tanker left the power line, the tanker took the lead and the line was shifted 50 feet to the north. The plow overlapped the previous line, but did not tie the two together. Somewhat further along, the plow circled around a spot, indicating control difficulty immediately behind the tractor. It is reasonable to assume that by this time the fire had crossed the line behind both units (likely fairly extensively). A second plow line started from the power line about 200 feet west of the tractor #1. Clearly, by the time the second plow unit had arrived, the first line had been lost. At the point of the circle, Figure 7, (Tractor Controlled Spot), the fire is burning southeast to south on the south side of the line, indicating possible drawing in by the main fire. Just north of the line, the fire is spreading northeast to north, indicating that it was no longer under the influence of the main fire.

Somewhat further along, the tanker continued straight while the plow again shifted 75 feet north leaving a segment of unconstructed line behind him. Presumably, at this time the fire was north of the tanker line. We can hypothesize a separation between the units on the order of 5 minutes at this time. The tractor continued plowing eastward for a short distance (100 to 200 feet). It appears that the fire crowned to the north, across the path of the tractor. He turned north and lifted his plow. After about 100 feet he abandoned the tractor and ran eastward. By this time, however, the fire which had crossed the line behind the tractor had reached a large logged over open area with a good wind fetch. It crowned, spreading eastward, trapping the operator. The tractor's elapsed time from M-33 to this point was 20 to 25 minutes.

Meanwhile, the tanker, which had also abandoned its control effort turned north and then west, escaping ahead of the second crown fire. The two units were separated by approximately 100-200 yards. Finally, sometime afterwards the second plow line crossed the tanker's path and continued eastward. In the final analysis, not one of the control lines constructed during this period held the fire. The tanker operators reported that even traveling at 4-6 mph they never saw the head of the fire.

FIG. 7 SKETCH OF FIRE BEHAVIOR IMMEDIATELY AFTER THE ESCAPE



c. Ignition (NFDRS\* IC = 49/45; C/Q) (See Appendix F for a definition of all NFDRS indices).

It is clear that virtually any spark could ignite a fire. There are no significant unburned islands. The fire burned completely up to all plowed and sprayed control lines and roads on May 5. Even in areas where 1' to 2' jack pine reproduction was barely scorched, the fire burned evenly on the ground. One almost got the impression that the entire area had simply been painted black. The fire also burned through areas of grass despite visually apparent high percentages of green material. During the afternoon of May 5, no amount of line or width of road seemed capable of holding the fire, even on the flank, let alone at the head.

d. Spread (NFDRS SC = 25/40; C/Q)

The fire spread at extreme rates. It crossed Highway 33 at 1228 (Michigan DNR Pilot report - logged). A second estimate (Oscoda County Deputy Sheriff) indicated that the fire crossed the highway at around 1215. The fire reached Mack Lake at 1315 (Michigan DNR tractor operator report). The intervening distance is 2 miles. The derived spread rate is 2 mph or 176 feet per minute.

A second reliable report placed the fire just east of the intersection of Forest Service Road 4461 and County Road 469 at 1530. The distance from Highway 33 is 6 miles. Thus a 176-ft./minute rate of spread (2 mph) was sustained for at least 3 hours. There are reports of the fire keeping pace with vehicles on parallel roads. No doubt occasionally extreme rates of speed must have occurred to sustain an average rate of 176 feet/minute for 3 hours.

Between 1530 and 1800 (2½ hours) the fire spread an additional 3 miles. While the average rate during this period is 1.2 mph (100 ft/min), it is more reasonable to assume a gradually decreasing rate in response to rising humidity. Between 1800 and 2400, the fire spread an additional ½ mile, mostly on the ground, through hardwoods. The average spread rate is 7.3 ft/min. But again, a gradually decreasing rate during the period would be expected. On the second day (May 6), the fire did not materially increase its perimeter.

The extreme spread rate was dependent by these factors: relative humidity below 25 percent, 15 mph winds, gusting to 25 mph, and dense sapling to pole sized jack pine. In the late afternoon, RH rose from 37 percent to 55 percent between 1600 and 1800. Average wind speeds and gusts were unchanged to slightly higher during this period. At this time, the rate of spread was decreasing significantly. The fact that the fire was burning through hardwood stands at this time also contributed to the reduced rate of spread.

The observed rate of spread is 4 times greater than that predicted by the SC value for the Q fuel model and 6.4 times greater than that for the C model. Note that the SC does not predict crown spread rates.

\* National Fire Danger Rating System

e. Flame Length (NFDRS BI = 39/79 C/Q)

Flame lengths in the prescribed fire area were reported by several persons to be on the order of 6 inches to 1 foot. In much of the mature jack pine between the prescribed fire and Highway 33, scorch heights varied from 2 to 6 feet, indicating a moderate surface fire. Scorch heights on the order of 15 - 20 feet were also observed in this area. Spread appeared turbulent and variable in the standing timber, going in opposite directions, or at 90 angles at locations only 50 feet apart. Some scorching and small crown runs were noted. Along Highway 33, backing flame lengths were 6 inches to 18 inches (video tape of the fire). Flame lengths in 2 feet to 2½ feet deep, fresh slash were 5 feet to 10 feet high.

The crown fires, however, were a different story. Three polaroid pictures taken in the vicinity of Mack Lake indicate flame heights of two to three times the height of the jack pine saplings. A "wall of fire" was reported by the fire boss in the vicinity of Mack Lake. He was "impressed with the consistency." He reported flame heights of 20 - 30 feet above the trees. Thus, using an estimated 20-foot tree height, flame heights were 40 to 50 or 60 feet. That is an average of 6 times greater than predicted by model Q and 12 times greater than predicted by model C.

f. Energy Release (NFDRS ERC = 11/30 C/Q)

Byram (1959) gives a relationship for the flame length as a function of fire intensity:

$$(1) \quad L = 0.45 (I)^{0.46}$$

Converting to intensity as a function of flame length:

$$(2) \quad I = \left( \frac{L}{0.45} \right)^{2.17}$$

Thus, for 1 foot flame heights in the prescribed fire area, intensities would have been only 5 BTU/ft.<sup>2</sup>/sec. - clearly an insignificant amount. For the 2- to 4-foot flame heights, intensities would be on the order of 25 - 100 BTU/ft.<sup>2</sup>/sec. For the tallest surface by flame lengths (10 feet) the intensity would be 850 BTU/ft.<sup>2</sup>/sec.

Table 13.--Fire Intensity vs. Flame Height

Flame Height (Crown Height=20 Ft.)	Energy Release Rate (BTU/Ft. <sup>2</sup> /sec.)
30	3,750
40	9,100
50	17,000
60	27,500

Thus, at the time of the major run, the fire was reaching peak energy release rates as high as 27,500 BTU/Ft.<sup>2</sup>/sec., with sustained average rates on the order of 9,000 BTU/Ft.<sup>2</sup>/sec.

Total energy released was determined by making a number of assumptions: (1) an average of 6 tons per acre of surface material and 5 tons per acre of foliage were consumed by the fire; (2) the energy content of surface material was 6,300 BTU/lb. and that of the foliage was 4,300 BTU/lb. This incorporates the heat required to raise the material to the ignition temperature. It also assumes incomplete combustion as is normally the case in larger fires (Byram 1959); (3) approximately 75 percent of the total fire area was jack pine and approximately 75 percent of that area crowned.

Thus, for surface material:

6	X	2,000	X	6,300	X	24,000 - 1.814 x 12 BTU
(Ton/Acre)		(Lbs./Tons)		(BTU/Lbs.)		(Acres)
5	X	2,000	X	4,300	X	13,500 = 5.805 X <u>1011</u>
TOTAL Energy Released from the fire						2.39 X 1012 BTU

Energy release rates for the fire can also be determined with the equation:

$$(3) I = HWR$$

Where H = Heat of combustion  
W = Weight of fuel per unit area  
R = Forward rate of spread

Using 5,400 BTU/lb. as an average value for surface material and foliage and 0.51 lbs/ft<sup>2</sup> of material, the following is determined:

- (1) At a 2 mph (2.93 ft/second) spread rate (first 3 hours), the average energy release rate is 8,080 BTU/ft.<sup>2</sup>/second;
- (2) At a 1.2 mph (1.76 ft/second) spread rate (second 2½ hours), the average energy release rate is 4.850 BTU/ft.<sup>2</sup>/second.

Note that rate (1) is consistent with the average obtained with the modified version of example 2. If we further assume a fire front width of 3 miles at the end of period 1 and 6 miles at the end of period 2, we can determine the total energy released during the first afternoon. During the first period, the average width (start at 0, end at 3) would have been 2 miles or 10,560 feet. During the second period, the average width would have been 4.5 miles.

Thus:

(1)	10,000	x	10,560	x	8,080	=	9.215 x 1011
	(second)		(feet)		(BTU/Ft./Sec)		
(2)	9,000	x	23,760	x	4,800	=	<u>1,037 x 1012</u>

Total energy released during the first afternoon = 1.96 x 1012

Thus: 82 percent of the total energy output was released during the first afternoon.

To put things in perspective, the total energy released by the fire is equivalent to 412,000 barrels of oil, and that during the first afternoon 339,000 barrels of oil. Examined from another perspective, approximately 70 times the energy content of a typical thunderstorm, or 7 times the energy contained in the bomb dropped on Hiroshima was released by the fire.

The ERC predicts energy release rates of 275 BTU/ft.<sup>2</sup>/sec. for fuel model C and 750 BTU/ft.<sup>2</sup>/sec. for fuel model Q. These rates are difficult to compare with what was observed. The ERC warns of crown fire potential but does not include crown fire energy release rates. Six- to nine-foot flame heights would have been consistent with predicted values of the ERC.

### g. Spotting

A Michigan DNR patrol aircraft reported that the fire was spotting repeatedly 200 feet in advance of the front. On the afternoon of the major run, ground and crown fires spotted readily across every road in the area (20- to 100-foot barriers). This is true even for surface fires in hardwoods. In the Mack Lake area, spotting on the order of ¼ mile was reported.

### h. The Convection Column

A video tape of the convection column indicated that the smoke column rose at a shallow angle ranging from 10° to 45°. During the peak of the fire, a black column was observed rising at 45° to 3,000 - 5,000 feet. This was topped by a white cumulonimbus cloud (in appearance) which reportedly topped out in excess of 10,000 feet. (Houghton Lake Meteorologist in-Charge). Considerable turbulence was observed in the smoke column. Although occasional fire whirls and dust devils were noted by various observers, they were considered inconsequential.

### 6. Fire Effects

All jack pine in the crown fire areas has clearly been killed. It is also anticipated that most of the scorched jack pine will also perish. Along the southern and eastern flanks, where the fire burnt predominately along the ground, it is reasonable to expect that damage to the residual stand will be far less severe. Although ground surveys will be needed to determine likely impact, most of the mature (8 inches +) hardwood trees should survive. Jack pine survival in the mature stands west of Highway 33 should be on the order of 50 percent or better.

Excellent jack pine seed dispersal has been noted on nine sites examined. Measurements indicate that seed density ranges from 87,000 to 1,845,000 per acre (one week after the fire - more seed is reported

failing). Note, however, that no seeds were found on one site where there was no jack pine of seed-bearing age. Crosciewicz (1974) rates a post burn duff depth of less than 1" as high quality in terms of seedling survival. Riley (1975) states that 20,000 viable seeds per acre are necessary for adequate stocking. Data summarized by McRae (1979) indicates that jack pine seed viability averages 50 percent. Thus, 40,000 seeds per acre should provide adequate stocking. The critical controlling factor with regard to successful regeneration will be post-fire precipitation. If it is normal or above, good regeneration should be expected. If it is less than normal, spotty or poor regeneration may result.

The rainfall record immediately after the fire is:

5/06/80 - Trace of rain  
5/07/80 - Trace of rain and snow  
5/10/80 - 0.8 inch of rain  
5/13/80 - 0.42 inch of rain (5 rain gauges)

Depth of burn was inconsequential. On the average 1/8" to 1/4" of litter and duff were consumed. In many cases, the fire only blackened surface pine litter and oak leaves. Their forms could still be seen on the surface. This phenomenon was observed in crown fire areas as well as surface fire areas. Clearly, only the flashiest fuels were consumed. Little woody material greater than 1/4 to 1/2" was consumed by the fire. Large material charred to a depth of 1/4 to 1/2". However, brush piles in the prescribed burn area were almost completely consumed. In general, the fire could be classified as a "flash" fire with residence time of only 1/2 to 2 minutes.

As a final note, it is anticipated that there will be no permanent adverse effects on air quality, soils, or water in the vicinity of the fire. This conclusion is based primarily on the fact that little of the surface organic layer was consumed.

#### D. Fire Management

##### 1. Detection

For the purpose of this analysis, detection is considered as the time at which the fire was discovered on the east side of Highway 33.

It appears that this took place at about 1215 on May 5, 1980, and was discovered by the Fire Boss within a few minutes (perhaps immediately). The prescribed Fire Boss assumed Fire Boss responsibility for the escaped fire at this point and began initial attack. Other detection times were Sheriff's Department 1215 and Michigan DNR aircraft with trained detection pilot 1228. The Sheriff was with the Fire Boss on M-33.

Discovery standards are not pertinent to this analysis.



Visibility at time of discovery is not pertinent to the detection of this fire; however, smoke was heavy.

The regular detection system was not involved on this fire. Normal fire detection is by contract aircraft from Welch Aviation, Alpena, Michigan. An observation plane was needed according to the prescribed burning plan. At 1124 Tawas notified Mio that Welch was having problems with plane. They could get a larger plane up or have the regular plane up by 1230 to 1300. The Fire Boss decided to wait for the regular plane considering no more than a 1 hour delay.

## 2. Communication

The closest estimate on the time the fire jumped Highway 33 is 1215. The first entry to this effect in the dispatcher's log (District) is at 1230 when the MDNR so reported. However, the Mio dispatcher (Clerk Typist) recalls that she had received a call from Fire Boss between 1221 and 1230 but didn't enter it in the log due to her involvement on the telephone and other "hectic" matters. This exceeds the standard of 2 minutes by several minutes; however, the standard seems somewhat meaningless in this case since the suppression forces for initial attack were already at the scene.

In our judgment, under these circumstances, there was not a significant delay in detector to dispatcher communication.

The Mio Ranger District radio system is in the process of being converted from a 2-channel to a 4-channel system. Channel 4 is a high band, all purpose channel capable of also receiving transmission from Channels 1 and 2. The District has the base set channel selector for Channel 4 taped down. Channel 3 is a fire channel. All the handi-talkies and Volunteer Fire Department (VFD) mobile radios are on Forest Service channels 1 and 2. Some individuals on the District do not think Channel 1 is functional; others say it is. The ways in which the new radio system can be used did not appear clear to some District employees. When asked, nobody can recall hearing any direction to the fire organization to go to Channel 3 during the initial attack phase.

During the afternoon of May 5 several people stated that communication by radio became impossible. Important fire messages were being cut in on. Besides the Forest Service use of radios, some local VFD, for the first year, also had Forest Service net Channel 1 and 2 radios. The volume of radio traffic caused delays in transmitting or receiving of important radio messages. At the Mio Office two separate fire logs were being used.

The Mio Office has two available telephone lines. Both were in constant use with calls for a variety of purposes.

## 3. Dispatching

The location of the escaped fire was known by the dispatcher and available District initial attack forces on-site. An automatic dispatch plan for Mio or the Forest did not exist so reinforcements

were on a request basis as the Fire Boss asked for them. Based on the danger rating for the day, the initial attack strength was short. Those units identified as needing to be on standby at Mio should have all been dispatched automatically. The cooperater with tractor and plow and Forest Service foreman, radio and tractor foreman, three men with 50-gallon slip-on tanker, and 3 men with hand tools were not on standby.

4. Statistical and Graphic Records (a thru e can be added by Huron-Manistee)

f. Status and Location of District Initial Attack Forces

On May 5, 1980, the Mio Ranger District had a predicted (AFFIRMS) FLI of 34-C model, 54-Q model. This put them in Manning Class Level 7 according to the District Mobilization Plan, Manning and Specific Action Guide (Appendix G). A comparison of the M-SAG and actual action follows:

<u>Manning and Specific Action Guide Calls For:</u>	<u>Actual Location</u>
5-2 6x6 tanker at Mio w/2	On prescribed burn
5-4 tilt bed at Mio w/1	On prescribed burn
5-5-4 tractor plow w/1 at Mio	On prescribed burn
5-3 pickup w/3 in Luzerne area	On prescribed burn
5-5 120-gallon tanker w/3 in Mack Lake area	On prescribed burn
Cooperator w/tractor plow unit with F.S. Foreman	Not on standby
Radio and tractor foreman in Mio	Not on duty
Mack Lake VFD and 190-gallon slip-on with 2 tankers on standby at Mack Lake	Not on standby
3 men w/50-gallon slip-on tanker at Mio	Not on duty
Cooperator w/tractor and plow with F.S. radio and tractor foreman at McKinley	Not on duty
McKinley, Luzerne, Mio, Lupton VFD on standby	Not on standby
3 men w/handtools at Mio	Not on duty

Actual manpower in place as specified in M&SA Guide - 0, Floyd Moore was on call at home and four VFD's had been notified that prescribed burn was planned for May 5.

The items at the prescribed burn should not be considered since they were not free to leave the area and respond to an unexpected wildfire.

