Introduction to Wildland Fire Suppression for Michigan Fire Departments

STUDENT WORKBOOK

1ST Edition – 2002

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Michigan Department of Natural Resources DNR

"CODE OF CONDUCT FOR SAFE PRACTICES"

* Firefighter safety comes first on every fire, every time.

* The 10 Standard Fire Orders are firm. We don't break them; we don't bend them.

* Every firefighter has the right to know that their assignment is safe.

* Every fireline supervisor, every fire manager, and every line officer has the responsibility to ensure compliance with safe firefighting practices.

INTRODUCTION TO WILDLAND FIRE SUPPRESSION FOR MICHIGAN FIRE DEPARTMENTS

STUDENT WORKBOOK

Student Workbook
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INTRODUCTION TO THE COURSE

This course is specifically designed for the inexperienced firefighter or for firefighters with previous experience and training that need reinforcement of existing knowledge. This course will provide the basic training needed to make a safe, effective initial attack on smaller "forest fires" in **Michigan**.

This is a 7 hour course. It will be presented using short lectures, accompanied by slides, viewgraphs, and videotapes. Class discussion and demonstrations are encouraged. This student workbook is provided for notes and mind joggers to emphasize key points and principles.

Short written or oral quizzes may be given at the end of each unit to provide instructors with feedback as the course progresses. These quizzes are designed to help you review the material covered in each unit. A final exam will be given at the conclusion of the course.

INSTRUCTIONS

As the lesson progresses, jot down brief comments, key words, or other indicators that will help you develop a more detailed and complete answer later.

PERFORMANCE OBJECTIVES

Upon successful completion of the course the trainee will be able to:

A. Understand Michigan's forest fire laws, authorities, and the responsibilities of the DNR, local fire departments, and the party responsible.

B. Describe the effects of fuel, weather, and topography on wildland fire behavior, and to predict the direction and rate of the fire spread.

C. Correctly define wildland fire terms commonly used in the course and fire service.

D. Locate and safely respond to a wildfire; size-up the situation in order to develop a plan of attack.

E. Select the appropriate method of suppression for a given fire situation;

employ mobile engine attack strategies and construct fireline using hand tools to meet given standards.

F. Secure the fireline, and ensure complete extinguishment of a given fire by employing recognized mop-up techniques.

G. Understand organization of the Incident Command System, basic terminology, and common responsibilities to effectively manage a wildfire incident.

H. Detect potentially hazardous situations by using standard safety practices and promptly communicate such hazards to a fireline supervisor.

UNIT I - MICHIGAN FOREST FIRE LAWS

OBJECTIVES

The trainee will gain basic knowledge of Michigan's Forest Fire Laws including the definition of "forest fire," the section of the State Statutes that contain the forest fire laws, and know who is responsible for costs of suppression and damages.

INTRODUCTION

The majority of the laws concerning wildland fire ("forest fires") are found under the heading "Prevention and Suppression of Forest Fires" and are found in Chapter 324 of the Michigan Statutes.

Many of these laws are listed below to use as a future reference. A complete listing can be found in the *Michigan Fire Law Enforcement Guide* published by the Michigan Interagency Wildland Fire Protection Association.

MICHIGAN FOREST FIRE STATUTES

This is not a complete list of the Michigan Forest Fire Statutes. However it is a sample of a few of the more important laws involved in forest fire control. The paragraphs in Italics are commentaries about the above section and not part of the actual law's text.

Department of natural resources; authority; appointment of assistants

324.51502. The department shall have charge of the prevention and suppression of forest fires and shall appoint assistants as needed to implement this part.

> *(DNR has responsibility for all forest fires. This is our basic authority to do what we do. Notice that it does not say that DNR is the only agency that can suppress these fires).*

Burning permits; conditions

324.51503. (1) At any time the ground is not snow-covered, a person shall not burn any flammable material on or adjacent to forest land, except for domestic purposes, without a permit from the department.

(2) The department shall set the times of day and, consistent with this part, the conditions under which burning for other than domestic purposes on or adjacent to forest land is permitted.

(3) Any person doing any burning on or adjacent to forest land for other than domestic purposes, prior to such burning operations, and at all times while the burning continues, shall take such action in and around the area in which the burning is done so as to prevent the spread of fire as may be required by the department.

(This section (2) of the law gives DNR the authority to regulate open burning through a permit process. The key thing to understand is that the law only provides for permits for burning "on or adjacent to forest land," which is specifically defined to exclude "lands devoted to agriculture." Note that permits are not needed for burning done "for domestic purposes" which is defined as burning done in an approved burn barrel and a campfire.)

Department of natural resources director; administration of part; rules; investigations; surveys; construction of part as to other law enforcement agencies and local ordinances and regulations

324.51513. The department shall administer this part and shall promulgate rules necessary to implement this part. The department may make, conduct, or participate in investigations and surveys designed to establish the cause of a responsibility for a particular forest fire or forest fire conditions generally. This part does not limit or otherwise impair the jurisdiction or powers of any other department, agency, or officer of this state to investigate, apprehend, and prosecute violators of this part or **obviate local ordinances or prevent enactment of local regulations that are as restrictive or more restrictive than this part.**

(This section of the law allows local burning ordinances to take precedence over the State Forest Fire Law, and describes the conditions under which a local ordinance may do so.)

Acts prohibited

324.51504. A person shall not do any of the following (also see 750.78 – Willfully or Negligently Setting Fire to Woods, Prairies, or Grounds):

(a) Dispose of a lighted match, cigarette, cigar, ashes or other flaming or glowing substances, or any other substance or thing that is likely to ignite a forest, brush, grass, or woods fire; or throw or drop from a moving vehicle any such object or substance.

(b) Set fire to, or cause or procure the setting on fire of, any flammable material on or adjacent to forest land without taking reasonable precautions both before and while lighting the fire and at all times after the lighting of the fire to prevent the escape of the fire; or leave the fire before it is extinguished.

(e) Use or operate on or adjacent to forest land, a welding torch, tar pot, or other device that may cause a fire, without clearing flammable material surrounding the operation or without taking other reasonable precautions necessary to ensure against the starting and spreading of fire.

(f) Operate or cause to be operated any engine, other machinery, or powered vehicle not equipped with spark arresters or other suitable devices to prevent the escape of fire or sparks.

(This section describes a number of unlawful acts. Notice that paragraph b makes it unlawful to leave a fire unattended. Paragraph f requires the use of approved spark arresters on ***all*** *internal combustion engines used in wildland areas.)*

Intentionally causing fire

324.51510. A person shall not do any of the following (also see 750.78 – Willfully or Negligently Setting Fire to Woods, Prairies, or Grounds):

(a) Willfully, maliciously, or wantonly set fire or cause or procure to be set on fire any forest land, lands adjacent to forest land, or flammable material on such forest land.

(b) Willfully, maliciously, or wantonly set, throw, or place any device, instrument, paraphernalia, or substance in or adjacent to any forest land with intent to set fire to the land or which in the natural course of events would result in fire being set to the forest land.

(Wildland arson is defined and the penalties set in this section.)

Extreme fire hazard conditions; proclamation by governor as to use of fire; prohibited acts

324.51507. (1) Whenever the governor finds that conditions of extreme fire hazard exist and that it is necessary in the public interest and for the preservation of the public peace, health, and safety, he or she may forbid, by proclamation, the use of fire by any person entering forest lands or lands adjacent to forest lands in parts of the state as he or she considers the public interest requires. The proclamation shall be in full force and effect 24 hours after notice is given by the governor.

(2) During periods described in subsection (1), and in such areas as the governor proclaims, a person shall not do any of the following:

(a) Build a campfire of any nature, except within containers at authorized campgrounds or places of habitation.

(b) Smoke a pipe, cigarette, or cigar, except at places of habitation, authorized improved campgrounds, or in any automobile or truck.

(c) Burn or cause to be burned any flammable material unless he or she first obtains a permit, in writing, to do so as provided in this part.

(This part of the law defines the Governor's Proclamation, or "burn ban" process, and what it does and does not restrict.)

Liability for Forest Fires

324.51509. Any person who sets fire on any land and negligently allows the fire to escape and become a forest or grass fire is liable for all expenses incurred by the state in the suppression of the fire.

324.51506. Any person who, in violating this part, causes a forest or grass fire is liable for all damages resulting from that fire, including the cost of any governmental unit fighting the fire. This part does not affect any other right of action for damages.

(Anyone who, through negligence or a violation of the State Forest Fire Law, causes a forest or grass fire is liable for all damages and suppression costs.)

SUMMARY

Your job as a firefighter is the protection of lives, property, structures, and resources. Even though your job is not primarily law enforcement, you cannot condone violation of the laws. This is why we want you to be more aware of the forest fire laws than the average citizen.

REVIEW

1. In Chapter 324 of the Michigan Statutes, what agency is to have charge of the prevention and suppression of forest fires?

   _____

2. When is a burn permit required?

   _____

3. What types of outdoor burning are exempt from the need for a burn permit?

---

4. Any person who sets fire on any land and allows such fire to escape and become a forest fire shall.....

---

5. True or false? It is against the law for anyone to leave a fire without properly extinguishing it.

UNIT II - FIRE BEHAVIOR

OBJECTIVES

Upon completion of this unit the trainee will be able to:

1. Draw a fire triangle and describe how the major elements of fuel, oxygen, and heat affect combustion.

2. Describe how weather factors—i.e. wind (speed and direction), relative humidity, and temperature affect the spread of fires in natural fuels.

3. Describe how fuel volume, size, arrangement, and moisture affect the spread of fire.

4. Describe how topography (slope and aspect) affects the spread of fire in natural fuels.

5. Define the adjective ratings (Low, Moderate, High, Very High, and Extreme) of fire danger ratings which are used in media news.

INTRODUCTION

DEFINITION: Fire Behavior is the manner in which fuel ignites, flame develops, and fire spreads and exhibits other phenomena. The combined effects of the fire's environment on how the fire acts or behaves.