## SECTION II - FIRST PHASE - INITIAL ATTACK

### A. INTRODUCTION

On May 5 the District Clerk (primary dispatcher) was off duty on a flexi-tour. The Clerk Typist (back-up dispatcher) and a Senior Community Service Employment Program (SCSEP) employee were working in the Mio office. The Clerk Typist has worked for the Mio District and Forest Service for about 2 years and is acquainted with the operation of the District radio. Her experience has been gained as back up dispatcher and has dispatched on several small fires. She has been instructed in making entries in the fire log book. The afternoon of May 5, she was assisted by the SCSEP employee who helped out by answering the telephone. The District Clerk was called to duty at 1245 (radio log) and reported about 1300.

The location and behavior of the fire was observed by the initial attack Fire Boss from detection through initial attack. As explained previously, report and travel time are immaterial since the initial attack forces were at the scene. Initial attack on spots east of M-33 were fast and aggressive.

B. INITIAL ATTACK FORCES

- 1 - Fire Boss
- 1 - Tractor plow unit and operator
- 1 - 1000-gallon pumper with driver and nozzleman
- 1 - 125-gallon tanker with driver and crewman  
(on way to Mio to have 4x4 electrical system repaired when fire jumped M-33)
- 2 - Misc. overhead
- 3 - Crewman with hand tools and pack pumps

Total of 11 people, all from the prescribed burn.

C. REINFORCEMENTS\*

- 1 - Tri-Town VFD 4x4 - Arrived at 1225
- 1 - Tractor plow unit - Arrived at 1230
- 1 - MDNR Wildlife D-7 Tractor - Dispatched at 1252
- 1 - MDNR Tractor/plow with Forest Service radio - Dispatched 1255
- 1 - Tractor - Arrived at (Unknown)
- 1 - 1000-gallon tanker, Rose City - Arrived at (Unknown)
- 1 - Rose City VFD 4x4 - Arrived at 1330
- 1 - MDNR Skidder (Roscommon) - Dispatched at 1345
- 1 - MDNR 6x6 (Mio) - Dispatched at 1358
- 1 - Mio - Arrived at (Unknown)
- 1 - Luzerne VFD - Arrived at (Unknown)
- 3 - Fairview VFD - Arrived at (Unknown)
- 1 - Tawas Crew - 7 men - Arrived at 1520
- 2 - Brush Trucks - Camp Grayling - Arrived at 1730
- 1 - Dozer - Camp Grayling - Arrived at 1730
- 2 - McKinley VFD - Arrived at 1753
- 2 - St. Ignace tankers - Arrived at 2030
- 1 - Lupton VFD - Arrived at (Unknown)

\*These reinforcements were entered in the Forest Service or MDNR radio logs. Other equipment was observed by various people as being on the fire; there is no record of what kind or owner.

The Fire Boss recognized the need for reinforcements for both the prescribed burn and initial attack. The radio log records his request for traffic control help from the Sheriff at 1142. At 1220 the Fire Boss told the dispatcher in Mio he needed the 4x4 from Tri-Town and another tractor/plow unit. At 1230 he asked for another tanker and tractor. By 1245 the Fire Boss asked for the Luzerne VFD, and more trucks. A general request for reinforcement was started by the Mio dispatcher at this time.

The initial attack forces used for much of the initial period were those assigned to the prescribed fire.

MDNR equipment was readily available and they (MDNR) made two contacts (1228 and 1236 from MDNR radio log) with the Mio office to ask if they were needed. They were told to standby and that someone would get back to them; then in the press of business (or lack of a direct telephone line), the

Forest Service called back at approximately 1430 asking for equipment in the D-6 and D-7 class. However, several pieces of MDNR equipment were dispatched by someone to the fire: a Wildlife Division D-7 from Grayling at 1252, a Mio tractor at 1255 (request by Forest Service), Roscommon Skidder 1345 (request by Forest Service), and Mio 6x6 tanker at 1358.

The Assistant District Forest Manager, MDNR, Mio, upon hearing about the condition of the escaped fire from his dispatcher and aerial observation plane pilot called other MDNR units and advised them that they could expect calls for assistance. About midnight, a call was made to the Fire Boss who was at the Mio office. Equipment was offered for the following day shift and accepted. Thirteen pieces of MDNR equipment were dispatched to the Mack Lake fire on the morning of May 6.

The afternoon of May 5 the MDNR authorized its District headquarters to give all assistance possible to the Mack Lake fire. Equipment was shifted from MDNR Regions I and III to the Roscommon Region in order to provide for additional equipment, if needed, and to strengthen support fire control capability for any other occurring fires.

All personnel on the prescribed fire had the minimum fire suppression training that is required. The training records were not complete but it is doubtful that anyone except the Fire Boss and District Ranger had much additional formal fire training. The Forest has not held any formal training session on prescribed burning. This was the second time that the Forest Service Mio District tractor operator had performed on a wild fire as a tractor plow operator. He had received formal tractor driving training, but was scheduled for a license exam during the week of May 5.

The initial attack equipment assigned was the kind needed. The new armored 6x6 and the tractor with recently attached Michigan fire plow performed very satisfactorily. There was not enough of it. The 4x4 slip-on tanker unit may not have been in good condition as its crew had a problem keeping it running and starting it during the prescribed burn.

Early in the initial attack radios were available in adequate numbers for Forest Service people and when communication problems did exist, they were handled by radio replacements. Later, however, equipment operators and individuals were involved with initial attack for several hours without radio contact or direction. This was especially true for MDNR and VFD units. Control line was built by people without the ability to inform anyone of problems that might be developing. Difficulty existed in assignments and in trying to maintain contact.

There does exist in Michigan a fire control frequency assigned by the State only for on-site fire control use, 154.295, and many VFD

and all MDNR area fire supervisors have mobile radios with this capability. In addition, at Roscommon, the MDNR has a fully equipped communications command post, (mobile) self-contained, and is available for use on any emergency.

The initial attack was unsuccessful in that sufficient equipment was not available to pick up spots before the jack pine began to torch out and make a running crown fire. The availability at the fire of a second tractor plow unit, as called for in the burning plan, would probably have made picking up the first three spots east of M-33 possible. Whether this would have been enough to control any additional problems is open to question, particularly as the peak of the day's burning conditions was still to come.

A key part of the dispatching duties is to anticipate needs and do preliminary arrangements for overhead, firefighters, and equipment. The Forest does not have an automatic mobility or backup plan for wildfires. Backup to Forest Service initial attack normally comes from VFD units and the Michigan DNR. The 1968 MDNR - Forest Service Memorandum of Understanding states that either agency, upon request, will assist in mobilizing and recruiting manpower and equipment and loan to the other agency for fire suppression supervisory personnel and equipment within its ability. Cooperative agreements with local VFD spell out the responsibilities of each agency and like the Forest Service and the MDNR, the VFD have worked closely on many wild fires in the past. In fact, on May 5, at 1105, the Luzerne VFD reported a fire on County Road 490 just past Big Creek and proceeded to control it before a Forest Service dispatched dozer was needed.

#### D. MACK LAKE COMMUNITY

It was during the initial attack phase of the Mack Lake fire that approximately 44 private structures were damaged or destroyed. The wildfire moved from source of ignition to the Mack Lake residential area in about 45-60 minutes, a distance of 2 miles. The main fire arrived as a running head fire. It is not clear who dispatched what equipment to protect the buildings in this area. Indications are dispatching was by more than one source. The Mio-Tri-Town VFD was called at 1224 and asked to send everything. The Fairview and Rose City VFD's were called at 1315 and asked to send all equipment--Fairview to Mack Lake and Rose City to Wagner Lake. The McKinley VFD said the Sheriff's Department notified all VFD's at 1300. The Mio radio log shows Luzerne and the MDNR were on their way to the fire at 1253.

Some of the VFD, MDNR, and Forest Service units went directly to Mack Lake, others to staging areas. The Fire Boss was concerned with getting the residents to safety and was informed by the Mio Office that the Sheriff's Department had evacuated everybody from Mack Lake (time not recorded), but there were still people in the area coming and going. The Sheriff's Department patrolmen and Forest Service employees were trying at various locations to keep traffic from going into the head of the fire. At other locations, people were deciding to go into the fire to protect the cabins. Some made

it, others were forced back by the smoke and heat. Because of the size of the fire by 1300-1330 and the number of access roads in the Mack Lake area, no one person knows for sure what was happening. A central control post had not been established. The Fire Boss was trying to scout the fire and use the radio for communicating messages to others involved with the initial attack.

The decision to keep people out of the area of the fast moving head fire was the right one and was reflected by several individuals who tried to stop traffic and stage equipment until definite instructions were available. Protection of life was placed before protection of property.

A question many people have asked is, "Whose responsibility was it to suppress structural fires." At least one available Forest Service tanker was asked to put water on burning homes, but did not. The driver's reason for this was the training he had received in March 1979. The Michigan Department of Labor Occupational Safety Standards Commission requires in its Safety Standards, Part 74, November 18, 1977 (Appendix H), special equipment and 66 hours of training before being permitted to fight structural fires. The Forest Service Health and Safety Code Handbook Chapter 6-4, states "structural firefighting requires special knowledge and skills. Fire fighters must be properly trained and equipped and that there is a high incidence of fatalities in professional firefighter ranks." The Forest Service employees did not have training or possess the proper equipment to fight structural fires.

In discussing this problem with the State Fire Marshall, he pointed out that around recreation areas, typically, there will be gasoline stored in and around buildings. There were also many propane tanks and fuel oil tanks. Downed electrical lines can also be a hazard. Safe fire suppression practices must be understood before working near such structures.

A reason this training or equipment has not been provided Forest Service employees is that the Cooperative Fire Agreements between the Township VFD and Huron-Manistee National Forests state the Town VFD has the responsibility for suppression of all structural fires within their protection areas and are to assume command and control of any building or domestic fire that it takes action on. The same agreements list the Forest Service responsibility as suppression of all forest, grass, and brush fires within their protection area.

The Forest Service crews at Mack Lake reported that they did limit their actions to suppressing fires threatening structures. They extinguished grass, rubbish, and wood pile fires next to the threatened homes and feel they saved six cabins, two west and four east of Mack Lake.

One resource identified during this analysis is the State Fire Marshall's Office. This office maintains a list and location of all the VFD equipment in the State. They also work directly with the VFD and can provide a valuable service to the Forest Service in the future. Coordination with the Sheriff's Department, State Highway Patrol, and MDNR fire people is also needed. Sources of fire fighting and law enforcement help was available outside the Forest Service, but not automatically requested.

### SECTION III - SECOND PHASE - REORGANIZATION TO CONTROL FIRE

The Second Phase is considered to be from 1600 on May 5 until 0600 on May 6, when the Class II Team arrived and assumed responsibility for the suppression action. No escaped fire situation analysis was made during this time.

The Prescribed Burn Fire Boss (Later the Initial Attack Fire Boss) was the best qualified man available to fill the Fire Boss position until a fully qualified Class II Fire Overhead Team arrived.

The Class II Team was requested to be put on standby by 1445 and ordered at 1717 on May 5.

The Forest Fire staff at Cadillac did anticipate some needs for the overhead team, tractor plow units, and other equipment, and had alerts put out by the Supervisor's Office.

The Fire Boss recognized the need for improved intelligence during the initial attack phase, and the information gathered by the District Ranger in the fixed wing aircraft was of great value in making plans for the afternoon and night.

There is no record of any estimate of fire size by 1000 on May 6, nor any estimate of manpower and equipment needs. However, some estimates were obviously made since a control force of 205 people, 16 tractors, and 22 pumpers was assigned to the fire on May 6. A good complement of DNR and cooperator equipment was included.

Beginning at 1600 on May 5 and continuing through the night, organized and coordinated work was performed. The fire was organized into three divisions and equipment and manpower assigned to each.

Local special fire weather forecasts were not obtained, only the regular forecast. The Mio Ranger Station became the Fire Camp with a staging area for equipment located near the intersection of Highway 33 and County Road 604.

Plans apparently were pretty much mental and overhead was briefed on a one to one basis.

All things considered, accomplishments during this phase were good. Quite a bit of burning out to the control lines was necessary during the May 6 day shift. About 15 miles of the 35 miles of final control line were in by 0600 on May 6. The regular forecast for the 6th was considered by the Fire Boss in estimating needs.

Firefighting costs seemed adequately considered. The decision not to establish a camp in the field was a good cost effective decision.

There were delays in getting some material to the fire camp. The Plans Chief stated it took 2½ days to get the Plans kit. Tools from Boise Interagency Fire Cache took from Monday night to Wednesday morning.



Items shipped from the Ely, Minnesota, fire cache spent 15½ hours on the road after being loaded. Ordered personal protective equipment for line workers was not available in Region 9 and the Class II Fire Boss did not find out until late in the afternoon of May 6.

The Prescribe Burn Fire Boss did a competent job during the Reorganization Phase, particularly in view of the problems earlier in the fire. He should have documented his estimates, plans, and actions, and, as previously mentioned, coordination with MDNR and VFD's should have been better.

No serious mistakes were noted during the Reorganization Phase except as noted on the preceding paragraph.

The Fire Boss failed to control the fire during the first burning period due to the long perimeter and the limited amount of equipment available. Although no formal Escaped Fire Situation Analysis was prepared by the initial attack Fire Team, the decision to order equipment and manpower in judicious amounts was a good one. The delay in control time after the first burning period did not appreciably add to either acreage burned, values lost, or cost. The final containment with completed line around the fire was at 1800 hours on May 6. The Mack Lake Fire was declared controlled at 1200 on May 7.

SECTION IV - THIRD PHASE - MAJOR CONTROL AND ORGANIZATIONAL PROBLEMS

The fire Overhead Team arrived at Mio Ranger Station at 0500, Tuesday, May 6, 1980. (Appendix J). The Deputy Forest Supervisor gave Overhead Team initial briefing and turned fire over to Team at 0700. Direct attack that day was possible on nearly all lines due to more favorable fuels and weather (late afternoon showers). Location of the fire was expected to be essentially the same from 0900 Tuesday to control based on line boss scouting by helicopter and weather conditions.

Additional overhead and forces were not required based on the above estimate. This proved correct.

The organization and distribution of overhead, manpower, and equipment at successive time intervals by sectors, divisions, etc., are shown in the shift plans. (Appendix I).

The forces mobilized were sufficient. Excessive sector length, assignment of forces, and lack of radio equipment caused problems on Tuesday, May 6. Out-service personnel expressed concern about the apparent lack of coordination or planning for early Tuesday (0700). No one at the fire site seemed able to assign or coordinate the use of equipment. Some action was undertaken and later in the morning some equipment was released and returned to their dispatch locations. It apparently took some time to assign and utilize equipment.

Scouting was done by line boss, and fire boss with helicopter, District contract patrol plane, four general scouts on foot, and line forces as construction progressed. Scouting was adequate, but minimal.

Fire camp location and adequacy were no problem. Travel time by vehicle from camp to all parts of the fireline were usually not more than 1/2 hour. Camp was close enough to fireline.

All line constructed after 1000 Tuesday held. Tractor-plow lines and roads accomplished control. Plan of attack succeeded.

Crew arrival on line was not a problem. Crew supervision was adequate. The 16-hour limitation was not exceeded. Production was adequate. No problem occurred with specialized equipment, operator skill, or production. Mop-up, patrol, and demobilization were adequate.

Safety measures were adequately applied. No first aid cases, medical aid cases, or lost time accidents occurred from 0700 Tuesday, May 6, to 1030 Friday (one did occur at approximately 1251, May 9, 1980, after overhead team was released).

It is Forest Service direction that the fireline organization will have available to them and wear prescribed personal protective equipment (Forest Service Manual 5135.26, Health and Safety Code 3.3B). Personal protective equipment, however, was not provided to non-Forest Service personnel on the fireline. The Forest did not have enough fire shirts, pants, and shelters available to equip all on-line personnel. The Forest has

invoices showing where personal protective equipment has been ordered from General Services Administration, but back ordered. Personal protective equipment was ordered from the Regional Fire Cache, Ely, Minnesota, on the morning of May 6. It was not until late on May 6 that the Fire Boss and overhead team realized personal protective equipment was not coming. Due to the condition of the fire, weather forecast, and available equipped Forest Service personnel, it was decided by the Fire Boss and Huron-Manistee National Forest to utilize these non-Forest Service people without personal protective equipment. Properly equipped personnel were set up to make initial attack on any breakovers. Personal protective equipment was not ordered from outside the Region.

## SECTION V - LINE OFFICER PARTICIPATION

The Prescribed Burning Fire Boss assumed Fire Boss of escaped fire at initial attack. The Ranger then became active on the fireline as tractor helper for initial attack tractor-pLOW unit. About 1300, the Ranger left the fire for airport. He secured a contract aircraft and became aerial observer. The Forest Supervisor's Office requested assistance of a Class II Overhead Team at 1717, Monday, May 5.

The Forest Supervisor set up a Fire Management Task Force and appointed the White Cloud District Ranger as team coordinator. The line officer or coordinator was available to the Overhead Team at all times and attended the Overhead Team briefings.

There were no major communication problems between line officers and team members. Due to fatality, size of fire, and damages, there was major involvement with the press, public, and other agencies. There was concern by the State Fire Marshall's office that the fatality was not promptly reported to them. It was, however, reported to the State Police which is a department of the Fire Marshall's office.

Overall, the principal line officers involved carried out line responsibility and participated in all fire management activities associated with a fire of this magnitude.

## SECTION VI - PERFORMANCE OF OVERHEAD

All overhead on the Regional Class II Team met National Fire Qualification Standards. There were problems in filling support positions (i.e., tool manager, tractor boss).

All overhead were rated before release (Appendix K).

All teams were kept intact until released.

Inability to fill a few support positions indicates a need for training in how to get the fire overhead staff needed.