A basic understanding of fire behavior is necessary for each firefighter. This knowledge is a necessary aid in safe and effective control of wildland fires.

A firefighter must know what the fire is doing at all times. Firefighters must base their action on what the fire is doing now and what they expect it to do. A firefighter can do neither of these unless the firefighter understands something about fire behavior.

After completion of this lesson, you will be able to identify the influences that fuel, weather, and topography have on fire behavior.

HOW A FIRE BURNS

To understand how a fire behaves, you must have some understanding of how a fire burns. The act of burning is called _____.

In order for combustion to occur, _____, _____, and _____ must be present.

Together these three components form what is known as the _____ _____. In our situation, the wildland fire fuels are the forest vegetation, oxygen is the air around us, and heat comes from lightning or man. All these things in combination create fire combustion.

FUEL + AIR + HEAT = FIRE

If you alter or change any one of the components of the fire triangle, the fire will behave differently. If you remove any one of these elements from the triangle, there can be no fire. Each of the hand tools and equipment utilized on a wildland fire was designed to remove at least one leg of the fire triangle and thus extinguish the fire.

HOW A FIRE SPREADS

In order for a fire to spread from point "A" to point "B," fuel, heat and oxygen must be present. The fuel bed must be sufficiently continuous for the fire to spread from one particle to another. The oxygen will be available since most forest fuels are surrounded with air. The real variable, and the one which most suppression actions deals with is the ability to transfer heat energy from one fuel particle to another. There are three methods of "heat transfer." They are:

1. _____

   Heat is transferred through the air from one object to another. The heat is transferred through space, at the speed of light, in all directions and is not affected by wind. In radiation, the heating surface does not have to be in contact with the heated surface.

2. _____

   Heat is transferred by the movement of hot air, burning gases and smoke rising and heating the fuel above.

3. _____

   The transfer of heat through an object. <u>This method has the least effect on the spread of a wildland fire</u> because wood is a poor conductor of heat.

FACTORS THAT INFLUENCE IGNITION AND SPREAD

Let's talk about some of the factors that influence how likely it is a fire will start and how it will spread once it is started.

Fuels

The likelihood of a fire starting is dependent upon the <u>ignition temperature</u> of a fuel. This is the temperature of a substance or a fuel at which it will ignite and continue to burn without any heat from an outside source. Different fuels have different ignition temperatures.

There are other things that influence the ease of ignition of a fuel and the rate-of-spread. These are fuel moisture, size, continuity, and volume.

1. _____ _____ is a comparison of the amount of moisture in a

piece of fuel (total weight) compared to the weight of that fuel when it is oven dry. Fuel moisture is a primary factor that influences the ease of ignition (how easy a fire will start) and the rate of combustion (how fast they will burn). The more moisture a fuel contains, the more heat is required to ignite it. Moisture within the fuel must first be vaporized and driven from the fuel before it can be raised to its ignition point (fire start).

2. Fuel Size - _____ or _____ vs. _____ or

3. Continuity - Another factor that influences the spread of a fire is continuity of fuels. This is through _____ and spacing.

   The most commonly used method of fire suppression is to break the continuity of the fuel by separating burning fuels from unburned fuels. This is the fireline.

4. Fuel Loading - _____ or quantity. The more fuel there is to burn, the more intense the fire can be and the harder the fire will be to extinguish.

Weather

One of the most important factors affecting the behavior of a fire is weather. In fire control, we usually break weather into three parts. These are:

1. _____

2. _____

3. _____

Of these factors, _____ plays the most important role. This is due to the fact that it is subject to the most rapid change over time.

Topography

Where the fire is burning, whether it is in steep terrain or flat ground, the lay of the land is an all-important factor in the rate and direction of fire spread. This lay of the land (or configuration of the land surface) is called topography.

Topography is usually broken into three parts. These are:

1. _____

2. _____

3. _____

Of these three factors _____ has the greatest influence on fire behavior.

FIRE DANGER RATINGS AND COLOR CODES

The five ratings of fire danger are identified as: Low, Moderate, High, Very High, and Extreme. Each fire danger class represents the net effect of several factors that can be combined to identify a broad but distinctive level of potential fire load to a fire fighting agency. The ratings express the relative ease of a fire brand igniting a fire and the maximum effort that will be required to contain a fire during a rating period.

1. _____ - green

Fire danger negligible; Fires will start from open flame, spread slowly and in the absence of wind tend to go out. The safe time to burn.

2. _____ - blue

Some wildfires probable. Fires start from a match or burning embers, spread quickly in dry grass or leaves. Average control difficulties on escaped fires. Burn with caution.

3. _____ - yellow

Fires start readily from a match or sparks, spread quickly, and spot readily. Fires in heavy fuels will be difficult to control. Extra precautions are required on outdoor burning.

4. _____ - orange

Fires start easily, spread very rapidly, crown and spot. Conditions are dangerous and wildfires are difficult to control. Burning is not recommended.

5. _____ - red

Conditions are explosive. Wildland fuels (vegetation) are tinder dry. Fires start easily, burn fiercely and crown readily. Fires are often very difficult or impossible to control during the day. All wildfires require reinforced attack. Outdoor burning of any kind is not recommended.

UNIT III- WILDLAND FIRE TERMINOLOGY

OBJECTIVES

Upon completion of this unit, the trainee will:

1. Know the proper terminology for the three types of wildland fires.

2. Know the proper terminology for the most important parts of a wildland fire.

3. Be aware of the glossary of other wildland fire terms available in Appendix A of this workbook.

TYPES OF FIRES

A _____fire is a fire that burns grass, brush, and small plants. It also removes the valuable humus layer from the soil.

A _____ fire is one that burns under the ground, often called a "peat" fire, and is very stubborn to suppress.

A _____ fire races through the tops of the trees and is the most complex type of fire to suppress. This usually happens in areas where pine, or other “evergreen,” trees are predominant.

PARTS OF A FIRE

This is as important as being able to read a map. As we go through the slides and descriptions use your notebook to write down the parts of a fire in the blanks provided, and on the diagram on page 23.

A._____-- Where the fire started. Important as a starting point for investigation of the cause of the fire. Try to protect this area from outside disturbances.

B._____ of the Fire -- The upwind side of the fire, where it is backing into the wind. This is a good point to "anchor" your fireline and proceed up the flanks of the fire.

C. _____-- The sides of the fire. Usually called the "right" and "left" flank. This is oriented looking from the rear of the fire towards the head of the fire.

D._____ -- The "hot" end of the fire. Where the most active flaming front is located. Usually "downwind" from the rear of the fire.

E._____- Like your hand these are areas that seem to spread independently. May be caused by the fire going around an obstacle or non-flammable fuel.

F._____ -- The outside edge of the fire. The area inside this perimeter is used to measure the fire size.

G._____ POINT -- Where line building efforts begin. Should be located

at the rear of the fire where there is little chance of the fire backing around it and racing up on the outside of your fireline.

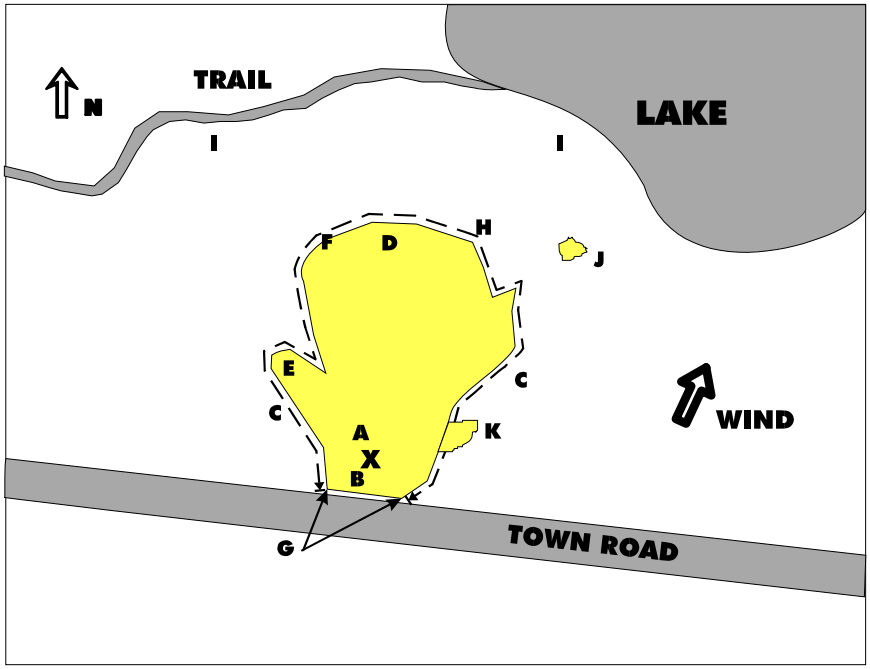
H._____ LINE -- An inclusive term for all constructed or natural fire barriers and treated fire edge used to control a fire. The part of the control line scraped or dug to mineral soil is also referred to as the FIRELINE.

I. _____ -- Any natural or constructed barrier where fire spread is stopped or planned to be stopped.

J. _____ FIRE -- A fire set outside the perimeter of the main fire by flying sparks or embers. They may be located up to one mile ahead of the main fire, but are usually within 1/4 mile. Dangerous because they can trap firefighters between the main fire and the spot fire.

K._____ _____ -- Also called "break-out." This is a place along the fireline where the fire has broken over the line into fresh fuels on the "outside" of the fireline. Dangerous because the fire can race up alongside the line trapping firefighters between the original fire and this new fire. The line must be patrolled behind suppression crews to spot these. This person must have contact (radio) with suppression crews at all times to report slop-overs.

Figure 1 - Parts of A Wildfire



UNIT IV - LOCATING AND SIZING-UP THE WILDFIRE

OBJECTIVES

Upon completion of this unit, the trainee will be able to:

1. List the information needed from the caller at the time a fire is reported.

2. List five factors that should be considered while enroute to a fire.

3. List eleven factors that should be considered during a size-up assessment upon arrival at the fire scene.

4. List eight items that should be included in an initial action plan.

5. Provide a complete conditions or status report to the agency dispatcher.

6. Develop a safe and efficient plan of action to suppress the fire.

INTRODUCTION

DEFINITION: Size-up is the preliminary and continuing appraisal of the overall fire situation for purposes of determining appropriate control actions.

Prompt action is of prime importance in the early stages of a fire, for it can mean the difference between a small fire and a large one. Accordingly, you should leave as soon as possible.

When traveling to a fire, take the route that will bring you closest to the blaze in the shortest time. Although speed is important, don't jeopardize the public, yourself, or your equipment by driving in a careless manner.

Upon arrival at the scene, first impressions are important. Size-up the situation and make a determination of how to best attack the blaze. This may require walking the perimeter of the fire in order to get essential information about the fire and the territory in which it is burning. Without this information your attack may be ineffectual.

FACTORS INVOLVED IN TAKING THE CALL AND GATHERING PERTINENT INFORMATION ABOUT THE FIRE WHILE ENROUTE

Information needed from the caller:

1. _____ of caller, address, call back number.
2. _____ of the fire (property fire number, road name, address, legal description).
3. Best _____ to the fire.
4. Landowner name. May be different from the caller.
5. _____ of the fire and rate of _____.
6. What's burning now/ what may be threatened.
7. Suspected _____.

WRITE IT DOWN!!!

ENROUTE TO THE FIRE

1. Consider your knowledge of the fire area:

   a. _____ and terrain

   b. _____ roads and trails

   c. Barriers to fire spread

   d. Property ownership

   e. Fire _____ and causes in the area

   f. Nearby _____ sources

   g. Special _____

2. Think about recent fire behavior considering:

   a. Current _____ conditions

   b. Fuels and topography

   c. How this fire will behave compared to others

   d. Is fire danger increasing or decreasing?

3. Look for local current weather indicators:

   a. Wind direction and _____

   b. Dust devils or gusty winds - indicators of unstable weather

   c. Are unfavorable weather changes imminent?

   d. Impact of diurnal winds

4. After sighting smoke column check the:

   a. Color - indicator of _____
   b. Amount - indicates _____
   c. Shape - indicates _____

5. Approaching fire area, look for:

   a. Alternate access routes

   b. Potential _____ or suspects leaving

   c. _____ routes

   d. Hazards, risks, & exposures

   e. Evidence of fire cause

   USE CAUTION WHILE APPROACHING THE FIRE SCENE!

ARRIVAL ON FIRE SCENE

Take a minute to look at the total fire picture. The next few minutes are critical to the success of the initial attack. The fire scene must be rapidly sized-up" in order to determine how to best attack the blaze. This may require walking or scouting the entire perimeter of the fire. The first thing to do at the scene of a fire is to size-up the entire situation and determine the best method of attack, considering safety as the number one priority.

Fires should be fought aggressively but the safety and protection of personnel and equipment must be the first concern. Some general rules are:

- Provide for firefighter safety (LACES).
- Establish command early in the operations.
- Consider establishing a staging area.
- Protect the area of origin and any evidence you see.
- Do not cross the head of the fire unless it can be safely done.

SIZE-UP ASSESSMENT

Factors to consider:

1. Safety of firefighters and equipment
2. Point of _____ and _____
3. _____ of the fire
4. Length of the fire perimeter
5. Location of the head of the fire
6. Forces on the scene
7. Values threatened
8. _____ conditions
9. Fire _____ and intensity
10. Fuel types
11. Topography
12. Time of _____ and season

PLANNING THE ATTACK

As soon as you have completed your initial size-up of the fire, you should plan and implement an immediate attack, taking into consideration the fire situation, the availability of personnel and equipment. Your knowledge of fire behavior and suppression methods learned in previous classes will be most helpful in determining how you are going to handle the fire.

Factors to consider:

1. Safety
2. Where to attack the fire
3. Method of _____
4. Location and type of _____ _____
5. Estimated completion rates
6. Estimate probable _____ rates and expected fire behavior
7. Determine location and extent of possible danger spots

8. Hazards and risks
9. Location of _____ routes
10. Protecting the point of origin
11. Arrival of additional units

STATUS REPORTING

At the earliest opportunity, and periodically, as conditions change, a report should be provided to the agency dispatcher in a clear, concise format.

Information to include in a conditions report:

1. Notification of command establishment
2. Location and access to the fire area
3. Size of the fire
4. Anticipated control problems
5. Values threatened
6. Anticipated time of control
7. Resources committed or needed
8. Fire behavior encountered

UNIT V - WILDLAND FIRE SUPPRESSION METHODS

OBJECTIVES

Upon completion of this unit, the trainee will be able to:

1. Define direct, and indirect suppression methods and list the conditions when each are used.

2. Illustrate the standards of direct and indirect fireline construction necessary to control fast moving fires in light fuels.

3. Locate fireline placement in flat and rough terrain.

4. List potential safety hazards involved in the use of direct and indirect line building methods and precautions to be taken in each case.

5. List the four mobile attack strategies with engines and when each should be used.

6. Demonstrate the proper use of water in attacking a wildland fire.

7. Demonstrate the identification, proper use, and maintenance of the hand tools used to construct fireline on wildland fires.

INITIAL ATTACK STRATEGIES

The strategy used to control a fire depends on the rate of spread, intensity, spotting potential, values at risk, size, type of available attack resources, and other factors. Anchor control lines to an existing barrier such as a road, creek, burned area, etc., to minimize the chance of being flanked by the fire. Fire attack may involve one, or a combination of, the following strategies.

There are two basic methods of attack:

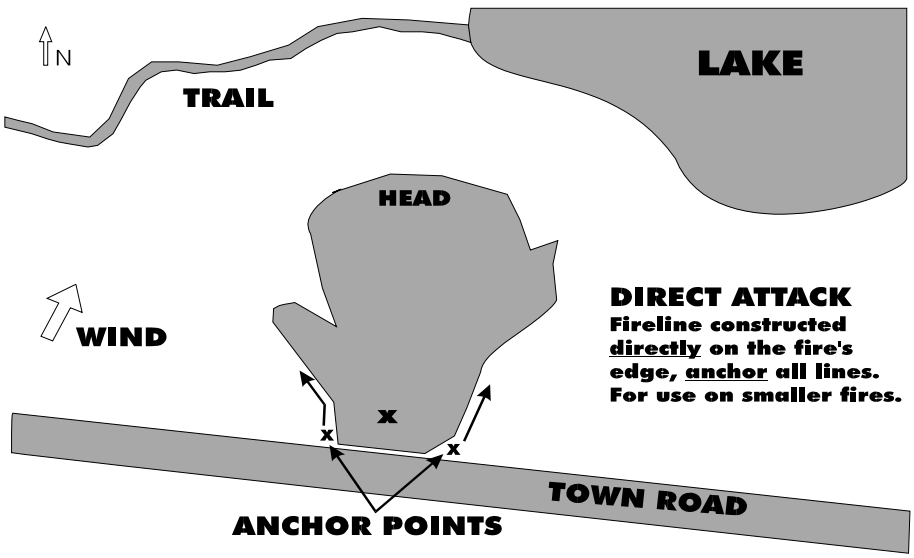
A. THE DIRECT ATTACK

The direct attack method consists of a series of related direct actions to cool, drown, smother, beat out, starve, or otherwise extinguish the flames of a going wildfire. As the term implies the control line is constructed along and directly on the edge of the fire.

B. THE INDIRECT ATTACK

The indirect method of attack is used when a direct attack is not possible or practical. In this method, firefighters select the *ground* on which to meet the fire to gain the greatest advantage in suppression and control of the fire. This tactic locates the fireline some distance from the fire's edge. How far is critical. Topography, fuel type, fire behavior, and available fire fighting resources dictate fireline placement.

A. THE DIRECT ATTACK



Conditions when used:

a Control efforts, including line construction, are conducted at the fire perimeter, which becomes the control line.

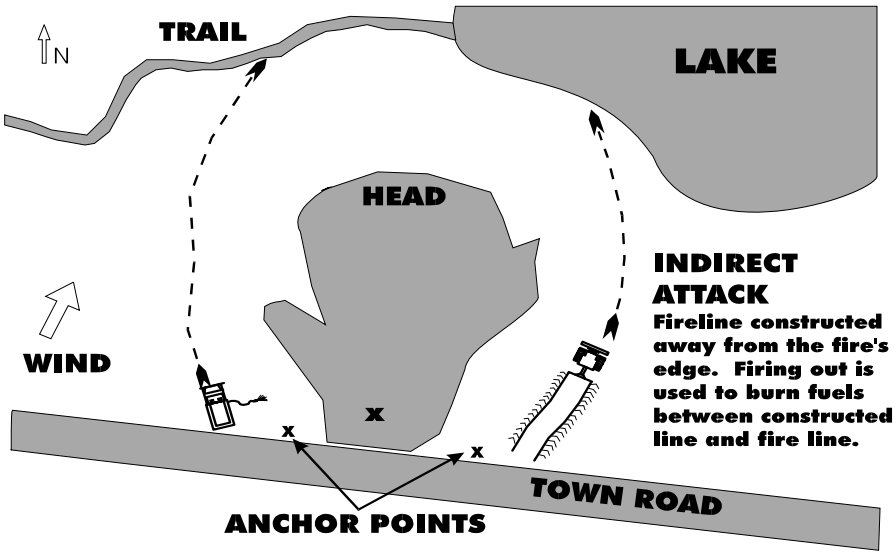
b. Used when fire perimeter is burning at low intensity and fuels are light, permitting safe operation at the fires edge.

c. Often used where high value resources and/or improvements are threatened.

d. The burned area is kept to a minimum.

e. In light fuels, such as grass, attack may be from inside or outside the *black*.