Fireline communications were complicated because of lack of an assigned fire frequency. Forest administrative net and fire traffic were on same frequency. The Regional Fire Cache radios were used as backup. The Ottawa National Forest sent radios with its crew. Radios were effectively used.

No actions were needed because of personnel deficiencies.

Past training and experience of overhead team members was reflected in professional manner; all team members carried out their responsibilities. State MDNR people commended the Fire Boss for his cooperative attitude. Plans Chief was especially effective because of recent training.

Crews were housed and fed at local facilities. Crew bosses stayed with crews at all times.

Use of vehicles and aircraft was well controlled after start-up problems were overcome.

## SECTION VII - EFFECT OF SUPPRESSION ACTION ON ENVIRONMENT

The Forest Supervisor appointed the District Ranger, Harrisville, and Region 9 Wildlife Biologist as Resource Advisors. One or the other was available to the Overhead Team at all times.

Rehabilitation plans were being carried out immediately after control. Effects of fire and suppression actions on soil, vegetation, and wildlife were all part of rehabilitation plans (Appendix L).

All strategy sessions included discussions of environmental impacts. Fire line width was not excessive. No felling of snags or trees into streams was noticed. There was no major construction activities. Heavy equipment use will not have adverse effect on environment after rehab is completed. There were no restrictions on use of tractors. No dust problems existed.

## SECTION VIII -- FINDINGS

- A. The "jack pine barrens" have evolved in close association with naturally occurring wild fires. Both the State and Forest Service believe that prescribed fire has been, and can be, an effective management tool in modern forest and wildlife management. With today's knowledge of Kirtland's Warbler habitat use, the loss of prescribed fire as a management tool will probably result in the ultimate extinction of the Kirtland's Warbler.
- B. Personnel and equipment available to assist in the prescribed burning operation were below the planned level at the time of the burn. Failure to calculate the Burning Index prior to ignition, thinking the fire could be controlled even with a forecast of very high fire danger by mid-afternoon, and limited resources were errors in judgment. The critical fuel and weather factors predicted for the afternoon of May 5 placed prescribed burning conditions out of prescription. The prescribed burning unit plan was not fully followed.
- C. The number of spot fires and the difficulty in controlling some of them was an indication of potential problems, but not recognized by the Prescribed Burning Team. Spots 1, 2, and 3 presented no unusual control problems, but the difficulty with controlling spot fire 4 showed the Ignition Component was very high for that time of the day and that control of spot fires was going to become harder as the daily weather extremes approached. The Analysis Team attributes this lack of awareness to the inexperience of the Burning Team with local fuels.
- D. Two of the three prescribed burning plan objectives could have been achieved without prescribed fire. The slash could have been burned in the slash pile created by the Halm Harvester timber processor used on the Crane Lake Sale. A desirable machine planting site would have existed if the logging slash had not been returned to the sale area. The reason for the prescribed burn was the habitat needed by the Kirtland's Warbler.
- E. A tracing of the Burning Index for Fuel Model Q shows fire managers can expect significant management problems in planning spring burns because of pronounced day-to-day changes in the Burning Index. This complicates the manager's decision for picking a day on which to commit equipment and forces to a prescribed burn.
- F. Based on the Manning and Specific Action Guides approved for the Mio Ranger District, the initial attack forces required for May 5 were not on duty. The District manpower and equipment assigned to the prescribed fire had not been fully replaced with back-up forces.
- G. The prescribed burn was started with one of the two planned dozer/plow units present. Attempting to burn with less than two tractor plows on the burn site was taking a risk. The chances of one tractor becoming hung-up, hydraulic lines broken, and/or distance to a spot fire not being close are high. A back-up water unit can knock down a spot, but often cannot hold the fire. A line should be constructed to maintain control. Several spot fires occurring simultaneously will push the control capabilities of one dozer beyond what is required.

H. The knowledge exists to conduct prescribed burns at various times during the fire season. It is not known, however, if the Kirtland's Warbler will use habitat created at different seasons of the year. Research to answer this question has been started, but it takes a minimum of 7 years to find out if the Warbler will occupy the different test sites.

I. Logging slash from the processor piles was scattered on the safe area. The plan was to use the slash to help carry the prescribed burn. The piled slash did not contribute to carrying the fire the same as randomly scattered slash left after logging would have. The slash piles, because of their concentration of fuel and location near to the control lines, did most likely contribute to the spot fires and the escaped fire.

J. Time was not taken to restructure or reorganize for initial attack once an escaped fire situation was recognized; spot fire 7 occurred, attack was immediate, control unsuccessful, the prescribed burn abandoned. The pre-fire briefing did not consider what actions to expect if spot fire control did not succeed. What crews and equipment will respond to an escaped fire and which will stay with the prescribed fire must be planned in advance. An abandoned prescribed fire and/or portions of a line, while control actions are underway on a spot fire, can often result in additional escapes that become a threat to initial attack crews working on the spot fire.

K. The tractor plow and 6x6 were in jeopardy as soon as they began flanking the fire in the heavy jack pine timber. Open line left behind the equipment, expected slip over long distance spotting combined with the very high fire day should have dictated that the equipment retreat to a safe location.

The 6x6 tanker on the fire, had it been patrolling the line in back of the tractor, might have provided an escape valve. It should not have been in the heavy timber. These units can become stranded and if any oak were present the truck could not have continued through and may not have been able to turn.

Fast moving line construction equipment requires that operators use extra caution and always know what the fire is doing behind them. In this situation, the tractor operator did not know what the fire was doing and no provisions were made to keep him informed. If they are unable to do so, then line placement, escape routes, and caution must be the rule. It is no time for an aggressive attack.

L. The Mack Lake Fire started from an escape of the Crane Lake prescribed burn. Other causes were not considered.

M. There were no indications of any drought situation existing at the time of the fire. The winter of 1979-1980 was marked by 25 percent below normal snowfall, April precipitation was 50 percent above normal. The lack of snow early in the winter resulted in frost depths deeper than average. During the week preceding the fire, 0.68" of rain was measured at the Mio Forest Service Ranger Station. Temperatures the week prior

to the fire averaged 8 degrees above normal maximum. The 1400 relative humidities from May 2 to May 4 were 28 percent, 22 percent, and 19 percent. Given the low humidities over the weekend, one could hypothesize that fine fuel moisture was very low on May 5.

N. The placement of the prescribed burning control lines on the east side of the Crane Lake Unit was the result of concern for aesthetics. There appears to have been inadequate consideration of fire behavior and fire control principles in locating the line. The control line used on May 5 wound up where it did because of functional input and functional reviews without any documented evidence of objection from fire managers. The line should not have been placed on a side slope facing the fire area.

O. The joint Michigan Department of Natural Resources/Forest Service Management Plan for the Kirtland's Warbler lists a target of 35,000 acres for regeneration this 10-year period. Neither the State nor the Forest Service has been able to meet this schedule because prescribed burning is dependent on weather conditions over which resource managers have no control. Both agencies feel committed to meeting the goals of the Endangered Species Acts; however, the average number of working days per year that fall within the prescribed burn desirable weather factors is only 12. This finding is based on 9 years of data and excludes working on Saturday and Sunday. It does not consider fuels being too green to burn. The months of May and October, the seasons of cured fuels, average about 2.6 desirable days per year. The days meeting the prescription are not constant from year to year and when they do occur tend to run together.

P. There is some question whether comparison of fire behavior with the 1978 NFDRS Fuel Model indices is meaningful. The surface fires were less severe than predicted by the indices (possibly due to limited fuel consumption). At the other end of the spectrum, the indices are not intended to predict crown fire behavior. Only a small percentage of the Mack Lake fire exhibited behavior between the extremes. The MDNR still uses the 1972 NFDRS for computing their daily Burning Index as they feel it more accurately represents local fuels.

Q. The Mio Ranger District has been using both the Fire Load Index and the Burning Index indices with the C and Q Fuel Models. The Huron National Forest has been instructed to use only the Burning Index effective for the 1980 fire season. This has been done. The transition, however, appears to have caused confusion. The Fire Boss notes that a Burning Index of 39 is predicted for the afternoon of May 5 (Prescribed Burning Unit Plan). The actual predictions are 33 for Fuel Model C and 60 for Fuel Model Q. The prescription calls for a Burning Index of 15-30 for Fuel Model Q. Unit burning plans reviewed and the latest Manning and Specific Action Guide approved for use on the Mio Ranger District are still using Fire Load Index.



R. Based on experience of Mio, it is difficult to maintain individuals who are trained/experienced in wildfire suppression and who also have local experience in prescribed burning. The District has seen a complete turn over in Staff (except District Clerk) in about 3 years. Wildfire suppression and prescribed burning are similar but different as are the fuels encountered by Forest Service personnel. A person skilled in fire suppression and a particular fuel is not necessarily skilled in prescribed burning and different fuels.

SECTION IX - DISCUSSION AND RECOMMENDATIONS TO REGIONAL FORESTER

A. Improved formal guidelines for Kirtland's Warbler habitat need to be written. Such guidelines should more closely fix the range of burning parameters to safely accomplish the habitat management objectives.

B. Prescribed burning unit plans need to follow NEMA direction by being planned on the ground by an interdisciplinary team consisting of resource specialists and fire managers.

C. The 6x6 1,000-gallon tanker used by the Mio Ranger District is a piece of fire suppression equipment new to the Huron-Manistee National Forests. A review of its use as an initial attack vehicle on the Mack Lake fire shows a need for the Forest to develop standard operating procedures for 6x6 tanker use on fires both alone and in conjunction with other fire equipment and crews.

D. Region Nine Interim Directive No. 1 (11/14/78 extended to 12/15/80) states that burning a unit in the morning, before daytime temperatures have dictated wind patterns, humidity and fuel moisture for the day, can sometimes become a problem. If burning is to start prior to the mid-afternoon highs and lows, (1) an individual with no other conflicting duties needs to be present on-site to periodically measure weather changes; (2) the burning units must be laid out so that burning can be stopped and secured with minimum notice; and (3) the afternoon as well as morning burning parameters must be within the desirable ranges listed in the burning plan.

E. Work with Lake States' Department of Natural Resources in an expanded fire prevention program to provide information to home owners on the potential for fire damage, how to locate and landscape their homes to prevent loss and who they may call upon for fire protection in the event of fire.

F. Build into Forest Land Management Plan a program for creating fuel breaks composed of stands of less flammable hardwoods. These stands should be large enough to have some effect in slowing or stopping a wild fire and to be managed for the production of timber, wildlife, and other forest products.

G. Existing evidence and observation leads wildlife managers to believe the Kirtland's Warblers' critical habitat is dependent on fire. Unless it is demonstrated that productive nesting habitat can consistently be developed without the use of fire, organizations, agencies, and individuals, using Public Law 93-205 will pressure managers to use fire for survival of the Kirtland's Warbler. Research is needed to (1) answer the question on the need for fire to create usable habitat and (2) search for alternatives to fire that are usable by the manager, acceptable to the public, and usable by the Warbler. Independent but associated Kirtland's Warbler research efforts on habitat, soil, vegetation, fire, etc., now underway within the Forest Service need to be better coordinated and tied together.

H. Provisions need to be made to better coordinate Forest Service and MDNR Program Development and Budgeting, Annual Budgeting and Program Attainment Systems to handle major adjustments in short range schedule changes for prescribed burning. During any 10-year period, only 2 to 3 years might exist where significant acreages can be prescribed burned. When the burning conditions occur the money and forces need to be made available to take advantage of these conditions.

I. The use of two NFDR systems within the same fuel types may represent a barrier to coordination of fire and fuel management. A comparison should be made to determine the comparability of the two NFDRS systems and a conversion system prepared.

J. Given the possible confusion associated with keeping track of both the BI and FLI indices for two fuel models, it is recommended that the Forest go as quickly as possible to the use of only one index as the basis for the variety of fire decisions that have to be made.

K. Coordination between the Forest Service and MDNR should be expanded. The areas of expansion should include, but not be limited to the following:

1. Joint planning for fire management and prescribed burning.
2. An exchange of prescribe burning techniques;
3. Share forces and equipment on prescribed burns;
4. A direct telephone line or radio link between MDNR and Forest Service units in the same town;
5. Use of the concept of dispatching the closest forces available for initial attack.
6. Integration of FS/MDNR overhead teams and equipment in fire management.

L. The Huron-Manistee National Forests needs to clarify the Forests' interpretation of the Cooperative Agreements with the 50 or so VFD's. Should the people on these VFD's report to the fire fully equipped with Forest Service prescribed personal protective equipment? Who should purchase the personal protective equipment, if needed? If not legally needed for initial attack, does the Forest Service have a moral or legal responsibility to provide such equipment to these people during the later phases of a fire?

M. There is a general need for the Forest to fully utilize its upgraded radio system and a specific need to be able to adapt quickly to a tactical radio frequency for a large fire situation. The Forest needs to develop an operating procedure for use of its new 4-channel radios and old 2-channel radios being used by the VFD's.

Between the various firefighting and law enforcement organizations in Michigan, there exist several good radio systems. There needs to be one common frequency for all to use during emergency and disaster situations. The Forest Service, MDNR, VFD's, and Fire Marshall should be a part of the system.

N. The Huron-Manistee National Forests needs to improve their ability to organize, mobilize, and act in the event of a project fire or simultaneous small fires. We suggest they look at the following:

*Revised*

1. The use of a central Forest dispatcher;
2. The development of a preplanned dispatch system;
3. State agency dispatching of cooperators through the MDNR and/or State Fire Marshall;
4. Use of the National Interagency Fire Organization for ordering equipment and supplies as well as providing red carded people for overhead positions;
5. Making written procedural outlines for Mobilization Plan on how to coordinate actions such as reporting fatalities, getting private homes evacuated, requesting law enforcement help, early recognition of a large fire situation and others identified by the Forest.

O. It is the recommendation of this Analysis Team that future prescribed burns be conducted by a team of specialists not only trained in fire suppression but experienced in local fuels and trained in prescribed burning techniques, fire development, control line placement, crew and equipment needs, and other related activities. The possibility of joint development of such a team by the FS/MDNR should be explored.

P. Equipment operators using tractor plows and the armored 6x6 pumper tankers must receive specific training in tactics employed with their use. It must be understood that these units can often move faster than a relatively fast moving fire. This will cause the operator to be placed near the head and into spotting areas, and possibly even begin to turn into the front of the head of the fire. This is particularly true of 6x6's and the 450 class tractor plow. These units can maneuver through dense jack pine stands; extreme care must be used in selecting line placement. Escape routes must always be planned. No open line can be allowed. Line spotting must be secured, line patrol obtained, and/or direct control of units by aircraft maintained.

SECTION X - APPENDIX

- A. Crane Lake Prescribed Burning Unit Plan
- B. Fire Weather Special Forecast Request - 5/5/80
- C. Statement Concerning Fire Weather Forecasts
- D. Fire Weather Station Inventory and Inspection Report
- E. Cold Front Passage
- F. NFDRS Definitions
- G. Mio Ranger District Manning and Specific Action Guide
- H. Michigan Department of Labor Occupational Safety Standards Commission  
Safety Standards - Part 74. Fire Fighting
- I. Mack Lake Shift Plans - May 6 to 9, 1980
- J. Mack Lake Overhead Organization Chart
- K. Fire Overhead Performance Ratings
- L. Rehabilitation Plan for Mack Lake Fire

# Fire Analysis Notes

P. 43 - M+SAG + Appendix G

Total manpower called for is closer to 20 than 42. The figure 42 is the total of 6 Class 7<sup>(5)</sup> days/yr. multiplied by 7 mandays. Two pages of M+SAG's are identical - the page w/o budgeted days should be discarded.

VFD'S should not be counted as standby crews

## Findings

B. Level was probably OK if prescribed parameters were not exceeded.

F. Partially correct.

## Recommendations

SECTION X - APPENDIX

- A. Crane Lake Prescribed Burning Unit Plan
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USDA - Forest Service <b>PRESCRIBED BURNING UNIT PLAN</b> (Instructions in R-9 FSM 5152.23)	Burning Unit	Acres
	Crane Lake	210
	F.Y. 79	Planned Burning Month October - May
	Forest Huron	District Mio
Location: Section 12 Township 26N Range 2E	Comp. No.	
Est. Cost Fund Acct: PEM	IV 3150	Other

Objectives:

- a.  Fuel reduction
- b.  Hazard reduction
- c.  Insect & disease
- d.  Site preparation
- e.  Range improvement
- f.  Cover type conversion
- g.  Wildlife habitat
- h.  Other (explain)

Specific Objectives To 1) prepare the site for machine planting and 2) to provide for the future growth of the plant associations favorable to the endangered Kirtlands Warbler.

Type of Burn Needed to Meet Objective All portions of the area should be burned leaving only the heavier fuels unburned (sticks over 1" in diam.).

Area Description:

- a. Overstory (type, size, density) The area was cut over in early 1978
- b. Understory (type, density, average height) A few small jackpine remain - wiregrass
- c. Fuels (type, density, arrangement) Logging was very complete leaving only scattered clusters of logging slash as fuel. Most of the area is free of slash.
- d. Soil type Grayling Sand
- e. Topography Rolling but not precipitous.
- f. History of area Old growth jackpine harvested 1977-78

Desirable Preburning Weather Factors:

- a. Air temperature 45° ±
  - b. Wind direction W
  - c. Days since measurable rain 2-5
  - d. Special weather forecast needed? Yes
- Relative Humidity 25-50%  
 Velocity 5-10  
 Fuel sticks 9-15 (B2-15-3)  
 Model Q

Publicity and I&E Steps Needed Article in Oscoda Co. Paper would be desirable. Adjacent landowners to be contacted.

Preparation of Area for Burning:

- a. Line to construct (kind and chains) Single plow furrow around perimeter
- b. Existing natural or existing line (kind and chains) M-33 - 2 chains FR-4467 30 chains
- c. Snag felling necessary? No If so, where and how far from line? There are a few along the cage but most were eliminated in the harvesting operation.



Firing:

- a. Starting time 0. daymid afternoon Hours to complete 3 to 5
- b. Method(s) of firing See attached map. Prepare backfire against wind and head  
fire across when save burned out zone is provided.

Detection Needs for Spots and Breakovers Utilize aircraft & observer to locate spots.

Crew Organization:		11. Water Supply Source
a. Crew size		Ranger Station in Mio
b. Overhead organization (by name):		
Fire Boss <u>Ranger (or delegated)</u>		
Sector Bosses		
Crew Bosses <u>YACC crews w/hand tools</u>		
Firing Boss <u>Forester WL Technician</u>		12. Communication Needs:
Pumper Boss <u>Sale Prep Tech Sale Adm Tech</u>		a. Mobile radios <u>5</u>
Tractor <del>Tank</del> Boss <u>(2) Fire Tech TSI Tech</u>		b. Portables <u>7</u>

Equipment Needed (How many?):

a. <u>Dozer</u>	e. <u>Stake trucks</u>	i. <u>Drip torches</u>
b. <u>Tractor/plow</u>	f. <u>Power saws</u>	j. <u>Fuel</u>
c. <u>Tanker wagon &amp; pumps</u>	g. <u>Portable pumps</u>	k. <u>Other</u>
d. <u>Slip-on tankers</u>	h. <u>Hose (size <u>      </u>)</u>	

Special Precautions to Prevent Fire Escaping to Private or Other Lands  
Tractor & plow to follow each torchman along the line to put furrow around spots.  
YACC crews with hand tools to be 100' outside lines to look for spot fires.

Suppression Plan if Fire Escapes Direct attack - 2 tractors & power wagon - YACC  
crews to be diverted if needed.

Patrol and Mopup Plan Powerwagon Crew to remain until dark. Patrol following day  
plus map up.

Correlation with Research or Other Agencies DNR in Mio to be informed. Also Sheriff  
State Police. Traffic control on M-33 may be necessary when smoke is close to the  
highway.

Erosion Control Measures Needed After Burn None

Multiple Use Coordination Check (initials):		20. Special evaluation or analysis for Wildlife (soils, wildlife, etc.) needed <input type="checkbox"/> before <input checked="" type="checkbox"/> after: <input type="checkbox"/> during prescribed burn.
Engineering <u>RD</u> <u>SO</u>	Timber Mgt. <u>RD</u> <u>SO</u>	
Fire <u>      </u> <u>      </u>	Watershed <u>      </u> <u>      </u>	
Lands (forage) <u>      </u> <u>      </u>	Wildlife <u>      </u> <u>      </u>	
Lands (usage) <u>      </u> <u>      </u>		

Prepared by	Signature and Title	Date
Approved by District Ranger	<u>James H. Rogers</u>	<u>6/20/78</u>
Reviewed by Fire Control Staff Officer	<u>[Signature]</u>	<u>6/21/78</u>
Approved by Forest Supervisor	<u>[Signature]</u>	<u>6/21/78</u>

22. "Prior to Burn" Checklist:

a. Day Before:

- Weather forecast favorable \_\_\_\_\_
- Necessary lines constructed \_\_\_\_\_
- Adjoining landowners notified \_\_\_\_\_
- I&E work finished \_\_\_\_\_
- Cooperators notified \_\_\_\_\_
- Crews notified \_\_\_\_\_
- Equipment ready \_\_\_\_\_
- Camera available \_\_\_\_\_

b. Day of Burn:

Pertinent crew-briefing points \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

23. Summary and Evaluation Immediately after Burn:

- a. Date burned \_\_\_\_\_ Time set \_\_\_\_\_
- b. Rain - \_\_\_\_\_ days since \_\_\_\_\_ inches of rain.
- c. Acres burned \_\_\_\_\_ d. Cost \_\_\_\_\_
- e. Person in charge \_\_\_\_\_

f. Weather factors:	At start	During Burn
Wind direction and velocity _____		
Wind behavior _____		
Temperature (dry bulb) _____		
Relative humidity _____		
BUI _____		
SI _____		

Rate of spread average during major part of burn ft/min.  
 Back Fire \_\_\_\_\_ Head Fire \_\_\_\_\_

- g. The objective  was  was not  was partially met because (also include unusual conditions, such as spotting, fire whirls and etc.) \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

24. Attach special evaluations or analyses made before or after burn.

Evaluated by (signature and title) \_\_\_\_\_ Date \_\_\_\_\_

25. Evaluation and Recommendations after One Year:

The objective  was  was not met because \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Examined by (signature and title) \_\_\_\_\_ Date \_\_\_\_\_

"Prior to Burn" Checklist:

a. Day Before:

Weather forecast favorable UNTIL NOON, UNFAVORABLE AFTER 1200Z 15 APR  
 Necessary lines constructed YES, PREVIOUSLY  
 Adjoining landowners notified YES, TOM BATES  
 I&E work finished YES, NEWS RELEASE, ATTACHED CLIPPING, ALSO LIST OF RAINING STATES  
 Cooperators notified YES, LIST ATTACHED  
 Crews notified YES  
 Equipment ready YES  
 Camera available YES

b. Day of Burn:

Pertinent crew-briefing points SLASH ALONG SOUTH TIP.

3. Summary and Evaluation Immediately after Burn:

a. Date burned 5/5/83 Time set 1015 HRS  
 b. Rain - 4 days since .7 inches of rain  
 c. Acres burned 5 days 131 inches of rain  
 d. Cost \_\_\_\_\_  
 e. Person in charge TOM BATES

f. Weather factors:

	At start	During Burn
Wind direction and velocity	<u>W @ 10 MPH</u>	
Wind behavior	<u>STEADY 6-10 MPH</u>	
Temperature (dry bulb)	<u>74°F</u>	
Relative humidity	<u>37%</u>	
<u>WT 81</u>	<u>28/58</u>	<u>39 @ 1400HRS</u>
<u>ST FUEL STICKS 16 @ 9:00 AM</u>		<u>11 @ 1400HRS</u>

Rate of spread average during major part of burn ft/min.

Back Fire \_\_\_\_\_ Head Fire \_\_\_\_\_

g. The objective  was  was not  was partially met because (also include unusual conditions, such as spotting, fire whirls and etc.)

4. Attach special evaluations or analyses made before or after burn.

Evaluated by (signature and title)

Date

5. Evaluation and Recommendations after One Year:

The objective  was  was not met because

Examined by (signature and title)

Date

Pvt.

4457E

4168A

4457

4168



2

11

WIND DIRECTION

11-35

4150  
Department Valley Road

T25N R2E SEC 12  
↑ North

LEGEND

H Fire Boss Hqtrs.

W Water Source

----- Burning Unit Boundary

① Firing Order

————— Flow Line

② → → → → Direction of Firing

-X-X- Disc Line

Wind → Wind Direction

-O-O- Dozer Line

↔ A ↔ Sectors

Acres to Burn 210

Use standard map legends for other features.

Scale: 4 Inches = 1 Miles

Date prepared 6/16/75 Initials SR



WS FORM D-1  
12-711  
Pres. By WSOM D-41

# FIRE WEATHER (SPECIAL FORECAST) REQUEST

(See reverse for instructions)

### REQUESTING AGENCY WILL FURNISH:

1. NAME OF FIRE OR OTHER PROJECT  
**CRANK LAKE**

2. CONTROL AGENCY  
**U.S.F.S.**

3. REQUEST MADE  
TIME: ~~200~~ **1000** DATE: **5/5/80**

4. LOCATION (By 1/4 Sec - Sec - Twp - Range)  
**1/2 SEC 12 T25N R2E**

5. DRAINAGE NAME  
**N/A**

6. EXPOSURE (N, E, SE, etc.)

7. SIZE OF PROJECT (Acres)\*  
**200**

8. ELEVATION\*  
TOP **1200** BOTTOM **1150**

9. FUEL TYPE  
**Grass & light slash**

10. PROJECT ON:  
 GROUND  
 CROWNING

### 11. WEATHER CONDITIONS AT PROJECT OR FROM NEARBY STATIONS (See example on reverse)

PLACE	ELEVATION	OB TIME	WIND DIR-VEL.	TEMP.		H (Lv. Blank)		REMARKS (Indicate rain, thunderstorms, etc. Also wind condition and 10ths of cloud cover.)
				DRY	WET	RH	DP	
<b>2029002 11/2</b>	<b>1050'</b>	<b>0800</b>	<b>W / 11</b>	<b>55</b>	<b>50</b>			<b>dry light - mod. slash 1/2</b>

12. SEND FORECAST TO: PLACE **Ann Arbor**

VIA **Telephone**

ATTN: (Name, if applicable)

11 - FIRE WEATHER FORECASTER WILL FURNISH: TIME AND DATE: **0900 5/5/80**

### 13. FORECAST AND OUTLOOK

Winds SW-W 6-10 Temp 64 at 1000  
 35% humidity 20% clouds cov. w/ cumulus  
 1200-1400 SW-W 10-15 mph gusts 20  
 Temp. 72-76 humidity 23% cloud cov 30-40  
 Weak C front mov. SE from U.P. expected  
 to move thru area between 3-5 p.m.  
 Wind shift W-NW 10-15 mph gusts 20  
 30% chance of thunder storm  
 Max Temp 82° Min Hum. 18-23

Wind at 1000' W at 15-25 mph

NAME OF FIRE WEATHER FORECASTER  
**Cathy Roberts**

FIRE WEATHER OFFICE  
**Ann Arbor**

### III - REQUESTING AGENCY WILL COMPLETE UPON RECEIPT OF FORECAST

IV. FORECAST RECEIVED: TIME **0900** DATE **5/5** NAME **[Signature]**

- Use 24-hour clock to indicate time. Example: 10:15 p.m. = 2215; 10:15 a.m. = 1015.
- For concentrations (as groups of lightning fires) specify "Concentration"; then give number of fires and size of largest. If concentrations are in more than one drainage, request special forecast for each drainage.
- No entry necessary. To be computed by the Fire Weather Forecaster.

APPENDIX C

The fire weather forecasts for the Mio area are issued by the National Weather Service (NWS) in Ann Arbor, Michigan. The fire weather forecaster assumed his duties April 15, 1980, after NWS transferred this responsibility from the Houghton Lake, NWS Office. He is in his mid-50's, and has worked in the field of meteorology for about 34 years, mostly in this region. He spent 15 years as a forecaster in the Detroit-Ann Arbor State Forecast Office.

We asked for two evaluations of his work, the first by John Bruger, Meteorologist-in-charge of the Houghton Lake Office and former fire weather forecaster for the area. He states that Falkowski is a good weather forecaster. He volunteered for the weather forecaster position at Ann Arbor because of interest, and he approached his responsibilities with enthusiasm. He also stated that Falkowski has already collected the necessary background information on the weather events occurring during the Mack Lake Fire and intends to do a documented report on it.

The Michigan DNR works closely with Falkowski. State MDNR Officials state that their people report favorably on his abilities, attitudes, and forecasts.

FIRE-WEATHER STATION INVENTORY AND INSPECTION REPORT

APPENDIX D

State <i>Michigan</i>	County <i>Oscoda</i>	Agency <i>H-m NF</i>	Unit <i>1710</i>	Station Number <i>202902</i>
Station Name <i>M10 R.D.</i>		Lat/Long <i>45° 39' E / 84° 7' 47"</i>	Elevation <i>1050</i>	Slope <i>1</i>
Site Class <i>3</i>	Herb. Veg. <i>NP</i>	Fuel Model(s) <i>C, Q, K</i>	Obs. Time <i>1300</i>	

Station Manager	Name and Title <i>RAND Parlovich</i>	Telephone - FTS Comm.
	Office Address <i>M10 R.D., M10, MICH</i>	

Prin. Obs.	Name and Title <i>Same as above</i>	Telephone - FTS Comm.
	Office Address	

Principal Observer	Received Fire Weather Observer Training	YES	NO
	Received NFDRS Training	✓	
	Understands NFDRS Indexes & Components	✓	
	Has Current NFDRS Manual	✓	
	Has Fire-Weather Observers' Handbook	✓	

Other Observers' Names  
*Pam Wolf, Ruth Kling*

Days of Possible Fire-Weather Observations 2 Days Observations Missed 0

Instruments Owned by: USFS  USWB  Other \_\_\_\_\_

Date Station Last Inspected 4/80 By (Name & Title) Tom BATES/FART

Station Condition: Improved  Deteriorated  Unchanged

(Use Remarks Section to explain Station condition)

Instrument Shelter	Cotton Region <input checked="" type="checkbox"/> Region 6 <input type="checkbox"/> Other <input type="checkbox"/>	YES	NO
	Door opens to north	✓	
	Painted glossy white--inside and out		✓
	Dust free--inside and out	✓	
	Houses temperature sensitive instruments only	✓	
	Firmly mounted, level, and plumb	✓	
	Floor 48" above ground	✓	
	Ground cover: Grass <input checked="" type="checkbox"/> Other <input type="checkbox"/>	YES	NO
Exposed to direct sunlight from 0700-1700	✓		

Psychrometer	Electric Fan <input checked="" type="checkbox"/> Sling <input type="checkbox"/> Mortar Board <input type="checkbox"/> Other <input type="checkbox"/>	YES	NO
	Thermometers clean	✓	
	Columns unseparated	✓	
	Wet bulb uncalcified	✓	
	Markings legible	✓	
	Wicking clean	✓	
	Fan working	✓	
	Battery fresh	✓	
	Mortar board level and plumb	N/A	
	Reservoir water clean	✓	

Max/Min Thermometer	B Type <input type="checkbox"/> U-Type <input type="checkbox"/> Other <input type="checkbox"/>	YES	NO
	Thermometers clean		
	Columns unseparated		
	Markings legible		
	Townsend support spins easily		

*NOT BEING USED*



		YES	NO
TELEGRAPH	Belfort <input checked="" type="checkbox"/> Friez <input type="checkbox"/> Weather Measure <input type="checkbox"/> Other <input type="checkbox"/>	/	/
	Temperature calibrated daily	/	/
	Relative humidity calibrated daily	/	/
	Sensing hairs cleaned regularly	/	/
	Pens indicate same time	/	/
HYGRO	Sensing hairs intact	/	/
	Dust free	/	/
	Clock keeping accurate time	/	/
		YES	NO
RAIN GAGE	8 inch <input checked="" type="checkbox"/> 4 inch <input type="checkbox"/> Recording <input type="checkbox"/> Wedge <input type="checkbox"/> Other <input type="checkbox"/>	/	/
	Level and plumb	/	/
	Securely mounted	/	/
	Measuring stick legible	/	/
	45° clearance around gage	/	/
		YES	NO
FUEL MOISTURE STICKS	Fence adequate	/	/
	Duff bed 3' x 3' x 2"	/	/
	Duff bed weed free	/	/
	Exposed 10" above duff	/	/
	Hook pointed north, brads down	/	/
Sticks changed every _____ months	/	/	
		YES	NO
WEIGHING DEVICE	Triple Beam <input type="checkbox"/> Appalachian <input checked="" type="checkbox"/> Other <input type="checkbox"/>	/	/
	Dust free	/	/
	Calibration checked regularly	/	/
	Scale shelter: W/Window <input type="checkbox"/> Appalachian <input type="checkbox"/> Other <input checked="" type="checkbox"/>	/	/
Shelter level and secure	/	/	
		YES	NO
ANEMOMETER	Stewart <input checked="" type="checkbox"/> Forester <input type="checkbox"/> Friez <input type="checkbox"/> Other <input type="checkbox"/>	/	/
	Age of anemometer _____ years	/	/
	Exposed correctly	/	/
	Tower plumb and stable	/	/
	Serviced at least twice annually	/	/
	Date last serviced <u>4/80</u>	/	/
Counter/Timer operating well	/	/	
Counter/Timer checked regularly	/	/	
Date last calibrated <u>4/80</u>	/	/	

REMARKS - Explain all boxes checked "NO"

ANEMOMETER TEST SPEEDS  $\frac{20}{19.0}$   $\frac{15}{14.5}$   $\frac{10}{9.5}$   $\frac{5}{5.0}$  acceptable

STEWART

ANEMOMETER SERVICED ANNUALLY.

SHELTER NEEDS SCRAPING and painting

Recommend installing MAX/MIN Thermometer

Hygro RH arm should be replaced

TEST SPEEDS  $\frac{14}{13}$   $\frac{10}{9.0}$   $\frac{5}{4.5}$

BACKUP ANEMOMETER FORESTER [9x145]

Inspected by: Name/Title <i>John J. Suet / Meteorological Technician</i>	Date: <i>4-3-80</i>
Rec'd by: Name/Title <i>Barbara J. Paulson / District Clerk</i>	Date: <i>4/3/80</i>

DUFF bed needs more duff.

Tall bed fixed 4/2/80 by TB.





## APPENDIX F

### Fuel Model Q

Upland Alaskan black spruce. Stands are dense but have frequent openings filled with usually inflammable shrub species. The forest floor is a deep layer of moss and lichens, but there is some needle litter and small-diameter branchwood. The branches are persistent on the trees, and ground fires easily reach into the tree crowns. This fuel model may be useful for jack pine stands in the Lake States. Ground fires are typically slow spreading, but a dangerous crowning potential exists. Users should be alert to such events and note those levels of SC and BI when crowning occurs.