B. THE INDIRECT ATTACK



Conditions when used:

a. Control line is located along natural firebreaks, favorable breaks in topography, or at considerable distance from the fire. The strip of unburned fuel between the fireline and the edge of the fire is burned out as soon as possible during fireline construction.

b. Applications include: fast moving ground fires that are too intense for crews or equipment to work safely on the flanks, crown fires, steep terrain, excessively wet areas, or areas with preplanned or natural barriers.

c. If an indirect attack is necessary, the fire may be rapidly increasing in complexity to one requiring extended attack forces. Be alert to this possibility.

FIRE CONTROL TACTICS

PRINCIPLES OF FIRELINE LOCATION

No matter what strategy is selected to control the fire, (e.g. direct, or indirect attack) the following principles should be considered in locating the control line:

1. Locate the line an adequate distance from the fire so it can be completed, burned out and held, considering the predicted rate of spread, and the fire's behavior.

2. Allow adequate time for firefighters to not only build line, but also to do other work, such as fell snags, and burn out.

3. Make the line as short and straight as possible.

4. Use the easiest routes for control without sacrificing:

    a. The ability to hold the line.
    b. Too much area or values.

5. Eliminate possible hazards from the fire area.

6. Avoid undercut lines (a fireline below a fire on a slope) and sharp turns in the line.

7. Utilize existing natural and man made barriers.

8. Use machinery, where possible, for line construction.

9. Provide for safety of all firefighters (see unit VIII).

PRINCIPLES OF LINE CONSTRUCTION

1. Anchor all control lines.

2. Build continuous fireline. Burnout firelines as control line proceeds.

3. Make the line no wider than is necessary for control.

4. Clean all lines to mineral soil where practical.

5. Discard unburned line construction material outside of the fireline.

6. Scatter charred or burning material inside the burned area.

7. Construct trenched lines to catch rolling materials below the fireline on steep slopes (not common in Michigan).

8. Increase effectiveness of line width by cooling down adjacent fire with dirt or water.

9. Cover or wet down rotten logs and stumps that are just outside the control line, with dirt or water.

10. Fall all snags (e.g. standing dead trees) that are near the line, before burnout begins if time permits.

PRINCIPLES OF WATER USE

1. Use water sparingly when in short supply.

2. Direct the water at the base of the flames.

3. Spray the water parallel to the line of fire as much as possible.

4. Firefighters with hand tools must work with the nozzle person to make effective use of water (especially during mop-up).

5. Good communication is required between the nozzle person and the water source.

6. Plan for ample water supply.

7. Coordinate so that all units do not run out of water at the same time during critical period.

8. Do not block roads.

9. Keep engines headed in the right direction for escape, if necessary.

10. It is the Michigan DNR's policy to follow up with a fireline to mineral soil around the entire fire after direct attack with water where

appropriate.

11. Provide eye protection for use by nozzle operator.

12. Consider the use of foam or other water additives to increase effectiveness and save water.

BURNING OUT

Setting fire inside a control line to consume fuel between the edge of the control line and the fire to strengthen the fireline (create a black line). Burning out removes the danger that fuel near the line will burn at a later date when no one is around, or when conditions are such that flare-ups near the line would spot over the line.

USE OF ENGINES ON WILDFIRES

The Engine (4 X 4 Brush Truck) is the most versatile element in the fire service. It carries firefighters, water, hose, and other fire fighting equipment. It usually transports the first Incident Commander to the scene of an emergency, and is a communications link to the central dispatch.

Engines can be used for:

- Initial attack on fires.
- Transporting hand crews that will construct control line.
- Mop-up and patrolling fires.
- Supplying water (or foam) to hose lays, and back can pumps, and resupplying other engines.
- Protecting structures or other valuable resources.
- Providing medical aid to injured firefighters or members of the public.

CONDITIONS WHEN MOBILE ATTACK IS USED

1. When the fuels are light (i.e. grass or scattered brush).

2. When the topography and soil allows the maneuvering of an engine across it.

3. Engine must have pump and roll capabilities (i.e. be able to pump while

moving).

4. Engine must be constructed for the task (i.e. have adequate clearance and flexibility).

PRINCIPLES OF MOBILE ATTACKS

1. Mobile attack with engine companies is a fast, efficient method of controlling wildland fires. An engine operator, a hose-puller, and a nozzle operator are desirable for effective, safe use of engines in fire suppression.

2. In a mobile attack the engine drives along the edge of the fire and the nozzle person walks just ahead and to the side of the engine, extinguishing the fire as they move. The nozzle person and hose-puller must always be in plain view of the engine operator.

3. The nozzle person and the engine should work from the *black* (area that has burnt) whenever possible in light fuels.

4. A mobile attack may be a direct or an indirect attack. The distance the control line is from the fire edge usually is dependent on fire intensity.

5. The engine moves along the line as fast as the fire is extinguished. Be sure *all* fire is extinguished! (All too often, a mobile attack moves too fast and the fire flares up behind the engine.

6. If possible, backup the engine's water line with a hand crew.

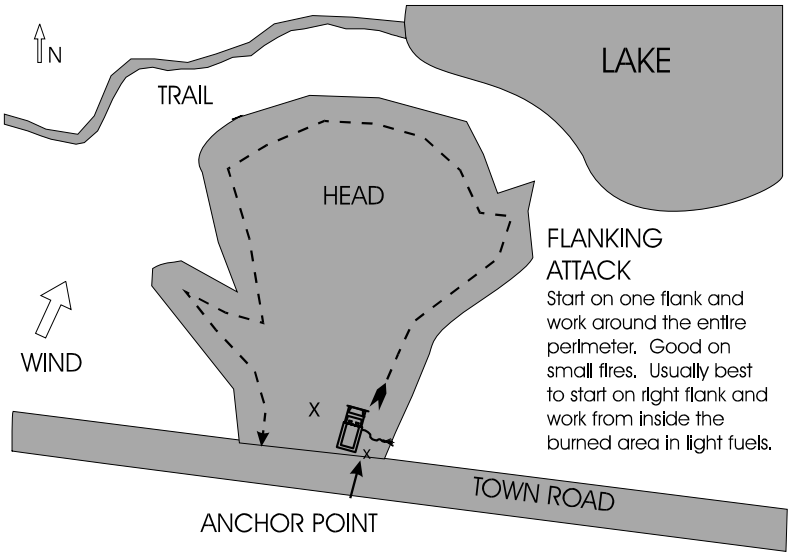
RECOGNIZE SITUATIONS WHERE A MOBILE ATTACK WITH ENGINES *SHOULD NOT BE USED*

1. Fire fighter safety would be compromised.
2. Fuels are too heavy to permit travel along the fireline.
3. Poor access to and from the fireline.
4. Terrain is too rugged for vehicle travel.
5. Water supply is too far from the fire for effective operations.
6. Support units or crews for engines are not available.
7. When attempting to control the fronts of fast spreading fires.

MOBILE ATTACK METHODS:

1. **FLANKING ATTACK WITH AN ENGINE:**

In a flanking attack the engine ties in with existing break near the rear of the fire and proceeds up one flank of the fire toward the head. Continue down the other flank, being careful to watch for any spots that rekindle along the extinguished portion of the fire perimeter.



a. Attack from the black (burned area)!!

b. Utilize a nozzle person who walks in front of the engine, in the burned area, to set the speed of the attack.

c. Watch for rekindles if there is no follow-up. Return to areas of rekindle prior to continuing your attack.

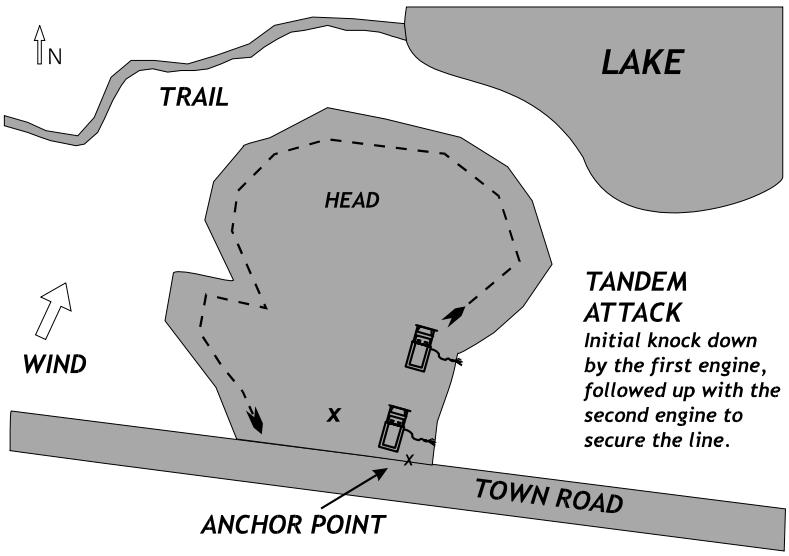
d. Normally initial attack begins on the right flank of the fire due to weather factors, however, consider a left flank attack first if weather or improvements needing protection dictate a left flank attack first.

e. Use a spotter to assist in direction of the engine, especially in spotty burns, or in fuels where hazards need to be identified.

2. TANDEM ATTACK WITH ENGINES:

A Tandem Attack is a flanking attack that involves two or more engines or other fire apparatus, (e.g. dozer, hand crew, etc) working together on a flank.

Use a tandem attack if the fuel is heavy or matted. The key is not to have any rekindles.



a. The lead engine takes the heat out of the fire, ATTACKING FROM THE BLACK (burned area) after starting from an anchor point.

b. The second engine is used to follow the first engine, picking up hot spots, and securing the control line.

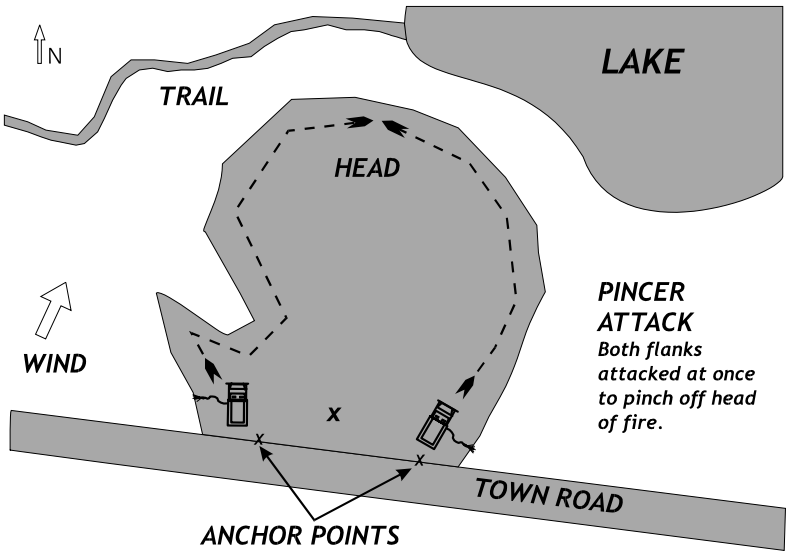
c. The lead engine can move faster knowing that the tandem engine will pick up the hot spots. The second engine must watch for rekindles. Use spotters to direct engines, especially if hazards exist.

d. The engines can also *leap frog* each other, thus giving firefighters on the lead engine a break from heat and smoke.

e. Attack the right flank first, unless weather, improvements or fuel types dictate a left flank attack.

3. THE PINCER ATTACK WITH ENGINES:

In the Pincer Attack both flanks of the fire are attacked at approximately the same time, with the objective of "pinching" off the fire at the head.



a. Both units begin at the rear of the fire after anchoring their control lines. ATTACH FROM THE BLACK (burned area)!

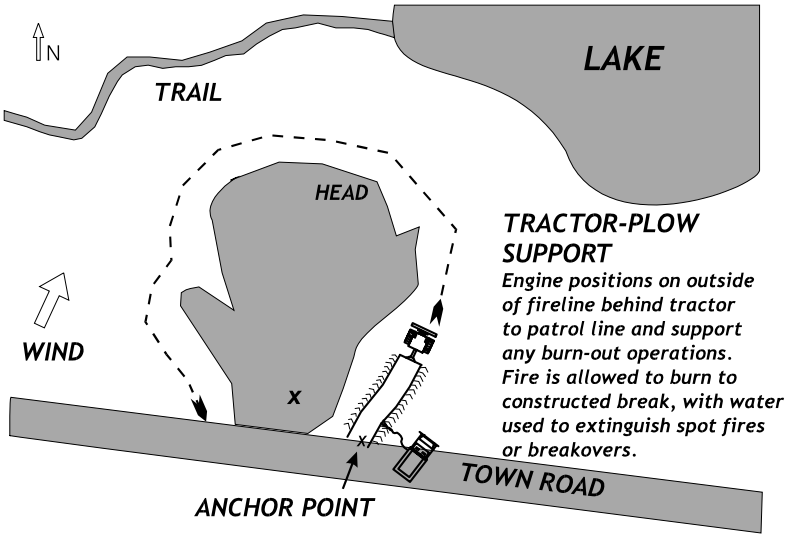
b. The attack moves up the right and the left flanks in a coordinated effort. Watch for rekindles. Use a spotter to direct engines, especially when hazards exist.

c. Proceed with the attack until the engines meet. At this point, each engine can then cross and proceed back down the other's flank to fortify the line.

4. TRACTOR-PLOW SUPPORT

Tractor-plow support is an attack that involves engines working together with tractor-plows or dozers to construct and hold a fireline.

Use this attack if the fuel is heavy or matted, and tractor-plows or dozers are being utilized. The key is to ensure a black line exists inside the constructed break.



a. Position the engine a safe distance behind the tractor-plow on the outside of a furrow or along the dozed break.

b. Allow the fire to burn up to the constructed break or assist with burning out as line construction progresses. Do not apply water inside the burn area unless needed to cool down flare-ups that may threaten the fireline.

c. The engine is used to contain spot fires or slop-overs that may cross the control line. Communicate with the tractor-plow operator regarding any fire that jumps the line.

d. Maintain communications and/or visual contact with the tractor-plow unit at all times. Maintain a safe distance of at least one and a half times the height of surrounding trees from a tractor-plow unit or dozer. Be ready to move your engine out of the way if needed.

FIXED ATTACK USING HOSELAYS:

1. Booster Reels

a. Small diameter, rubber hose mounted on a reel. Durable. Easy to deploy and retrieve.

b. Best used for small fires or mop-up when a lot of water isn't needed and access is good.

c. Do not use to start an extended hose lay due to high friction loss and an inadequate amount of water.

2. Simple Hoselays

a. Pre-connect hose is laid from the engine to the fire and then charged (laid dry).

b. Best used on small fires away from the engine when quick extinguishment is possible or when more water is needed than from a booster line.

c. Hose is most often 1", 1-1/2", or 1-3/4", single or double jacket.

d. Be careful when laying hose to avoid damage from fire and heavy equipment.

3. Progressive Hoselays

a. Hose is advanced along the fire perimeter with extinguishment taking place as additional hose is added (laid wet). Hose remains charged while additional hose is added by using hose clamps.

b. Start with 1-1/2" or 1-3/4" line and place in-line tees every 200-300 feet. Connect 1" unlined hose as needed to in-line tees for mop-up, flareups, and crew protection. Gated wyes may also be utilized.

c. Crew should consist of a nozzle operator, hose-puller, and appliance handler in addition to a pump operator. Start from an anchor point and operate with one foot in the black, watching for rekindles. Follow-up with handtools.

PUMPING TECHNIQUES:

Use water patterns in the correct form.

1. Straight stream is used when:

    a. The fire is too hot to get close.

    b. The fire is confined to a small area.

    c. A lot of pressure is needed to reach any distance.

    d. Targets cannot be reached with a fog/spray.

    e. Hot roots or beds in mop up need digging out.

    The amount of water used in a straight stream is more than with other nozzle applications.

2. Fog/spray used when:

    a. Needed for close work.

    b. Fire covers a larger area.

    c. A smaller volume of water is required to put out the fire.

    d. Fire situations where fog/spray may be used are:

        * hot spotting
        * building a wet line
        * direct attack
        * mop up

3. Water application

    a. If the fire is hot, use a straight stream to knock the flames down so you can get to the edge (if fog/spray will not work).

    b. Next, turn and direct the fog spray <u>parallel</u> to the edge of the fire, at the base of the flames.

c. Once on the edge, continue with a fog pattern.

d. Be sure the fire is completely knocked down before going further.

e. Watch the extinguishing edge and behind in case of flare-ups.

f. Follow-up your water line with a hand line as soon as possible, especially in heavy fuels. Fire edges that have been knocked down with water may come back to life if not completely extinguished.

g. Aim accurately and maintain water stream in sweeping motion.

h. Apply water intermittently. This action will help to determine if more water is needed, and helps conserve water.

i. Watch the pump pressure. High pressure will deliver air as well as water to the fire and can fan the flame rather than knock it down. Excessive pressure wastes water, while low pressure may not penetrate to the base of the flame.

4. Hazards to hose and accessories:

a. Fire damage

b. Sharp rocks

c. Vehicle damage in traffic areas.

d. Damage from hitting or placing hose on sharp tools.

e. Hose reels.

HAND TOOLS

There are many kinds of hand tools. They are primarily used to construct control lines. There are cutting and scraping tools, pumping, and firing tools. Each is designed to *break* one or more *legs* of the fire triangle. Hand tools like engines, must be handled properly if the job is to be done right. This requires that the firefighter understand which type of hand tool to use, how to use it, and how to maintain it.

PRINCIPAL HAND TOOLS USED FOR FIRELINE CONSTRUCTION IN MICHIGAN:

1. Fire Swat

    a. Used to smother fire with a rubbing motion. (Beating on the flames with a fire swat will only serve to fan the fire.)
    b. Normally used in light fuels (like marsh grass) where access with engines or brush rigs is not possible.
    c. Care: Maintain the wooden handle and the rubber swat.

2. Council Rake/Fire Rake

    a. Used to construct fireline by raking, cutting, or digging. This is a very versatile tool on the fireline.
    b. In addition, the council rake can be used to drag burning debris back into the burn area, or *string* counter fires along the inside of the control line.
    c. Care: Maintain the wooden handle, and keep the cutting edges sharp and clean.

3. Fire Shovel

    a. Used to *scrape* fireline to mineral soil.
    b. Used during *mop-up* to smother burning debris.
    c. Care: Maintain the wooden handle and keep it sharp and clean.

4. Pulaski

    a. A versatile scalping, digging, *and* cutting tool used to construct fireline and in mop-up.
    b. Often used in tandem with firefighters that are using shovels for hand line construction.
    c. Care: Maintain the wooden handle, and keep the cutting edges sharp and clean.

5. Backpack Pump

    a. Used in both fire suppression and mop-up to cool the fire.
    b. Weighs 50 lbs. when fully loaded. Use care in putting it on, and taking it off to avoid back injuries.
    c. Add a wetting agent to make the water go further.
    d. Never drink from a back can or bladder bag pump!