### Fuel Model C

Open pine stands. Perennial grasses and forbs are the primary ground fuel but there is enough needle litter and branchwood present to contribute significantly to the fuel loading. Some brush and shrubs may be present but they are of little consequence. Situations covered by Fuel Model C are open, long leaf, slash, ponderosa, Jeffrey, and sugar pine stands. Some pinyon-juniper stands may qualify.

### Spread Component (SC)

Rate of spread of fire - chains/hr.

### Energy Release Component (ERC)

Heat produced by fire - 25 times BTU/sec./sq. ft.

### Ignition Component (IC)

Probability of ignition - relative scale 0 to 100

### Burning Index (BI)

Control difficulty - 10 times flame length in ft. at head



MANNING AND SPECIFIC ACTION GUIDE

FSM 5122.24

1/ Activity (Check One) Prevention Detection <input checked="" type="checkbox"/> Initial Attack	2/ District		3/ Action Needed		4/ Adj. Level		5/ Man Days		6/ Completed		7/ Total		8/ Fuel Mod		9/ Year		
	Estab. Season	Occur. Season	L	M	H	H	VH	VH	EXT	A.	B.	MAN DAYS	FLIGHT DAYS	EQUIP DAYS	C	Q	79
F.L.I.	A. 10/1-10/30	B. 3/16-11/15	0-5	6-10	11-16	17-21	22-26	27-31	32+	172	60	5					
Manning Class			1	2	3	4	5	6	7	92	59						
Ave. No. Days			85	74	40	24	11	5	6	33	33						
Two men with 6x6 Tanker at Mio (5-2)					2	2	2	2	2								
Two men with tractor/plow at Mio (5-4, T-5-4)						2	2	2	2								
Three men in Luzerne Area or Luzerne V.F.D. (5-3)																	
Patrol with Three men in Mack Lake Area (5-5)							3	3	3								
Co-operator w/tractor & plow with F.S.								1	1								
Radio and Tractor foreman in Mio																	
Mack Lake V.F.D. and 190 gal. s.o.t. on stand by								2	2								
Mack-Lake-on Standby																	
6/ Completed: . . .					80	96	77	65	78	496	229						
7/ Total Man Days																	

3/ Activity (Check One) <input type="checkbox"/> Prevention <input type="checkbox"/> Detection <input checked="" type="checkbox"/> Initial Attack	2/ District Huron										Fuel Mod		Year
	L	M	H	H	VH	VH	EXT	A.	B.	C	Q	79	
3/ Action Needed  MANPOWER AND EQUIPMENT PLACEMENT	Estab. Season A. 10/1-10/30 4/1-8/15										5/ MAN DAYS FLIGHT DAYS EQUIP DAYS		
	Occur. Season B. 3/16-11/15												
	0-5	6-10	11-16	17-21	22-26	27-31	32+						
4/ Adj. Level	1	2	3	4	5	6	7	8	9				
F.L.I.	85	74	40	24	11	5	6						
Manning Class													
Ave. No. Days													
Two men with 6x6 Tanker at Mio (5-2)			2	2	2	2	2					320	
Two men with tractor/plow at Mio (5-4, T-5-4)				2	2	2	2					172	
Three men in Luzerne Area or Luzerne V.F.D. (5-3)								3	3			72	
Patrol with three men in Mack Lake Area (5-5)					3	3	3					66	
Co-operator w/tractor & plow with F.S.								1	1			22	
Radio and Tractor foreman in Mio													
Mack Lake V.F.D. and 190 gal. s.o.t.								2	2			44	
Mack Lake on Standby													
6/ Completed:	148	160	168	143	65	78						762	
Revised:													





4 Pages

**DEPARTMENT OF LABOR  
OCCUPATIONAL SAFETY STANDARDS COMMISSION  
SAFETY STANDARDS**

Filed with the Secretary of State on

These rules take effect 15 days after filing with the Secretary of State

NOV 18 1977

(By authority conferred on the occupational safety standards commission by sections 16 and 21 of Act No. 154 of the Public Acts of 1974, as amended, being §§408.1016 and 408.1021 of the Michigan Compiled Laws)

**PART 74. FIRE FIGHTING**

**R 408.17401. Scope.**

**Rule 7401.** This part prescribes rules for training; for the construction, care, and use of equipment; and for the safeguards to be furnished and maintained as it relates to municipal fire service personnel and equipment. The occupation can be permanent or part time; for pay or volunteer status.

(6) "Turnout" means the outer garments worn by fire service personnel for personal protection.

(7) "Volunteer" means a person permitted to work and is trained as a member of an organized fire department.

**R 408.17411. Duties of employer.**

**Rule 7411.** An employer shall:

- (a) Provide training to an employee as prescribed in standards promulgated under Act No. 291 of the Public Acts of 1966, being §29.361 of the Michigan Compiled Laws, which is provided by the Michigan Fire Fighters Training Council, or its equivalent training, as to the hazards and safe practices of the assigned job.
- (b) Assure that the prospective fire service personnel are physically fit and have the ability to perform assigned fire fighting duties.
- (c) Assure that job required equipment and tools are maintained in a manner free of recognized defects which would cause an injury.
- (d) Develop a basic procedure covering the treatment and transport of injured employees from the emergency scene to a medical facility.

**R 408.17402. Applicability.**

**Rule 7402.** A person functioning as a fire fighter and posed to hazards of a structural fire shall comply with this part.

**R 408.17403. Definitions F to L.**

**Rule 7403.** (1) "Fire apparatus" means mobile fire fighting equipment such as, but not limited to, a pumper, an aerial ladder truck, a tanker, or any other similar equipment whose primary use is for fire suppression or rescue. A vehicle not designed, equipped, or utilized for emergency fire fighting is not fire apparatus.

(2) "Fire house" means a structure in which fire service equipment is housed and employees may be quartered.

(3) "Fire service personnel" means all employees engaged in fire suppression, fire inspection, fire investigation, or subjected to the hazards at an emergency scene.

(4) "Ladder pipe" means a large capacity water delivery device attached to an aerial ladder.

(5) "Lower control station" means that work station where the operator of apparatus with an elevating platform is stationed.

**R 408.17404. Definitions O to V.**

**Rule 7404.** (1) "Operator's control station" means that work station where the operator of apparatus, such as an aerial ladder or pumper, is stationed.

(2) "Platform control station" means that work station where the rider of an elevating platform is stationed.

(3) "Roof ladder" means a ladder equipped with folding hooks. These hooks provide a means of anchoring the ladder to the roof ridge or other roof part.

(4) "Stay poles", sometimes called tormenters, means poles attached to the rails of long extension ladders to aid in the raising and supporting of the ladder.

(5) "Structural fire" means any fire other than a vegetative cover fire.

**R 408.17412. Duties of employee.**

**Rule 7412.** An employee shall:

- (a) Use personal protective equipment as prescribed by this part.
- (b) Report defective equipment, tools, and hazardous conditions to a supervisor.
- (c) Not remove safeguards from equipment except when necessary to service. The safeguard or equivalent shall be replaced before returning the equipment to operation.
- (d) Not use equipment and tools unless trained in their use and authorized to do so.

**R 408.17415. Slide pole obstructions and mat; emergency lighting system; switches and electrical equipment subject to hazards created by moisture; sleeping quarters.**

**Rule 7415.** (1) The area within 3 feet of the slide pole on all sides shall be maintained free of any obstruction. A floor to ceiling wall shall not be construed to be an obstruction.

(2) It is recommended that a cushioned mat, not less than 3 feet in diameter be located around the base of the slide pole at all times.

(3) The dormitory and any means of egress from the dormitory, apparatus bay, and aiseways shall be equipped with an emergency lighting system which shall be automatically activated in case of power failure. The system may be operated by battery or generator.

(4) Switches and electrical equipment located in the shower room or other areas subject to hazards created by moisture shall be weatherproof or removed to an area not hazardous.

(5) All sleeping quarters shall be equipped with a smoke detection device.

### CONSTRUCTION AND USE OF EQUIPMENT

#### R 409.17421. Fire apparatus, generally.

**Rule 7421.** (1) Fire apparatus shall have a braking capability to stop within 30 feet after application of the brakes at 20 miles per hour.

- (2) Fire apparatus shall be equipped with:
  - (a) Windshield wipers.
  - (b) Head, tail, stop, and backup lights and a backup alarm.
  - (c) Horn and siren.
  - (d) Slip resistant steps, tailboard, and work platforms.
  - (e) Seat belts for all seated employees and a restraining device such as, but not limited to, a grab bar, arm loop, back bar, or web strap for all other employees. The safety belt or restraining device shall be used when the apparatus is in motion.

(3) New fire apparatus purchased after the effective date of this part shall be as prescribed in NFPA standard 1901-1975, Automotive Fire Apparatus, which is incorporated herein by reference and may be inspected at the Lansing office of the Michigan Department of Labor. This standard may be purchased at a cost of \$4.00 from the National Fire Protection Association, 470 Atlantic Avenue, Boston, Massachusetts 02210, or the Michigan Department of Labor, State Secondary Complex, 7150 Harris Drive, Box 30015, Lansing 48909.

(4) Fire apparatus using a tillerman or other employees riding on the apparatus remote from the cab shall be equipped with a voice communication or audible signal system at each location of an operating employee. When the audible system is used, the following signals shall be in effect:

- (a) One long blast means stop.
- (b) Two short blasts means forward.
- (c) Three short blasts means reverse.

(5) An operator of fire apparatus shall not move the equipment when his vision is obstructed, except on instructions of a designated signalman.

(6) A minimum distance of 10 feet from energized equipment or high voltage transmission lines, as distinguished from low voltage secondary lines, and series street light construction, shall be maintained when using fire apparatus with elevating platforms, aerial ladders, or snorkels. Training of fire service personnel shall include development of the ability to recognize and identify primary, high voltage transmission lines and series street lighting construction.

#### R 408.17422. Fire apparatus tires.

**Rule 7422.** (1) Fire apparatus tires shall be inspected inside and out not less than every 5 years.

- (2) A tire shall be replaced if 1 of the following occurs:
  - (a) The average tread depth is worn to 5/32 of an inch or less.

(b) The tread depth at any 1 location is 2/32 of an inch or less.

(c) A cut or crack exposes the cord fabric.

(3) A replacement tire shall meet or exceed the standards of the original tire furnished with the equipment.

#### R 408.17423. Fire apparatus with elevating platform.

**Rule 7423.** (1) When an elevating platform is used parking brakes shall be set, and stabilizing jacks or outriggers shall be used. Ground plates shall be used under the jack or outrigger when needed.

(2) An instructional information plate, clearly visible to the operator, shall be located at the operator's control station, the platform control station, and contain the following information:

- (a) Rated capacity of the platform.
- (b) Operating controls identified for motion.
- (c) Cautions or restrictions of operation.

(3) The apparatus operator shall be at the lower control station at anytime the elevating platform is occupied.

(4) Equipment and operations of the elevating platform shall be as prescribed in the Occupational Safety Standards Commission rules, Part 58, Vehicle Mounted Elevating & Rotating Platforms, being R 408.15501 et seq of the Michigan Administrative Code.

#### R 408.17424. Aerial ladders.

**Rule 7424.** (1) An aerial ladder shall not be extended or retracted while an employee is climbing the ladder.

(2) When it is necessary to work from an aerial ladder the employee shall be secured with a safety belt.

(3) The tip of the aerial ladder shall not be forcefully extended against a solid object nor used to support the ladder.

(4) The steps and rungs of an aerial ladder shall have slip resistant surfaces.

(5) Jacks and outriggers shall be used as prescribed rule 7423(2).

(6) The rated capacity for an aerial ladder shall not be exceeded.

(7) The operator of an aerial ladder shall:

- (a) Remain at the turntable whenever the ladder is occupied.
- (b) Not move the apparatus unless the ladder is in the bed.

(8) The minimum distances prescribed in rule 7421 shall pertain to aerial ladders.

(9) The controls for the operation of an aerial ladder shall be of a type that returns to a neutral position when released.

(10) Tools or equipment shall not be mounted installed on the turntable.

(11) A 2-way voice communication system shall be provided between the employee on the raised portion of the equipment and the operator control station.

#### R 408.17425. Ladder pipes.

**Rule 7425.** (1) Detachable ladder pipes shall be operated in the direction the ladder is facing.

(2) Ladder pipes shall be secured to the ladder so that the pipe cannot be accidentally dislodged while in operation.

R 408.17426. Portable ladders.

Rule 7426. (1) Except as otherwise prescribed herein, a portable ladder shall be constructed, used, and maintained as prescribed in the Occupational Safety Standards Commission Standard Part 4 Portable Ladders, being R 408.10401 et seq. of the Michigan Administrative Code.

(2) The rung spacing shall be not less than 12 inches, nor more than 16 inches.

(3) The rungs of a metal ladder shall have a slip resistant surface.

(4) A roof ladder assembly shall be capable of supporting a direct load of not less than 500 pounds.

(5) Stay poles or bracing shall be furnished on any wood ladder extending more than 26 feet. The spikes on stay poles shall not project beyond the end of the ladder when nested. The locking pins on stay poles shall be securely attached to the ladders.

R 408.17427. Line throwing gun.

Rule 7427. (1) A line throwing gun shall:

- (a) Be loaded just prior to firing time
- (b) Not be pointed, loaded or unloaded, at any person.
- (c) Not be left unattended or stored while loaded.
- (d) Be stored in a box with the cleaning kit and breakdown tools.

(2) The storage box shall have the words, "Explosive Tool", conspicuously printed on the top of the box.

R 408.17428. Storage of equipment.

Rule 7428. All equipment shall be stored in or on the fire apparatus in a safe manner.

PERSONAL PROTECTIVE EQUIPMENT

R 408.17431. Personal protective equipment.

Rule 7431. (1) Personal protective equipment used by more than 1 employee shall be cleaned or sanitized after reassignment.

(2) An employee assigned to fire fighting tasks shall be provided and shall wear suitable personal protective equipment for the type of exposures involved to provide the following protection during fire fighting activities:

- (a) Body protection from moisture, flames, radiant heat, contact with caustic or toxic materials, or other harmful exposures.
- (b) Foot protection.
- (c) Head protection.
- (d) Face and eye protection.
- (e) Hand protection.

R 408.17433. Helmet.

Rule 7433. A fire fighter's helmet shall be of a light colored, nonconductive material. Dark colored, nonconductive helmets may be used if reflective tape is applied to the exterior sides of the helmet.

R 408.17434. Boots.

Rule 7434. (1) Fire fighter boots shall have the following:

- (a) A puncture resistant, slip resistant sole.
- (b) A safety toe prescribed in the Occupational Safety Standards Commission Standard, Part 31, Personal Protective Equipment, being R 408.13101 et seq. of the Michigan Administrative Code.

(2) ¾ length boots may be worn in place of turnout pants.

R 408.17435. Gloves or mittens.

Rule 7435. A fire fighter shall be provided with heat insulating gloves or mittens which are not readily flammable.

R 408.17436. First aid kits.

Rule 7436. A first aid kit to treat injuries to a fire fighter, shall be approved by the attending physician and shall be readily available at the fire site.

R 408.17441. Explosive devices.

Rule 7441. (1) An explosive device shall not be used in an explosive or flammable atmosphere.

(2) A fire service which uses an explosive device shall develop a procedure for protecting the employees and general public.

R 408.17442. Covering or protecting tools.

Rule 7442. (1) When not in use, the cutting teeth of a chain saw shall be covered to prevent inadvertent contact.

(2) An axe or other sharp edged or pointed tool shall be protected when stored or carried on the apparatus.

R 408.17443. Air moving equipment.

Rule 7443. Air moving equipment exposed to flammable or explosive fumes, dust, or vapors shall be powered by an explosion proof motor and labeled as such.

OPERATIONS

R 408.17451. Supervisor or employee in charge of emergency scenes.

Rule 7451. A trained supervisor or trained designated employee shall be in charge at all emergency scenes.

R 408.17452. Fires involving certain materials.

Rule 7452. A fire involving materials, such as, but not limited to, radioactive materials, explosives, flammable and toxics, in quantities, such as rail cars, warehouse storage tanks, and similar quantities, should be reported to the nearest State Police post immediately with the request that the State Emergency Services, if needed for technical assistance, be notified through the operations office.

INSPECTIONS

R 408.17456. Inspection of fire apparatus and equipment; record of repair or replacement; fire line guns and explosive devices; apparatus and equipment involved in accident.

Rule 7456. (1) The following items, if the apparatus is so equipped, shall be inspected for operation and defects not less than monthly. Where the item does not pass inspection, repairs or replacement shall be made:

- (a) Windshield washers and wipers.
- (b) Defroster and heater.
- (c) Head, tail, backup stop, and flasher lights.
- (d) Backup alarm.

- (e) Horn and siren.
- (f) Slip resistant steps and platforms.
- (g) Tires and suspension system.
- (h) Steering mechanism.
- (i) Braking system.
- (j) Operational controls.

(2) Records of repair or replacement shall be maintained for the life of the apparatus.

(3) Life line guns and explosive devices shall be cleaned and made ready for operation after each use.

(4) Apparatus and equipment involved in an accident shall be inspected by a licensed mechanic and tested before subsequent use.

**R 408.17462. Inspection of turnout equipment.**

**Rule 7462.** Turnout equipment shall be inspected by the user after each use. Cuts and tears in coats, pants, boots, and hand protection shall be repaired or replaced, if necessary in the judgement of the Commanding Officer. Head and face and eye protection shall continue to meet the requirements of the Occupational Safety Standards Commission Standards, Parts 32 and 35, being R 408.13201 et seq. and R 408.13501 et seq. of the Michigan Administrative Code.