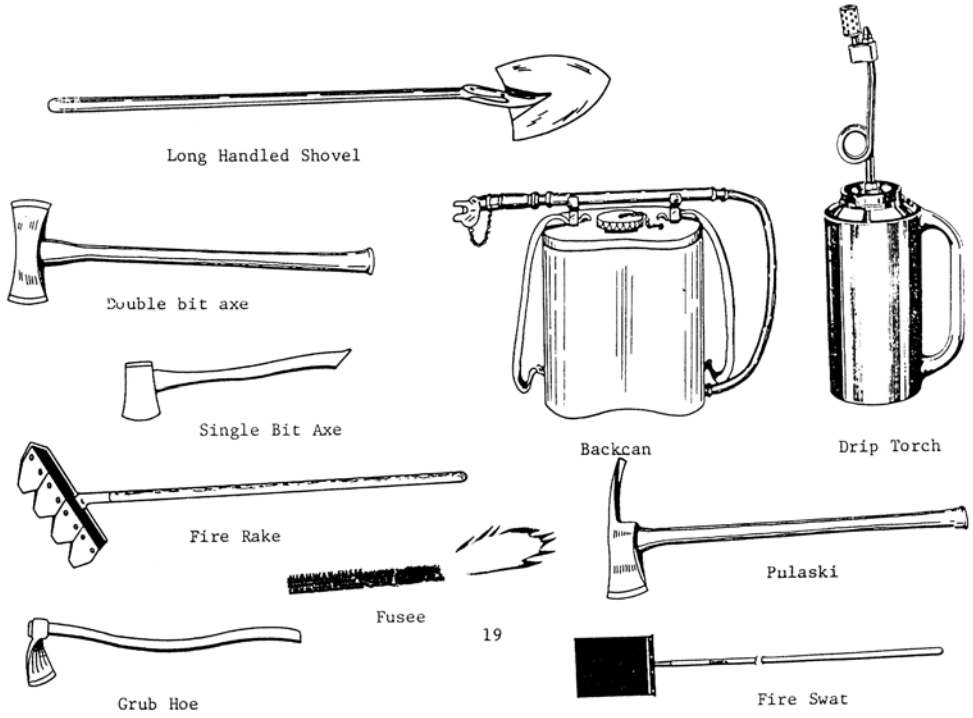
e. When extinguishing a fire in light fuel, use your finger over the nozzle to spread the water stream into a spray.
f. Periodically inspect, replace, and lubricate pump parts.
g. Store empty in freezing weather; drain the pump.

6. Drip Torch

a. Used to burnout control lines, and start counter fires (e.g. robbing the wildfire of fuel).
b. The proper fuel mixture is 1 part gasoline to three parts diesel fuel.
c. Safety: Always fill the torch in a safe area away from the fire, and ground the torch to minimize sparks.

7. Others: Axe, brush hook, wire rake, chain saw, portable pump, or fusees

WILDLAND FIREFIGHTING HAND TOOLS



HAND LINE OPERATIONS:

Primary use for hand crews:

- Construct fireline in steep, rugged terrain, or excessively wet sites, where bulldozers, tractor plows, or engines, cannot be used.
- Support mechanically made firelines.
- Assist with locating the line for mechanical equipment.
- Removing fuel buildup from and near control lines.
- Breaking up machine made fuel piles by scattering and spreading the material into the burn.
- Use a clean-up crew to firm up, and burn out, to the constructed line.
- Assist with hose lays.
- Assist with firing operations.
- Protect structures and other improvements.
- Begin mop-up and patrol the fireline as soon as possible.
- Clean up the fire ground.

Organizing the Hand Crew:

Spacing: Firefighters should be spaced at least 10 feet apart while constructing hand lines, to prevent injuring each other.

Tooling Order:

First	Back can pump or bladder bag: knocks down flaming front.
Second	Cutting Tool (e.g. Pulaski) Takes *one lick* at the vegetation and moves up the line.
Third	Scraping Tool (e.g. Shovel, pulaski, or council rake) Follows up to remove loosened vegetation from the line. The objective is to scrape a line to *mineral soil.*
Fourth, Fifth, & Sixth	Alternate Cutting and Scraping Tools, each taking one lick, and moving up.

Follow proper carrying procedures.

* Hold by the balance point.

* Carry on the downhill side.

* Keep your eyes on the target when using hand tools.

THE TECHNIQUE:

1. **Hot spotting:** Checking the spread of the fire at points of more rapid spread or special threat. This is usually the initial step in prompt control with emphasis on first priorities. Often done concurrent with the initial size-up.
2. **Cold trailing:** A method of checking a dead or partially dead portion of a fire line by carefully inspecting and feeling with the bare hand to detect any fire or heat source.
3. **Undercut line:** A fireline below a fire on a slope. Also called an underslung line.
4. **Trenching:** A small ditch often constructed below a fire on sloping ground (undercut or underslung line) to catch rolling material.

UNIT VI - MOP-UP & Patrol

OBJECTIVES

Upon completion of this unit the trainee will be able to:

1. Describe the techniques of mop-up, based on fire, current and anticipated weather conditions, topography, and fuel conditions required to declare a fire out.

2. Describe the standards for declaring a fire "out" after mop-up.

INTRODUCTION

DEFINITION: "Mop-up is the act of making a forest fire safe after control." This is done by removing or extinguishing all burning material along the control line or perimeter of the burning area.

Mop-up is the last step in fire suppression; the thoroughness of mop-up operations may be the factor that determines whether the fire will make another run requiring additional control work. It is something that must be done on all fires and entails a lot of dirty tedious work, but its vital importance should never be forgotten. Hard work at this point will pay off in a sense of satisfaction and knowing the fire is out and further runs will not be necessary.

Mop-up operations can begin as soon as line is constructed in order to ensure that the line holds. Mop-up is not an assigned task until the fire is contained.

Remember to protect the fire origin area while conducting mop-up operations in order to preserve evidence of fire cause.

KEY POINTS TO REMEMBER ABOUT MOP-UP

TECHNIQUES

1. SMALL FIRES: Mop-up the _____ fire by using a grid or zigzag pattern to cover the entire burn area.

2. LARGE FIRES: Mop-up everything within at least _____ of the fire perimeter. Concentrate first efforts on areas posing the greatest threat to the control line.

3. Search for and extinguish all _____ materials near the line.

4. Search for possible _____ _____ across the line.

5. Dig out any _____ that may cross under the line.

6. _____ _____ any concentrations of burning fuel to cool or burn out completely if safe to do so.

7. Watch for _____ and other unburned fuels that may ignite and blow over the line.

8. Stir and mix hot embers with cool _____ _____ to cool temporarily. Do not leave burning logs or stumps covered.

9. Use water in conjunction with _____ _____ to separate and expose burning materials.

10. Match the amount of water to the job. Use water sparingly.

11. Use wetting agents or Class A foam to increase the effectiveness and penetration of water.

12. Cut and remove unburned or partially burned brush near the line. A rule of thumb is that if it's burned, black or scorched it goes _____ the line. Totally unburned fuels can be thrown _____ the line.

13. Fell any snags adjacent to the line to avoid spotting.

14. Turn logs parallel to the slope and block with rocks or soil to prevent rolling.

15. _____ _____ unburned patches of fuel inside the line to prevent a fire from rekindling and making a run at the line.

16. The practice of checking for hot spots by using bare hands to detect heat sources is called _____ _____.

17. Be sure the fireline is clean to mineral _____. Reinforce the line where needed.

18. Good mop-up cannot be conducted from the truck. You must get off the truck with the hose and wet down all sides of burning fuels.

19. Continue to mop-up and patrol until your supervisor reassigns or releases you.

STANDARDS FOR DECLARING A FIRE "OUT"

1. Check _____ the fireline for any missed spot fires or other heat sources.

2. Check inside the fireline for:

   a. _____ patches of fuel.

   b. _____ fuels such as roots, stumps, or logs that may be smoldering.

   c. Smoldering duff, peat and "meadow muffins."

3. Walk the entire perimeter using your sense of _____ to detect any sign of fresh smoke.

4. Re-check the fire early the following morning when the rising sun and calm winds make it easier to detect small smokes. Mark them immediately for later attention.

5. Patrol the fire daily until no more smokes are found. Then check it one more day to be sure the fire is out.

6. Only the _____ _____ will declare the fire "out."

FIRE INVESTIGATION

All fires must be investigated to determine cause and a responsible party. Your actions taken during fire suppression and mop-up operations may affect the success of the investigation. Be sure to do the following:

1. Protect the fire _____ area. Avoid using a straight stream of water or dragging hose through this area. Do not disturb or handle any evidence of fire cause.

2. Write down all information including names and addresses of witnesses, descriptions of suspects, and vehicles seen in the area.

3. Make complete reports on the fire

4. Relay all information to your chief or fire investigator.

UNIT VII - ICS ORIENTATION

OBJECTIVES

This unit is designed to acquaint structural firefighters with ICS structure and terminology as it is used on wildland fires. This orientation is intended for personnel assigned to an incident who have a minimum requirement for understanding ICS.

1. List the five major organizational activities within the Incident Command System and explain their primary functions.
2. Give the titles, and explain the duties, of Command and General Staff members.
3. Match organization units to appropriate Operations, Planning, Logistics, or Finance sections.
4. Match supervisory titles with appropriate levels within the organization.
5. Describe the terms used to name major incident facilities, and state the function of each.
6. Describe what an Incident Action Plan is and how it is used at an incident.
7. Describe how span of control functions within the incident organization and in the use of resources.
8. Describe the common responsibilities (general instructions) associated with incident or event assignments.
9. Describe several applications for the use of ICS.

INTRODUCTION

Safe and efficient fire fighting operations require the use of the Incident Command System. NFPA 1561 also states that an incident management system shall be used by each fire department. The Michigan Department of Natural Resources and all Federal Wildfire Fighting agencies have adopted the Incident Command System which was developed by the National Wildfire Coordinating Group (NWCG) The National Fire Academy has also adopted this system for all-risk incidents.

The ICS organization is:

1. **Functional**: Designed to be used on _____ incident and for incidents of _____ _____.

   _____ major functional areas are established.

2. **Modular**: Organizational _____ develops in a modular fashion.

   Staff builds from the top down with responsibility and performance initially placed with the _____ _____.

3. **Flexible**: Can be _____ or contracted to meet different needs.

   Not all _____ need to be filled.

On most wildfires the highest ranking officer of the Fire Department or the DNR Forest Fire Officer will assume the role of _____ _____.

COMMON TERMINOLOGY

In order for various agencies to work together on an incident, common terminology must be applied to:

Organizational Elements

There is a consistent pattern for designating each level of the ICS organization.