**R 408.17463. Inspection of fiber ropes.**

**Rule 7463.** (1) A fiber rope shall be inspected visually after each use for the following conditions:

- (a) Externally for abrasions, cut or broken fibers, decay, burns, lack of strength, softness, variation in size or roundness of the strands, and for mildew or mold.
- (b) Inspect internally annually, by separating the strands at 3 foot intervals, for broken fibers, presence of grit, mildew or mold, color change of the fibers, or powdering and short, loose fibers.

(2) A rope having any of these conditions shall be replaced or repaired.

**R 408.17464. Inspection of synthetic ropes.**

**Rule 7464.** (1) A synthetic rope shall be inspected visually after each use for abrasions, cut or broken fibers, burns, melted fibers, variations in size or roundness of the strands. A rope having any of these conditions shall be replaced or returned to the manufacturer for repair.

(2) All synthetic ropes shall be inspected and, if necessary, repaired or replaced as prescribed in rule 7463(1)(b) and 7463(2).

## EMPLOYER REQUIREMENTS

## I. Department of Labor - Occupational Safety Standards Park 74 - Fire Fighting

A person functioning as a fire fighter and exposed to hazards of a structural fire shall comply with this part.

Def: "Structural fire" means any fire other than a vegetative coverfire.

## Duties of employer:

1. Provide training, 66-hour basic minimum
2. Assure physical fitness
3. Assure that job required equipment and tools are free of defects
4. Develop a basic procedure for treatment and transport of injured employees

## Equipment requirements:

1. Conform to N.F.P.A. standard "Automotive Fire Apparatus".
2. Seatbelts for all seated employees - vehicle
3. Back up lights and alarm
4. Tires - 5-year inspection, replacement tread depth specified
5. All equipment must be stored in or on the fire apparatus in a safe manner.

## Personal protective equipment:

1. Personal equipment used by more than one employee shall be cleaned and sanitized before reassignment.
2. An employee shall be provided:
  - a. Turn-out gear (protection from flame, heat, toxic materials)
  - b. Helmet (head, face and eye protection)
  - c. Boots
  - d. Gloves
  - e. First Aid kits

## Inspections:

1. Fire apparatus - not less than monthly
2. Turn-out gear - after each use by fire fighter; damage repaired and replaced immediately
3. Ropes - after each use

## II. Department of Health - Occupational Health Standards Rule 3502 - General Respiratory Protection

When anyone is exposed to an non-respirable atmosphere or an atmosphere that contains substances above the maximum allowable concentration the person must wear a respirator. The employer must supply respirators (air masks) to employees involved in the suppression of structural fires.

## III. Michigan Highway Safety Requirements - Authorized Emergency Vehicles

Section 257.698 (d2). Publicly owned fire vehicles must be equipped with flashing, rotating, or oscillating red lights and used with due regard for safety.

Section 632. The speed limitations may be exceed with due regard for safety when the vehicle is equipped with a bell, siren, or exhaust whistle in combination with red lights as described about in Section 257.698.

Quick Plan

FIRE ASSIGNMENT

(ONE SHEET PER SECTION)

APPENDIX I

FIRE NAME Moose Lake

ESTIMATED TIME OF CONTROL 5-6-80

DATE 5-6-80 TIME 0900

SHIFT Day DATE \_\_\_\_\_

TOTAL ACRES 25,600 Ac

PUMPERS	SIZE	TANKER BOSS	# MEN
1	1500	BOSS	7

VEHICLE ASSIGN.

FIRE BOSS Paul Markin  
 LINE BOSS Kenn Dalquist  
 PLANS CHIEF Bob Jbers  
 SAFETY CHIEF Bruce Platt  
 SERVICE CHIEF Bob Markin

TRACTORS	SIZE	TRACTOR BOSS	# MEN
1	300	BOSS	1
2	300	BOSS	1
3	300	BOSS	1
4	300	BOSS	1
TOTAL			4

DIVISION # \_\_\_\_\_  
 DIVISION BOSS \_\_\_\_\_  
 LINE SCOUT \_\_\_\_\_

SECTOR A

SECTOR BOSS Larry Martiglo

ISSUE RADIOS TO CREW BOSSES \_\_\_\_\_

LINE RADIO FREQ. \_\_\_\_\_

SERVICE FREQ. \_\_\_\_\_

TRUCK #	SEC #	CREW NAME	#MEN	CREW BOSS	(YES OR NO) FIRE SHELTER	CHAINS OF LINE TO BUILD	CHAINS BUILT
1	1	Mark Turin	20	Henke	Yes		
2	2	CTT...	20	BOSS	Yes		
3	3	...	10	...	Yes		
4	4	...	6	Williams	Yes		

MANPOWER TOTAL: \_\_\_\_\_ TOTALS: \_\_\_\_\_

BREAKFAST AT \_\_\_\_\_ TIME SUPPER AT \_\_\_\_\_ TIME

MEN ON LINE AT \_\_\_\_\_ TIME LUNCHES FOR \_\_\_\_\_ (MEN)

TRAVEL ROUTE

TRUCK #	NAME	CREW BOSS
1.		
2.		
3.		
4.		

TOOLS & SPECIAL EQUIPMENT \_\_\_\_\_

LINE INSTRUCTIONS 1 VAN FOR 4M-CAD

FIRE NAME MAC LAKE

ESTIMATED TIME OF CONTROL \_\_\_\_\_

DATE 5/6/80 TIME 0900

SHIFT \_\_\_\_\_ DATE \_\_\_\_\_

TOTAL ACRES 25600

PUMPERS	GALLONS SIZE	TANKER BOSS	# MEN
4x6	400	MCKINLEY	2-3
4x4	200	MCKINLEY	2-3
4x6	1,000	MID	2-3
4x4	125	LILLY	2
1	?	LUZERNE	TOTAL 1-2

VEHICLE ASSIGN. \_\_\_\_\_

FIRE BOSS PAUL MARTIN  
 LINE BOSS KEVIN DALQUIST  
 PLANS CHIEF BOB JOENS  
 SAFETY CHIEF BRUCE DLETT  
 SERVICE CHIEF BOB MASON

TRACTORS	SIZE	TRACTOR BOSS	# MEN
1	450	ANDERSON	1-2
1	450	MORSE	1-2
1	750	SANDERS	1-2
1	70-7	SHAEONEAU	1-2
1	70-7	F.S.	TOTAL 7-2

DIVISION # \_\_\_\_\_  
 DIVISION BOSS \_\_\_\_\_  
 LINE SCOUT \_\_\_\_\_

SECTOR B

SECTOR BOSS WARREN PATTER

ISSUE RADIOS TO CREW BOSSES

TOTAL SUM TOTAL \_\_\_\_\_

LINE RADIO FREQ. N/A

SERVICE FREQ. N/A

TRUCK #	SEC #	CREW NAME	#MEN	CREW BOSS	(YES OR NO) FIRE SHELTER	CHAINS OF LINE TO BUILD	CHAINS BUILT
1		HAVERVILLE	6	SMYKER	YES	3-4 EXTRA RADIOS	
2		MT WAIN-SHIMMER	20	BLUEDORN	YES		
3		CHEQUAMUNGAN	20	RAZBOTHAM	YES		
4		LAKE CAD.	7	DAVIS	YES		

MANPOWER TOTAL: \_\_\_\_\_ TOTALS: \_\_\_\_\_

BREAKFAST AT \_\_\_\_\_ TIME SUPPER AT \_\_\_\_\_ TIME

MEN ON LINE AT \_\_\_\_\_ TIME LUNCHES FOR \_\_\_\_\_ (MEN)

TRAVEL ROUTE \_\_\_\_\_ PICK-UP CREWS & RETURN TO CAMP

TRUCK #	NAME	CREW BOSS
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____

TOOLS & SPECIAL EQUIPMENT \_\_\_\_\_

LINE INSTRUCTIONS \_\_\_\_\_





FIRE ASSIGNMENT

(ONE SHEET PER SECTOR)

FIRE NAME Mack Lake

ESTIMATED TIME OF CONTROL 25,000 AC

TUES DATE 5-6-80 TIME 1700

SHIFT Night DATE 5-7-80

TOTAL ACRES 25,000

PUMPERS SIZE TANKER BOSS # MEN  
Al Hershey ✓  
Tom Party ✓

VEHICLE ASSIGN.

FIRE BOSS Paul Martin

LINE BOSS Ken DeLant

PLANS CHIEF Bob Feens

SAFETY CHIEF Bruce Platt

SERVICE CHIEF R. L. Mason

TRACTORS SIZE TRACTOR BOSS # MEN  
TOTAL 6

DIVISION # \_\_\_\_\_

DIVISION BOSS \_\_\_\_\_

LINE SCOUT \_\_\_\_\_

SAW CREW NAME FALLING BOSS # MEN  
TOTAL \_\_\_\_\_

SECTOR Total Fire

SECTOR BOSS Frank Keller

ISSUE RADIOS TO \_\_\_\_\_ BOSS

LINE RADIO FREQ. \_\_\_\_\_

TOTAL SUM TOTAL \_\_\_\_\_

SERVICE FREQ. \_\_\_\_\_

TRUCK #	SEC #	CREW NAME	#MEN	CREW BOSS	(YES OR NO) FIRE SHELTER	CHAINS OF LINE TO BUILD	CHAINS BUILT
1							
2							
3							
4							

MANPOWER TOTAL: \_\_\_\_\_ TOTALS: \_\_\_\_\_

BREAKFAST AT 0630 TIME SUPPER AT \_\_\_\_\_ TIME

MEN ON LINE AT \_\_\_\_\_ TIME LUNCHES FOR 7 (MEN)

TRAVEL ROUTE PICK UP CREWS & RETURN TO CAMP NAME CREW BOSS

- TRUCK # \_\_\_\_\_ 1. \_\_\_\_\_
- TRUCK # \_\_\_\_\_ 2. \_\_\_\_\_
- TRUCK # \_\_\_\_\_ 3. \_\_\_\_\_
- TRUCK # \_\_\_\_\_ 4. \_\_\_\_\_

TOOLS & SPECIAL EQUIPMENT Crews take lunches, head lights & pumps

LINE INSTRUCTIONS Patrol roads & fire line with in fire area. Map up hot spots close to line - Main purpose is to scout fire & patrol

Time: 1550 516180

Tonite:

Cloud cover 100%

Min. Rel. Hum. 92-98%

Minimum Temp 34° around 3-7am

Chance of Precip. 30-40%

mixture of rain & snow

.1"

Cover 60% area

Winds shifty NW 12-17 miles  
gusts 28

Decreasing past 9pm less than 10 miles  
rest of nite

Wed:

100% Cloud Cover

Precip. ~~Temp~~ 30-40% rain - 1 or less  
over 60% area

Winds NW uncreasing 11am  
to 10-16 miles gust possibly

22 miles rest of afternoon

high temp 53°

Min. RH 35-40% 1-6pm remain unsta



FIRE NAME MACK LAKE

ESTIMATED TIME OF CONTROL 1500

DATE 5/7/80 TIME 0730

SHIFT Day DATE 5-7-80

TOTAL ACRES 25,000

PUMPERS	SIZE	TANKER BOSS	# MEN
5-2	1000 gal	Doug Nash + 1	2
5-1	500 gal	Wayne - Hoaiser	3
5-7	500 gal	Wayne - Hoaiser	3

FIRE BOSS Paul Martin  
 LINE BOSS Ken Dolquist Blue Rental  
 PLANS CHIEF Bob Toens  
 SAFETY CHIEF Bruce Platt  
 SERVICE CHIEF Bob Mason

TRACTORS	SIZE	TRACTOR BOSS	# MEN
Anderson	450	} Supplied by Sec. Boss	
Moore	450		
Raynom			
2-DIVR	350		

DIVISION # \_\_\_\_\_  
 DIVISION BOSS \_\_\_\_\_  
 LINE SCOUT Lee Fox & Tom Itahn

SAW CREW NAME FALLING BOSS # MEN

SECTOR A

By Ottawa

SECTOR BOSS Larry Martoglio - P.U.

ISSUE RADIOS TO Sec. Boss BOSS (3)

TOTAL  
SUM TOTAL

LINE RADIO FREQ. \_\_\_\_\_

SERVICE FREQ. \_\_\_\_\_

TRUCK #	SEC #	CREW NAME	#MEN	CREW BOSS	(YES OR NO) FIRE SHELTER	CHAINS OF LINE TO BUILD	CHAINS BUILT
1		Mark Tuoin - Shawnee	17	Bluedorn	Yes	0	
2		Ottawa	20	House	Yes	0	
3		Wayne - Hoaiser	6	Lindholm	Yes	(Pumpers)	
4							

MANPOWER TOTAL: 43 TOTALS: 0 10 mile

BREAKFAST AT 0630 TIME SUPPER AT 1930 TIME

MEN ON LINE AT 0800 TIME LUNCHES FOR 44 (MEN)

TRUCK #	TRAVEL ROUTE	PICK UP CREWS & RETURN TO CAMP
		NAME CREW BOSS
TRUCK #	<u>A.F. Bus. "A"</u>	1. <u>MT &amp; Shawnee Bluedorn</u>
TRUCK #	<u>A.F. Bus "B"</u>	2. <u>Ottawa House</u>
TRUCK #		3. _____
TRUCK #		4. _____

TOOLS & SPECIAL EQUIPMENT 1/2 Backpack, 1/4 shovels, 1/4 pulaski

Ottawa has chain saws

LINE INSTRUCTIONS Check for hot spots, improve line, 100% mop up, try to complete rehab work per plan, seed maybe delivered about noon. Once Sector A is done move 3 dozen to North line.

FIRE ASSIGNMENT

(ONE SHEET PER SECTOR)

18

FIRE NAME Mack Lake  
 DATE 5-7-80 TIME 0730  
 TOTAL ACRES 25000

ESTIMATED TIME OF CONTROL 1200  
 SHIFT Day DATE 5-7-80  
 PUMPERS SIZE TANKER BOSS # MEN  
5-5 175 Wayne-Hoosier 3

VEHICLE  
 ASSIGN.

FIRE BOSS Paul Martin  
 LINE BOSS Ken Dalquist  
 PLANS CHIEF Bob Jensen  
 SAFETY CHIEF Bruce Platt  
 SERVICE CHIEF Bob Moser

TRACTORS SIZE TRACTOR BOSS # MEN  
Shaboneau D-7  
" D-7  
Steinman 450 } Sec. Boss Jenny

DIVISION # \_\_\_\_\_  
 DIVISION BOSS \_\_\_\_\_  
 LINE SCOUT Lee Fox & Hahn

SAW CREW NAME FALLING BOSS # MEN  
 TOTAL 3

SECTOR B

SECTOR BOSS Larry Battey - 6pass P.U.  
 ISSUE RADIOS TO Sector BOSS (3)

LINE RADIO FREQ. \_\_\_\_\_ SERVICE FREQ. \_\_\_\_\_

TRUCK #	CREW NAME	#MEN	CREW BOSS	(YES OR NO) FIRE SHELTER	CHAINS OF LINE TO BUILD	CHAINS BUILT
1	Mark Twain #1	20	Henke	Yes	0	
2	Chequamegon	20	Rasputnik	Yes	0	
3	Wayne Hoosier	3	Lindholm			
4						

MANPOWER TOTAL: 43 TOTALS: 0 15 m/les

BREAKFAST AT 0630 TIME SUPPER AT 1930 TIME  
 MEN ON LINE AT 0800 TIME LUNCHES FOR 44 (MEN)

TRAVEL ROUTE

TRUCK #	NAME	CREW BOSS
<u>USAF "C"</u>	<u>Mark-Twain</u>	<u>Henke</u>
<u>USAF "D"</u>	<u>Chequamegon</u>	<u>Rasputnik</u>

TOOLS & SPECIAL EQUIPMENT 1/2 back pack, 1/4 shovel, 1/4 pulaski

LINE INSTRUCTIONS Check for hot spots, improve line, 100% mag-up, try to complete rehab. per plan, seed maybe delivered about noon.

Size - apx. 25,000 acres

TIME - 1500 hrs. Tues. May 6, 1980

TOTAL MILES - LINE - 35 miles

COMPLETED LINE - 30 miles

RESOURCES	<u>F.S.</u>	<u>D.N.R.</u>	<u>OTHER</u>
Manpower	123	20	44
Tractors	5	5	6
Pumpers	8	6	8
Salvation Army			6
Air Force			4
Local Cooperators			8

CONTAINMENT - 1800 5/6/80

FIRE ASSIGNMENT

(ONE SHEET PER SECTOR)

FIRE NAME MACK LAKE

ESTIMATED TIME OF CONTROL 1200

DATE 2/7/80 TIME 0730

SHIFT DAY DATE 2/7/80

TOTAL ACRES 25 000

PUMPERS SIZE TANKER BOSS # MEN

VEHICLE ASSIGN.

1 1000 DNR

1 1000 MID BILWITT

1 SGT. 75 RICHARDS

FIRE BOSS PAUL MARTIN

LINE BOSS KEN DOLOVET

PLANS CHIEF BOB JOHNS

SAFETY CHIEF BOB PLATT

SERVICE CHIEF BOB MASON

TOTAL

TRACTORS SIZE TRACTOR BOSS # MEN

DIVISION #

DIVISION BOSS

LINE SCOUT LEE FOX # TRAIL HORN

TOTAL

SAW CREW NAME FALLING BOSS # MEN

SECTOR "C"

SECTOR BOSS

ISSUE RADIOS TO BOSS

TOTAL

SUM TOTAL

LINE RADIO FREQ.