Examples: Sections, Branches, Divisions, Units

Position Titles

Distinctive titles for each position provides for a common standard and the placement of the most qualified personnel in ICS positions.

Examples: Safety Officer, Branch Director, Unit Leader, and Division Supervisor

Facilities

Used to support the incident needs. Established based on need.

Examples: Incident Command Post, Staging areas, Base, Camps, Helibase, and Helispots

Resources

Common designations have been established for various types and kinds of resources to provide a standard.

Examples: Engines, Dozers, Strike teams, Task forces

SPAN OF CONTROL

Effective span of control may range from ____ to ____ with a ratio of ____ to ____ being recommended.

ESTABLISHING THE ICS ORGANIZATION

The management of any incident always includes five major functions: Command,

Operations, Planning, Logistics and Finance/Administration.

During a small incident, it is possible for the incident commander to perform all these functions, however as the incident grows it will be necessary to staff these functions.

A basic ICS operating principle is that the person at the top of the organization is _____ until _____ is delegated and those portions of the organizational structure are developed.

It is critical for effective incident management that command be established early and that an incident _____ _____ be identified. Incident priorities must be determined and a plan developed to meet specific strategic objectives.

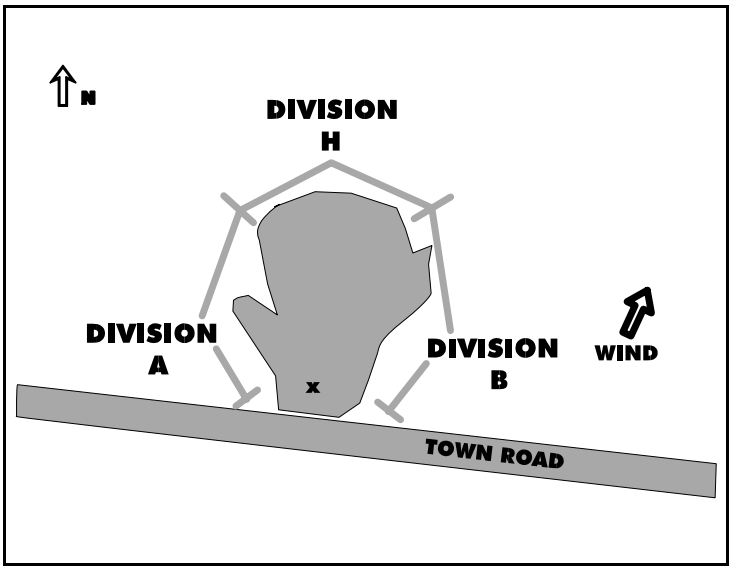
INCIDENT COMMANDER AND COMMAND STAFF

1. Incident Commander
2. Safety Officer
3. Information Officer
4. Liaison Officer

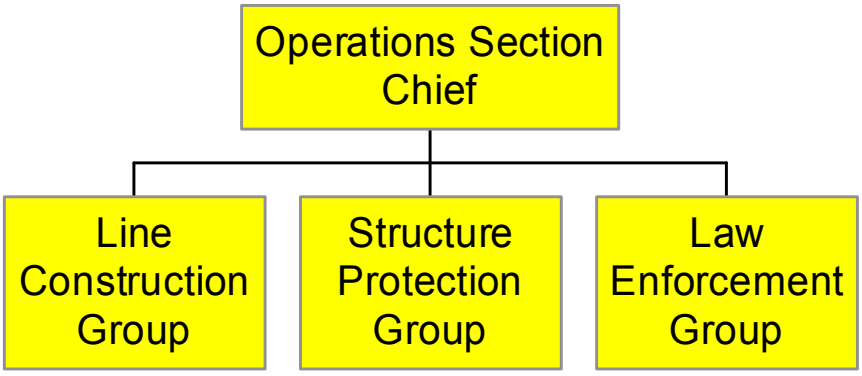
OPERATIONS SECTION

Responsible for all incident tactical operations under the direction of an Operations Section Chief. The organization of this section develops as required to help with span of control and effective resource management.

1. **DIVISIONS**: Established to divide the incident into _____ areas of operation.



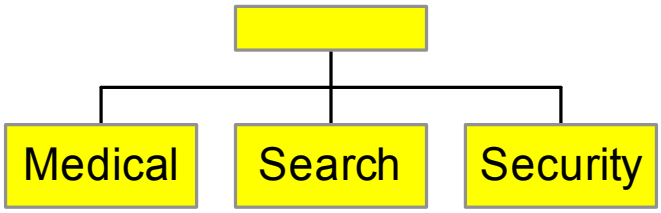
2. **GROUPS**: Established to divide the incident into _____ areas of operation.



3. **BRANCHES**: Established to aid in span of control, organize across jurisdictional lines or to establish a functional branch structure.

Michigan interface fires are often organized functionally with Wildfire, Structural, and Law Enforcement Branches in the Operations Section.

Functional Branches



4. **STAGING AREAS**: Locations used to temporarily place resources that are awaiting a tactical assignment. Several staging areas may be used on the same incident if needed.

PLANNING SECTION

Responsible for the collection, evaluation and display of incident information. Maintains status information, maps and documentation services. Develops the incident action plan for approval of the Incident Commander.

LOGISTICS SECTION

Responsible for all incident services and support needs including facilities, transportation, communications, supplies, equipment maintenance, fueling, food, and medical services.

May be divided into service and support branches on very large incidents.

FINANCE/ADMINISTRATION SECTION

Activated when on-site financial management is needed. Responsible to monitor costs, maintain financial records, administer procurement contracts, perform time recording, and process any claims or compensation for injury.

COMMON RESPONSIBILITIES

A. Receive an assignment. Don't _____.

B. Bring any specialized supplies needed to do your job.

C. _____-____ at the designated incident location.

D. Use _____ _____ for all radio communications.

E. Obtain a briefing and make sure you _____ your assignment.

F. Acquire necessary work materials, locate and set up your work station.

G. Organize and _____ your help.

H. Brief your relief.

I. Complete required paperwork.

J. _____ according to plan.

GUIDELINES IN DEVELOPING ICS

A. Establish _____ and an incident _____ _____ early. Only one ICP per incident should be set up.

B. Determine incident organizational and _____ needs. Utilize continuing size up information.

C. Consider needs for command and _____ staff.

D. Maintain _____ of _____.

E. Develop and follow an incident action plan with specific strategic _____.

F. _____ ICS elements when possible.

G. Avoid _____ positions whenever possible.

UNIT VIII — SAFETY

OBJECTIVES

To detect potentially hazardous situations on a given fire by using recognized safety practices and promptly communicate hazards to a fireline supervisor so that corrective action can be taken to ensure firefighter safety.

Upon completion of this unit, the firefighter will be able to:

1. Recognize common denominators of fire behavior on fatal and near miss fires.

2. Identify 18 Situations that Shout Watch Out.

3. Identify 10 Standard Fire Fighting Orders.

4. Explain the LACES concept and why it is important.

5. Identify items of safety equipment and clothing, and describe their use.

6. Describe safe vehicle operating practices.

7. Demonstrate safe hand-tool practices.

8. Recognize wildland/urban interface watch out situations.

COMMON DENOMINATORS OF FIRE BEHAVIOR ON FATAL AND NEAR MISS FIRES

1. Most fatalities occurred on relatively _____ fires and _____ portions of larger fires.

2. Most fatalities occurred on fires in relatively _____ fuels such as _____ and brush.

3. Unexpected_____ shifts or sudden increase in _____ _____ caused erratic fire behavior. Often times these fires were innocent in appearance or in the mop up stages just prior to the blow ups.

4. Fire ran _____ or on steep slopes.

5. Failure to recognize LACES.

18 "WATCH OUT" SITUATIONS

1. Fire not scouted and sized up.

2. You are in country you have not seen in the daylight.

3. Safety zones and escape routes not identified.

4. You are in an area where you are unfamiliar with local factors influencing fire behavior.

5. Uninformed on strategy, tactics and hazards.

6. You have been given an assignment or instructions not clear to you.

7. No communications with crew members or supervisor.

8. Constructing line without a safe anchor point.

9. You are building line downhill toward a fire.

10. You are attempting a frontal assault on a fire.

11. You are on a line in heavy cover with unburned fuel between you and the fire.

12. You cannot see the total fire scene and you are not in communication with anyone who can.

13. You are fighting fire on a hillside where rolling material can ignite fuel below you.

14. You feel the weather getting hotter and drier.

15. You notice the wind increases or changes direction.

16. You are getting frequent spot fires over your line.

17. Terrain and fuels make escape to safety zones difficult.

18. You feel like taking a nap near the fireline.

TEN STANDARD FIRE ORDERS

F Fight fire aggressively, but provide for _____first.

I Initiate all actions on current and expected _____ _____.

R Recognize current _____ _____ and obtain forecasts.

E Ensure instructions are given and _____.

O Obtain _____ _____ on fire status.

R Remain in _____ with crew members, your supervisor and adjoining forces.

D Determine safety zones and _____ _____.

E Establish _____ in potentially hazardous situations.

R Retain _____ at all times.

S Stay _____, keep _____, think clearly, act decisively.

LACES

LACES is a system that looks at both the Watch Out Situations and Fire Orders and stresses the importance of the components working together. LCES must be used by firefighters during any tactical operation where an objective hazard may be present to evaluate the assignment, identify hazards, analyze risks, and implement steps to ensure safety.

L - _____

Must be in a position to observe both the hazard and firefighters.

Must be trained to recognize and anticipate fire behavior changes.

The number needed depends on size of the fire and terrain.

A - _____

Lookouts watch for changes in fire behavior.

Lookouts track weather by taking regular readings.

Lookouts watch the sky for signs of change.

Fire Officers/Crew Leaders can understand what the lookouts are telling them.

Awareness is everyone's responsibility.

C - _____

Required between crew members, supervisors and adjoining forces.

Can consist of visual, voice, radio, flagging tape, or other means.

Methods chosen to alert firefighters of an approaching hazard must be prompt and clear.