SERVICE FREQ.

TRUCK #	CREW NAME	#MEN	CREW BOSS	(YES OR NO) FIRE SHELTER	CHAINS OF LINE TO BUILD	CHAINS BUILT
1	CADILLAC	4	WILLIAMS	YES	-	-
2	S.O. ENG.	4	RICHARDS	YES	-	-
3	MID 573		HOPKINS			
4						

MANPOWER TOTAL: \_\_\_\_\_ TOTALS: \_\_\_\_\_

BREAKFAST AT 0630 TIME SUPPER AT 1930 TIME

MEN ON LINE AT 0800 TIME LUNCHES FOR \_\_\_\_\_ (MEN)

TRAVEL ROUTE PICK UP CREWS & RETURN TO CAMP

TRUCK #	NAME	CREW BOSS
1.		
2.		
3.		
4.		

TOOLS & SPECIAL EQUIPMENT

INSTRUCTIONS

## REHABILITATION PLAN FOR MACK LAKE FIRE

AUTHORITY: Chief of Forest Service required approval

1. All roads and approaches that are plowed up will be leveled and returned to as near an original condition as possible.
2. All fire plow lines that are visible from major roads will be leveled and returned to as near an original condition as possible within visible zone.
3. All plow lines that go up or down steep (20%) hills will be water barred. I.e. in the hilly aspen stand country. These areas should be seeded to rye grass.
4. Return all plowed/bulldozed lines on private land to as near an original condition as possible.
5. Possible direct seeding of Jack Pine in Sections 10, 11, & 12 of T25N R3E and Section 7 of T25N R4E and Sections 2, 3 & 4 of burned portion in T25N R3E. This would be done with aerial seeding by helicopter or fixed wing.
6. Evaluate all areas for planting/reforestation for endangered species (Kirtland Warbler) survival.
7. Resolve the timber sale situations (lost decked timber, standing timber, logging equipment, etc.)
8. When fireline consisted of more than 2 plowed lines, they will be leveled and returned to as near an original condition as possible.

Tom Bates, Mio District Fire Technician  
Don Krejacarek, District Ranger, Harrisville  
Ven Bosman, District Ranger, Mio

Recommended By:

Cliff Reedy, Forest Fire Staff Officer  
Bill Irvine, Forest Wildlife Biologist  
Dick Lord, District Timber Mgmt. Assistant  
Robert Radtke, RO-Wildlife Staff Officer

Approved By:

Paul Martin, Fire Boss



For 5/7/80

I 12

I - REQUESTING AGENCY WILL FURNISH:

1. NAME OF FIRE OR OTHER PROJECT <i>Mack Lake</i>		2. CONTROL AGENCY <i>F.S.</i>		3. REQUEST MADE	
				TIME # <i>2130</i>	DATE <i>5-6-70</i>
4. LOCATION (By 1/4 Sec - Sec - Twp - Range)			5. DRAINAGE NAME		6. EXPOSURE (NE, E, SE, etc.)
7. SIZE OF PROJECT (Acres)* <i>25,000 Ac</i>	8. ELEVATION*		9. FUEL TYPE <i>J.P. &amp; Aspen</i>		10. PROJECT ON:
	TOP	BOTTOM			<input type="checkbox"/> GROUND <input type="checkbox"/> CROWNING

11. WEATHER CONDITIONS AT PROJECT OR FROM NEARBY STATIONS (See example on reverse)

PLACE	ELEVATION	OB TIME#	WIND DIR.-VEL.	TEMP.		† (Lv. Blank)		REMARKS (Indicate rain, thunderstorms, etc. Also wind condition and 10ths of cloud cover.)
				DRY	WET	RH	DP	

12. SEND FORECAST TO:	PLACE	VIA	ATTN: (Name, if applicable)

II - FIRE WEATHER FORECASTER WILL FURNISH:

13. FORECAST AND OUTLOOK *W-est.* TIME # AND DATE: \_\_\_\_\_

*100% Cloud cover, Precip. 30-40% Rain show.  
 Winds N increasing late morning 10-16 <sup>at</sup> 22  
 High temp low 50-52. Rel Hum 40-45%  
 1-6 PM. Air mass unstable*

NAME OF FIRE WEATHER FORECASTER	FIRE WEATHER OFFICE

III - REQUESTING AGENCY WILL COMPLETE UPON RECEIPT OF FORECAST

IV. FORECAST RECEIVED:	TIME #	DATE	NAME

Explanation of symbols: { \* Use 24-hour clock to indicate time. Example: 10:15 p.m. = 2215; 10:15 a.m. = 1015.  
 \* For concentrations (as groups of lightning fires) specify "Concentration"; then give number of fires and size of largest. If concentrations are in more than one drainage, request special forecast for each drainage.  
 † No entry necessary. To be computed by the Fire Weather Forecaster.

ALL FIRE LINE PERSONNEL

Here are some answers to questions you may have or you may be asked by the concerned public---

MACK LAKE FIRE

Fire Cause--Escaped prescribed burn in a Kirkland Warbler Management Area

Size--25,000 acres

Control--Should be announced early Wednesday AM

Mop Up--Will be 100% completed Wednesday

Rehabilitation--1. Will start immediately Wednesday AM  
 2. 8 dozer and several crews will be stabilizing plowed roads and all firelines constructed on steep slopes  
 3. Critical areas within the burn areas will be seeded with rye and direct seeded to jack pine

Forest Supervisor Wayne Mann is assembling 4 teams to handle various aspects of the fire.

1. Death investigation--Hoot Gibson and Dick Smith from the Regional Office and Deputy Supervisor Bill Erickson and Horace LaBumbard from the Huron-Manistee will conduct a full and complete investigation into the death of Jim Swiderski. Their investigation should be completed by Thursday.
2. Claims--Several people from the Regional Office, Supervisor's Office and OGC will handle private claims resulting from property loss and damage to 38 permanent and summer homes and an equal number of out buildings.

This team will be fully operational by Wednesday PM and will stay in the area until all private parties have been contacted.

Individuals requesting help or information should be directed to contact the Ranger Station in Mio.

3. Fire investigation--This team will be comprised of fire experts from the Michigan Department of Natural Resources and the Forest Service both Administration and Research.
4. Fire Suppression--Made up of present overhead team headed by Paul Martin, Mark Twain National Forest.

All of us are saddened by the loss of Forest Service firefighter Jim Swiderski. Funeral services will be held at 10:00 a.m. Thursday in Caledonia, Michigan.

Gordon Joiner, Coordinator  
 5/7/80

## Safety Gram

Dozers will be working in area.

When pushing trees stay  $1\frac{1}{2}$  TIMES  
the tree height away from dozers.

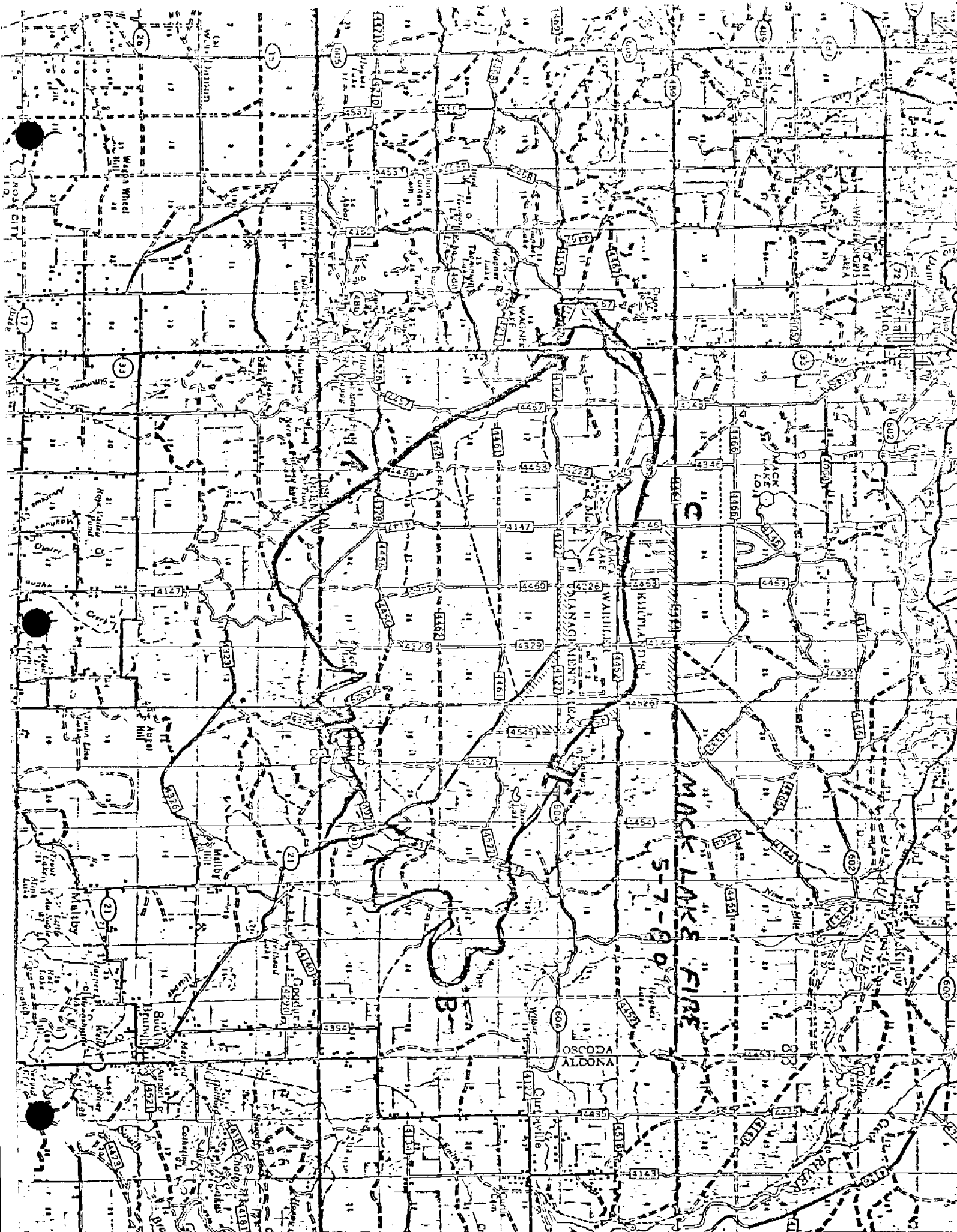
If you must approach a dozer, make  
sure the operator sees you & know  
your intentions.

# Air Operation Plan

A.S.M. - Dan Maijala

Helicopter to be at DNR  
Airstrip at 0800

Fixed wing detection plane available  
on request.



FIRE NAME MACK LAKE

ESTIMATED TIME OF CONTROLLED 1200 5/17/80

DATE MAY 8, 1980 TIME 0800

SHIFT DAY DATE \_\_\_\_\_

TOTAL ACRES 25 000

PUMPERS SIZE TANKER BOSS # MEN

VEHICLE ASSIGN.

FIRE BOSS PAUL MARTIN  
LINE BOSS KEN DOLQUIST  
PLANS CHIEF BOB JOENS  
SAFETY CHIEF BRUCE PLATT  
SERVICE CHIEF BOB MASON

TRACTORS SIZE TRACTOR BOSS # MEN  
1 MOORE 450 - - 1

DIVISION # \_\_\_\_\_  
DIVISION BOSS \_\_\_\_\_  
LINE SCOUT \_\_\_\_\_

SAW CREW NAME FALLING BOSS # MEN

SECTOR "A"

SECTOR BOSS MARTOGLIO

ISSUE RADIOS TO SECTOR BOSS (3)

LINE RADIO FREQ. \_\_\_\_\_

SERVICE FREQ. \_\_\_\_\_

TRUCK #	CREW NAME	#MEN	CREW BOSS	(YES OR NO) FIRE SHELTER	CHAINS OF LINE TO BUILD	CHAINS BUILT
1	OTTAWA	19	✓	YES	N/A	
2						
3						
4						

MANPOWER TOTAL: 19 TOTALS: \_\_\_\_\_

BREAKFAST AT 0630 TIME SUPPER AT 1930 TIME

MEN ON LINE AT 0800 TIME LUNCHES FOR EACH MAN (MEN)

TRAVEL ROUTE PICK UP CREWS & RETURN TO CAMP 1800  
NAME CREW BOSS

- TRUCK # USAF BUS 1.
- TRUCK # 4179 - VAN 2.
- TRUCK # M 5-3 P/U (SECTOR BOSS) 3.
- TRUCK # \_\_\_\_\_ 4.

TOOLS & SPECIAL EQUIPMENT H SEEDERS, 1/4 PULASKIS, 1/4 SHOVELS  
1/2 BACK PUMPS

INSTRUCTIONS CONTINUE MOPUP & COMPLETE WORK OUTLINED  
IN REHAB PLAN. MOORE'S DOZER ON SITE.  
LOAD UP SEED IN WAREHOUSE BEFORE LEAVING.

FIRE NAME MACK LAKE

ESTIMATED TIME OF CONTROLLED 1200 5/7/8

**NURS** DATE MAY 8 TIME 0800

SHIFT DAY DATE \_\_\_\_\_

TOTAL ACRES 25 000

PUMPERS SIZE TANKER BOSS # MEN

VEHICLE ASSIGN.

FIRE BOSS PAUL MARTIN

LINE BOSS KEN DOLOQUIST

PLANS CHIEF BOB JOENS

SAFETY CHIEF BRUCE PLATT

SERVICE CHIEF BOB MASON

TRACTORS SIZE TRACTOR BOSS TOTAL # MEN

DIVISION # \_\_\_\_\_

DIVISION BOSS \_\_\_\_\_

LINE SCOUT \_\_\_\_\_

SAW CREW NAME FALLING BOSS TOTAL # MEN

SECTOR "B"

SECTOR BOSS HOFFEMAN

ISSUE RADIOS TO SECTOR BOSS(3)

TOTAL SUM TOTAL

LINE RADIO FREQ. \_\_\_\_\_

SERVICE FREQ. \_\_\_\_\_

TRUCK #	SEC #	CREW NAME	#MEN	CREW BOSS	(YES OR NO) FIRE SHELTER	CHAINS OF LINE TO BUILD	CHAINS BUILT
	1	<u>SPLIT CHEQUAMEBONIC</u>		<u>RASPOTRIK</u>	<u>YES</u>	<u>N/A</u>	
	2						
	3						
	4						

MANPOWER TOTAL: 10

TOTALS: \_\_\_\_\_

BREAKFAST AT 0630 TIME SUPPER AT 1930 TIME

MEN ON LINE AT 0800 TIME LUNCHES FOR EACH MAN (MEN)

TRAVEL ROUTE PICK UP CREWS & RETURN TO CAMP 1800  
NAME CREW BOSS

- TRUCK # BUS A.F. 1.
- TRUCK # HALVERSON'S BLUE P/U 2.
- TRUCK # RED DNR FOR SECTOR BOSS 3.
- TRUCK # \_\_\_\_\_ 4.

TOOLS & SPECIAL EQUIPMENT 5 SEEDERS; PACK SACKS 5; 1/2 BACK

PUMPS: 1/4 SHOVELS; 1/4 PULASKIES.

LINE INSTRUCTIONS CONTINUE MOPUP & COMPLETE WORK OUTLINED IN REHAB PLAN. CHECK CHIP PILE. CALL MID FOR ANY EQUIP REQUIRED. Pick up seed before leaving.

5/6/80

CHIEF OF PLANS

REHABILITATION PLAN FOR MACK LAKE FIRE

AUTHORITY: Chief of Forest Service required approval

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2. All fire plow lines that are visible from major roads will be leveled and returned to as near an original condition as possible within visible zone.
3. All plow lines that go up or down steep (20%) hills will be water barred. I.e. in the hilly aspen stand country. These areas should be seeded to rye grass.
4. Return all plowed/bulldozed lines on private land to as near an original condition as possible.
5. Possible direct seeding of Jack Pine in Sections 10, 11, & 12 of T25N R3E and Section 7 of T25N R4E and Sections 2, 3 & 4 of burned portion in T25N R3E. This would be done with aerial seeding by helicopter or fixed wing.
6. Evaluate all areas for planting/reforestation for endangered species (Kirtland Warbler) survival.
7. Resolve the timber sale situations (lost decked timber, standing timber, logging equipment, etc.)
8. When fireline consisted of more than 2 plowed lines, they will be leveled and returned to as near an original condition as possible.

Tom Bates, Mio District Fire Technician  
Don Krejacarek, District Ranger, Harrisville  
Ven Bosman, District Ranger, Mio

Recommended By:

Cliff Reedy, Forest Fire Staff Officer  
Bill Irvine, Forest Wildlife Biologist  
Dick Lord, District Timber Mgmt. Assistant  
Robert Radtke, RO-Wildlife Staff Officer

Approved By:

Paul Martin, Fire Boss



AIR OPERATION PLAN

AIR SERVICE MANAGER

DAN MAIJALA

HELICOPTER TO BE AT DNR AIRSTRIP AT 0830.

FIXED WING DETECTION PLANE AVAILABLE ON REQUEST.

SAFETY GRAM

FATIGUE IS NOW AN INCREASING FACTOR CONCERNING US. REACTION TIME AND GOOD JUDGMENT CAN BE IMPAIRED AS FATIGUE INCREASES. SOME CREW MEMBERS HAVE BEEN DISPATCHED AWAY FROM THEIR HOME UNITS FOR WEEKS PRIOR TO BEING SENT TO THE MACK LAKE FIRE. WATCH OUT FOR EACH OTHER AND PROVIDE FOR SAFETY FIRST.

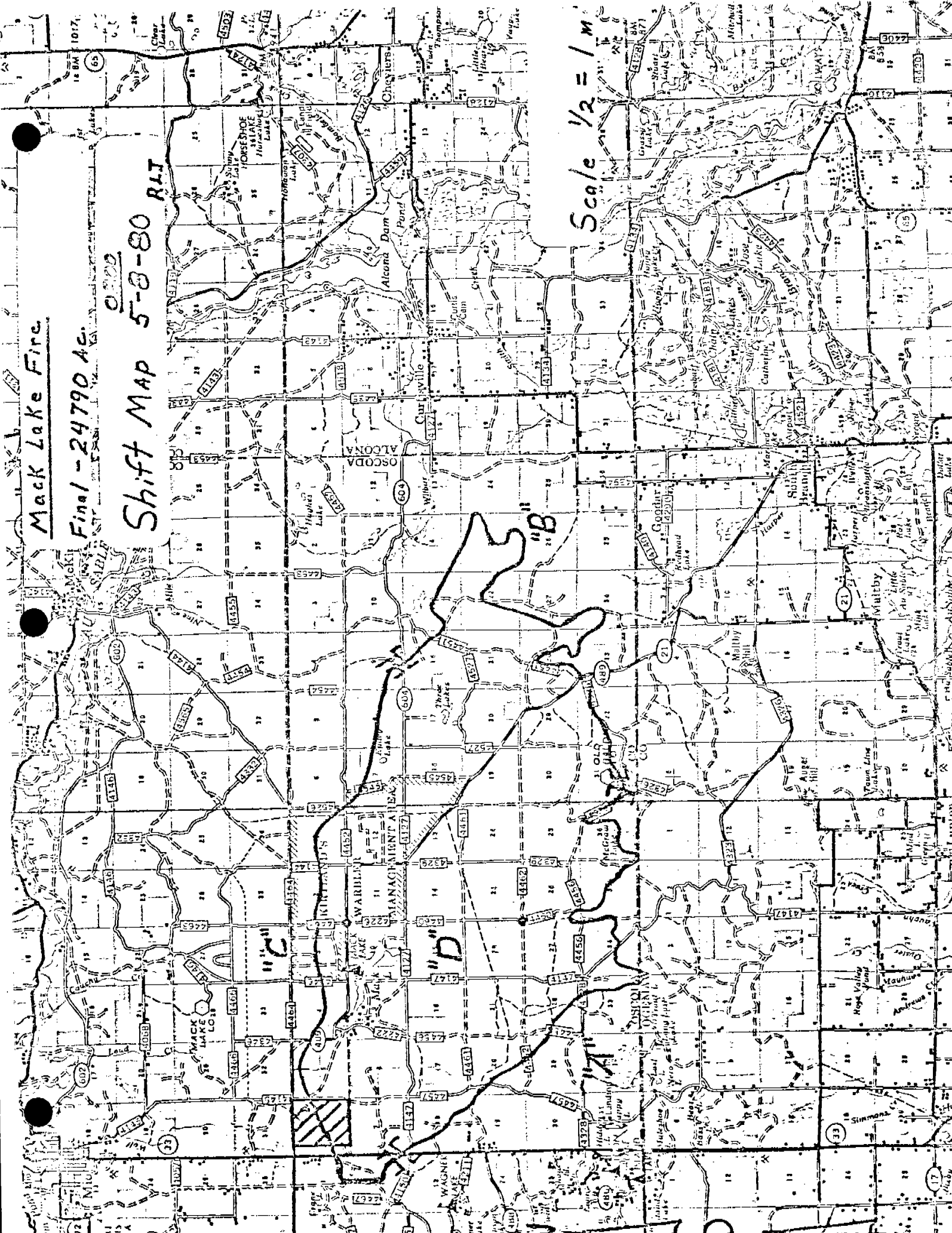
**Mack Lake Fire**

Final - 24790 AC

0:00

Shift Map 5-8-80 RLT

Scale 1/2" = 1 M



FIRE ASSIGNMENT

(ONE SHEET PER SHIFT)

108

FIRE NAME MACK LAKE

~~XXXXXXXXXXXX~~ CONTROLLED 1200 5/7/80

iday DATE May 9, 1980 TIME 0800

SHIFT DAY DATE

TOTAL ACRES 24,790

PUMPERS	SIZE	TANKER BOSS	# MEN
1	175		3
1	50		4

VEHICLE  
ASSIGN.

FIRE BOSS Paul Martin

LINE BOSS Ken Dalquist

PLANS CHIEF Bob Joens

SAFETY CHIEF Bruce Platt

SERVICE CHIEF Bob Mason

TRACTORS	SIZE	TRACTOR BOSS	# MEN
Moore		Martoglio	Radio
DNR		Dalquist	Radio
Anderson	450		Radio
Steinman		Lynch	Radio

DIVISION #

DIVISION BOSS

LINE SCOUT

SAW CREW	NAME	FALLING BOSS	# MEN
1	Rehab.	--	--

SECTOR A

SECTOR BOSS Kollar

ISSUE RADIOS TO Sector BOSS

LINE RADIO FREQ. N/A

SERVICE FREQ.

TRUCK #	SEC #	CREW NAME	#MEN	CREW BOSS	(YES OR NO) FIRE SHELTER	XXXXXX XXXXXX XXXXXX	XXXXXX XXXXXX
17 GAL.	M55 1	Pumper Initial Attack Crew	3	Stone Peters Senior	YES	N/A	Mobile 1 Radio
50 GAL.	M5-72	Rehab. Crew	4	Martin Cravens Taylor Albright Lindholm Hilderbrand	YES		1 Mobile 1 Portab.

4 (Sec Kollar & Wayne-Hoosier will remain on fire for entire shift)

MANPOWER TOTAL: \_\_\_\_\_ TOTALS: \_\_\_\_\_

BREAKFAST AT 0730 TIME SUPPER AT \_\_\_\_\_ TIME

MEN ON LINE AT 0830 TIME LUNCHES FOR \_\_\_\_\_ EACH MAN (MEN)

TRUCK #	NAME	CREW BOSS	
M5-3	Martoglio	Radio	1.
M5-6	Kollar	Radio	2.
PU	Dalquist	Radio	3.
Red DNR	Lynch	Radio	4.

VAN 4179 Wayne Mann

TOOLS & SPECIAL EQUIPMENT Pack Board, Chainsaws, Chaps for felling assignment.

Post lookout as needed. Ear plugs or muffs are required as P.P.E.

LINE INSTRUCTIONS Dalquist will meet DNR after briefing. Rehab. Crew will be

fire-tool equipped for Fire Fighting as needed. Anderson will move to

Junction 33-604 by bulletin board to start work. Forest will take

REHABILITATION PLAN FOR MACK LAKE FIRE

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4. Return all plowed/bulldozed lines on private land to as near an original condition as possible.
5. Possible direct seeding of Jack Pine in Sections 10, 11, & 12 of T25N R3E and Section 7 of T25N R4E and Sections 2, 3 & 4 of burned portion in T25N R3E. This would be done with aerial seeding by helicopter or fixed wing.
6. Evaluate all areas for planting/reforestation for endangered species (Girtland Warbler) survival.
7. Resolve the timber sale situations (lost decked timber, standing timber, logging equipment, etc.)
8. When fireline consisted of more than 2 plowed lines, they will be leveled and returned to as near an original condition as possible.

Tom Bates, Mio District Fire Technician  
 Don Krecjarek, District Ranger, Harris  
 Ven Bosman, District Ranger, Mio

Recommended By:

Cliff Reedy, Forest Fire Staff Officer  
 Bill Irvine, Forest Wildlife Biologist  
 Dick Lord, District Timber Mgmt. Assist.  
 Robert Radtke, RC-Wildlife Staff Office

Approved By:

Paul Martin, Fire Boss

FM 5120-1  
(2/77)

FIRE WEATHER FORECAST FOR LOWER MIO-IGAN

DATE: 5/18/76  
TIME: 2100Z

FIRE DANGER TREND

- Little Change \_\_\_\_\_
- Lower \_\_\_\_\_
- Higher \_\_\_\_\_
- Warning \_\_\_\_\_

WEATHER DISCUSSION:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

FORECAST FOR TONIGHT

1. CLOUDS
  - A. Little Change
  - B. Clearing \_\_\_\_\_
  - C. Increasing \_\_\_\_\_
  - D. Variable \_\_\_\_\_

2. PRECIPITATION PROBABILITY

- A. Unlikely (Less 20%)
- B. Chance (30-40%) \_\_\_\_\_
- C. Likely (50-75%) \_\_\_\_\_
- D. Most likely (80%) \_\_\_\_\_

TYPE

- A. Rain \_\_\_\_\_
- B. Showers
- C. Thunderstorms \_\_\_\_\_
- D. Snow \_\_\_\_\_

AMOUNT

- A. .10" or less
- B. .11 - .30" \_\_\_\_\_
- C. .31 - .70" \_\_\_\_\_
- D. .71 - 1.20" \_\_\_\_\_

Where \_\_\_\_\_  
When 50-40%

3. WIND DIRECTION

N-NW  
shifting to \_\_\_\_\_ at (time) \_\_\_\_\_  
WIND SPEED 1-10 mph 27:00 PM

4. LOWEST TEMPERATURES

32-36

5. DEW/FROST:

- None MAX REL 88-99%
- Light
- Moderate
- Heavy \_\_\_\_\_
- Drying off by 10 AM

FORECAST FOR TOMORROW

Friday

1. CLOUDS

- A. Sunny
- B. Cloudy
- C. Variable \_\_\_\_\_
- D. Increasing \_\_\_\_\_
- E. Decreasing A.M. P.M. \_\_\_\_\_

2. PRECIPITATION PROBABILITY

- A. Unlikely (Less 20%)
- B. Chance (30-40%) \_\_\_\_\_
- C. Likely (50-75%) \_\_\_\_\_
- D. Most likely (80%) \_\_\_\_\_

TYPE

- A. Rain
- B. Showers
- C. Thunderstorms \_\_\_\_\_
- D. Snow \_\_\_\_\_

AMOUNT

- A. .10" or less
- B. .11 - .30" \_\_\_\_\_
- C. .31 - .70" \_\_\_\_\_
- D. .71 - 1.20" \_\_\_\_\_

When \_\_\_\_\_  
Where 50-80% of area

3. WIND DIRECTION

N-NW  
shifting \_\_\_\_\_ at (time) \_\_\_\_\_  
WIND SPEED 15 mph @ 11:00 AM

4. TEMPERATURE Afternoon High 48-54

5. LOWEST AFTERNOON HUMIDITY 40-48%

5-6 PM

SMOKE PATROL: Visibility Restrictions 12 MS LT LESS THAN 4 MS

Turbulence Intensity 1 mph to 10 mph 3000 ft

EXTENDED OUTLOOK FOR NEXT THREE DAYS:

Temperature Trend Sak Sun Mon  
 Precipitation 100% 50-80% 100%  
 Clouds 100% 50-80% 100%

AIR OPERATORS PLAN

5/9/80

A helicopter Bell 47 will be available for use at  
heliport by 0900.  
First flight is scheduled for 1000. Congressman and  
Forest Supervisor anticipate one hour flight.  
Second scheduled flight will take place at 1100 and will  
be Dalquist and District Fire Boss.

District takeover scheduled for 1200. Dan Maijala  
Air Service Manager - will be released with off-forest  
overhead team. Helicopter will be retained on Forest  
only if service is requested by District. Replacement  
ASM if needed will be Cliff Reedy. District decision is  
requested by 1000 to provide smooth transition.

Fixed wing Detection Aircraft available on request.  
Forest Service Beachcraft Baron available through S.O. -  
Jim Price or Dispatcher.

## REHABILITATION PLAN FOR MACK LAKE FIRE

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6. Evaluate all areas for planting/reforestation for endangered species (Virdland Warbler) survival.
7. Resolve the timber sale situations (lost decked timber, standing timber, logging equipment, etc.)
8. When fireline consisted of more than 2 plowed lines, they will be leveled and returned to as near an original condition as possible.

Tom Bates, Mio District Fire Technician  
Don Krajecarek, District Ranger, Harrisville  
Van Eosman, District Ranger, Mio

Recommended By:

Cliff Reedy, Forest Fire Staff Officer  
Bill Irvine, Forest Wildlife Biologist  
Dick Lord, District Timber Mgmt. Assistant  
Robert Radtke, RC-Wildlife Staff Officer

Approved By:

Paul Martin, Fire Boss



SAFETY MESSAGE

THE WORK IS WINDING DOWN BUT DON'T SLACK OFF ON THE "SAFE WORKER" ATTITUDE. THE WORK BEING DONE NOW IS IMPORTANT, SO IS SAFETY. HARD HATS, GLOVES AND BOOTS ARE REQUIRED FOR ALL JOBS BEING DONE, PLUS ANY SPECIAL PERSONAL PROTECTIVE EQUIPMENT SUCH AS CHAPS AND EAR PROTECTION FOR CHAINSAW USE. BE ESPECIALLY CAREFUL WHEN WORKING NEAR DOZERS AND FELLING TREES..



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

SUPPRESSION ORGANIZATION CHART

1. Name: Mack Lake Fire

2. Fire No.:

3. Date: 5/6/80

4. Responsible Officer:

5. Time: 6. Shift

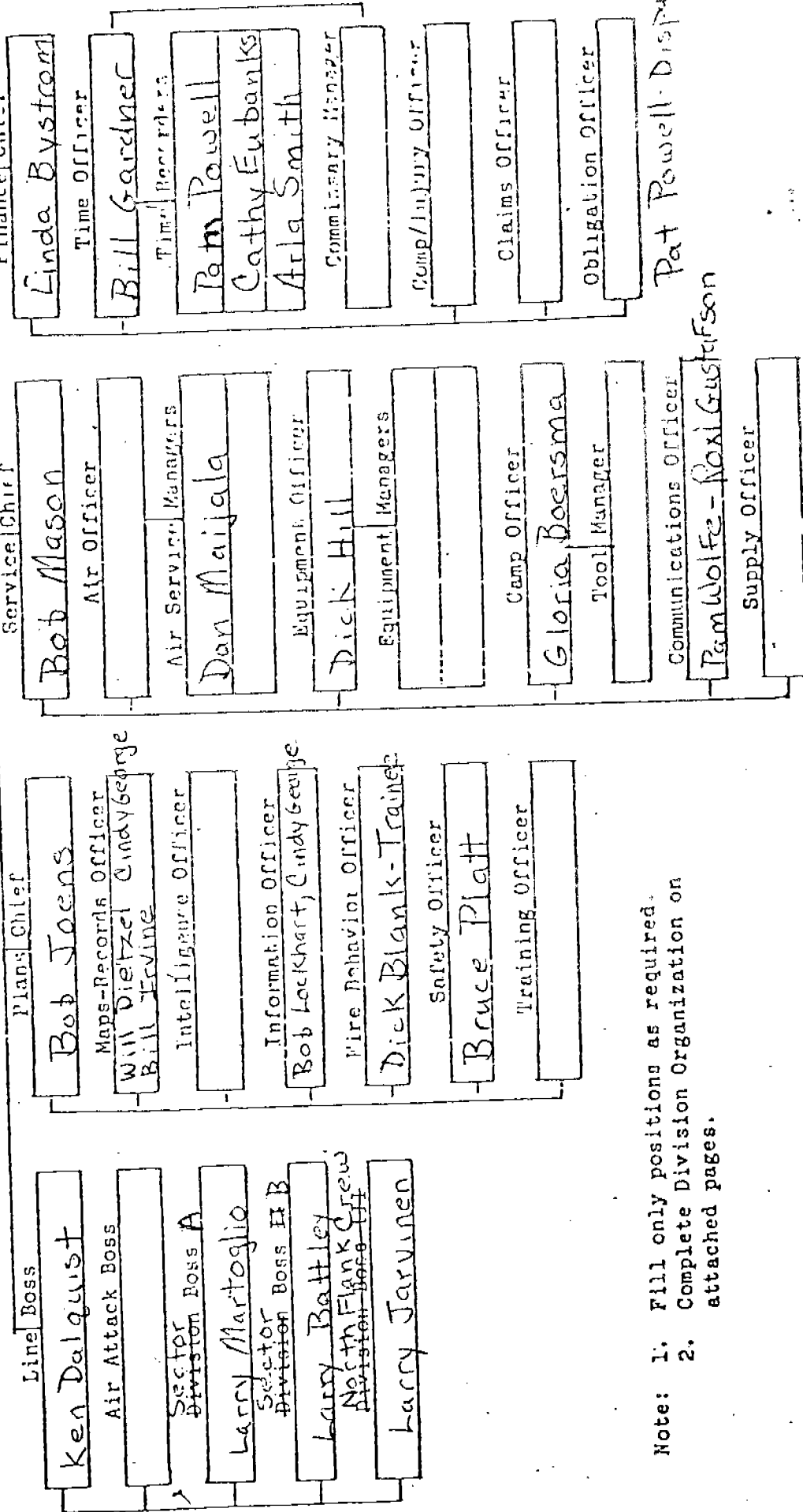
Fire Boss

Paul Martin

Resource Advisors  
Don Krejcarek  
Bob Radtke

Comptroller

Ass't Fire Boss



Note: 1. Fill only positions as required.  
2. Complete Division Organization on attached pages.

REHABILITATION PLAN FOR MACK LAKE FIRE

5/6/80

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