E - _____ _____

The path a firefighter must take to reach an area free from danger.

Must establish at least two at all times, both in front and to the rear.

Effectiveness changes continuously requiring constant re-evaluation.

Most common is the fireline itself.

S - _____ _____

A location where the threatened firefighter may find refuge from danger.

A place where fire shelters are not needed.

Must be established at all times.

Should be 1-1/2 times the height of surrounding fuels or large enough to accommodate all personnel.

SAFETY EQUIPMENT AND CLOTHING STANDARDS

Wildland fire protective clothing standards are found in NFPA 1977, which became effective in June, 1993.

1.	Hardhat:	Lightweight design provides for head protection over long periods of time. Also provides for air circulation. Chin strap and neck shroud can be attached.
2.	Eye Protection:	Goggles are the most common and can be attached to the hardhat. Should fit well and accommodate eyeglasses.
3.	Clothing:	Shirts and pants, or coveralls made of Nomex or Kevlar. Should be loose fitting and be worn with a second layer of cotton undergarments for best protection.
4.	Footwear:	Leather boots with eight inch tops and non-slip soles. Provides for good footing and proper ankle support.
5.	Gloves:	Should be leather and provide wrist protection. Lightweight design. Should provide a proper fit.
6.	Ear Protection:	Ear muffs or earplugs are required for working with power equipment such as pumps and saws. Disposable plugs can

be easily carried in pockets of turnout gear.

7. Fire Shelters: Designed as a last resort to provide for individual firefighter protection in entrapment situations. Designed to be worn on the belt or web gear.

8. Other Items:

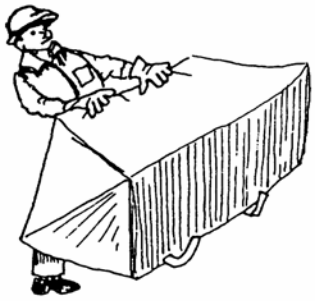
STRUCTURAL TURNOUT GEAR IS NOT RECOMMENDED FOR WILDLAND FIREFIGHTING DUE TO ITS BULKINESS, WHICH LIMITS FIREFIGHTER MOBILITY AND INCREASES THE POTENTIAL OF HEAT EXHAUSTION WHEN WORKING FOR EXTENDED PERIODS OF TIME.

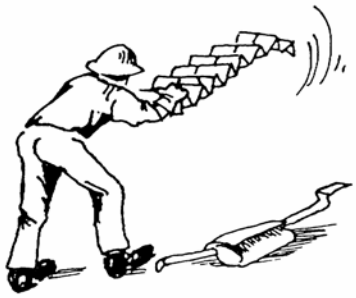
Use Of The Fire Shelter

1 • DON'T PANIC

- Pick largest available clearing
- Avoid heavy fuels and snags
- Find bare spot
- Scrape away flammable litter if time permits

2
- Remove shelter from case
- Shake out and open folds





3 • Grasp edge and shake open

4 • Crawl into shelter

5 • Alternate method——Stand up

6

- Hold front and rear flaps down with head and feet
- Keep sides spread wide for best protection
- If shelter gets hot, take shallow breaths through nose

- Do not open plastic bag until shelter is needed for emergency use.
- After fire has cooled, pick safest spot and wait for help.
- Watch for falling snags and rolling rocks.

SAFE VEHICLE OPERATING PRACTICES

A. Driving to the Fire:

Practice standard Emergency Vehicle Operating procedures.

Take the shortest and safest route directly to the fire.

Don't jeopardize yourself, your equipment, or others by careless driving.

B. Secure Firefighters and Tools in Vehicle:

Remain seated and _____ while enroute.

Separate handtools from firefighters during transport.

C. Heavy Smoke Will Reduce Visibility:

Adjust _____ according to conditions.

Keep vehicle's _____ on at all times.

Drive defensively.

D. Off-Road Operations:

Watch for hidden _____ such as rocks, stumps, ditches, and burning embers.

Maneuverability may be difficult.

Don't take your vehicles off-road if not designed for it.

Stay clear of dozers or tractor-plows working the fireline.

E. Operating Inside the Burn:

Can be done in _____ fuels where there is little risk to tires and hose.

More comfortable as firefighters are away from the heat and smoke.

May provide a good safety zone.

F. Be Alert for Handcrews and Others Working in the Area:

Keep your _____ in sight at all times during pump and roll.

Use caution when _____. This is where most accidents occur.

G. Anchor Points:

Must be used at all times to prevent being _____.

Ensure that _____ is provided to follow pumping operations.

H. Water Supply/Safety Line:

Maintain a reserve of _____ gallons in your engine's water tank and loop a short length of 1-1/2 hose on top of the engine for a safety line.

SAFE HAND TOOL PRACTICES

CARE AND MAINTENANCE:

DO ...

a. Keep cutting edges _____ and well guarded.

b. Keep _____ tight and smooth.

c. Keep all tools clean and free of _____.

d. Store tools neatly and well _____.

e. Inspect _____ and recondition after each use.

DON'T ...

a. Use handtools to lean on or as _____ _____.

b. Misuse tools for something they were not designed for.

c. Use tools for _____ activities.

d. Use tools with _____ defects such as warps, cracks and slivers.

e. Allow tools to lie or bounce around.

HANDLING AND USE:

a. Use caution when handling sharp edged tools. When walking, carry them at your side on the _____ side.

b. Maintain a safe distance of _____ between firefighters when carrying or working with handtools.

c. Do not work beyond the limits of your endurance.

d. Wear full protective clothing.

WILDLAND/URBAN INTERFACE FIRE SAFETY

The following situations involving structures in the wildland/urban interface shout "watch out." Be especially careful when you encounter them:

1. Wooden construction and shake roofs. Ignition of these fuels can be rapid.

2. Poor access, narrow, one way roads. Entrapment may result in rapidly spreading fires.

3. Inadequate water supply.

4. Natural fuels 30 feet or closer to structures.

5. Extreme fire behavior. Crowning and spotting.

6. Strong winds of 25 mph or greater.

7. The need to evacuate the public (panic).

8. Structures located in continuous, flashy fuels and on slopes of 30% or more.

9. Bridges with low load limits.

10. Powerline hazards.

APPENDIX A – Glossary

WILDLAND FIRE TERMINOLOGY
GLOSSARY OF TERMS

As in any other profession, forest fire control has developed its own special terminology. For us to be most effective, we must attempt to speak the same language.

These terms must be understood since most messages at the fire scene are given by radio in a stressful situation. Air time is at a premium and it is impractical to spend time explaining in detail what is being talked about. This lesson is presented to help you understand what is meant by some of the more common forest fire terms.

Anchor Point - A good location or point, usually with a natural barrier to begin constructing a control line around the fire perimeter. It is used to minimize the chance of the fire flanking or going around behind the firefighters and endangering their safety while they are constructing fireline.

Aspect - The direction a slope is facing, i.e. southwest.

Barrier - Any obstruction to stop the spread of a fire, typically an area or strip devoid of fuel.

Back Burn - (Backing fire) Used in some localities to specify a fire set to spread against the wind as in prescribed burning.

Backfire - A fire set along the inner edge of a natural or constructed control line to consume the fuel in the path of a forest fire. Not to be confused with "burning out the line."

Backing Fire - A fire, or that part of a fire, spreading or set to spread against the wind.

Berm - Outside or downhill side of a ditch or trench.

Black Line (concept) - The principle of fire containment that used a fireline with <u>all</u> adjacent fuels inside the line burned-out (black) for a safe distance.

Branch - ICS Term -- The organizational level having a functional/geographic responsibility for major segments of incident operations. Between Section and Division/Group.

Breakover- see slop over

Burning Out the Line - Used with direct or indirect attack when the control line touches parts of the fire. Burning out is intentionally setting fire to fuels inside the control line to strengthen the line and take the "black line" up to the reinforced

control line. (Usually a water line, mineral soil line, or natural barrier.) Most always done by the crew boss as a part of line construction. The control line is considered incomplete until there is no available fuel between the fire and the line. Sometimes called "firing out."

Burning Period - That part of each 24 hour period when fires will ignite and spread most readily. This is typically from about mid morning to about 5-6 p.m.

Children Caused Fires - Fires caused by the activities of minors: smoking, playing with matches, experimentation.

Course (Heavy) Fuels - Fuels of large diameter such as snags, logs, and large limbs which ignite and are consumed more slowly than flash fuels. However they give off more heat and usually require greater effort to extinguish.

Cold Trailing - A method of checking a dead or partially dead portion of fireline by carefully inspecting and feeling with the bare hand to detect any fire or heat source.

Combustion - Rapid oxidation of combustible material that produces heat energy.

Command Staff - ICS term that includes Incident Commander, Information Officer, Liaison Officer, and Safety Officer.

Condition of Vegetation - Stage of growth or degree of flammability of vegetation that forms part of the fuel complex. Usually broken down into green, curing, dry, or dead.

Conduction - Heat transfer through a solid material from an area of high temperature to an area of lower temperature.

Confine - To restrict the fire within determined boundaries established either prior to or during the fire.

Contain a Fire - To take suppression action as needed, which can reasonably be expected to check the fire's spread under prevailing conditions.

Continuity - The proximity of fuels to each other that covers the fire's capacity to sustain itself. This applies to aerial fuels as well as surface fuels.

Control a Fire - To complete a control line around a fire, any spot fires, and any interior islands to be saved; burnout any unburned areas adjacent to the fire side of the control lines; and cool down all hotspots that are immediate

threats to the control line, until the lines can reasonably be expected to hold under foreseeable conditions.

Control Line - An inclusive term for all constructed or natural fire barriers and treated fire edge used to control a fire.

Convection - The transfer of heat and or smoke upward because of heat rises (the flow of heat is from the warmer to the cooler area).

Convection Column - The thermally produced, ascending column of gasses, smoke, and debris produced by a fire.

Creeping Fire - Slowly spreading fire burning with a low flame.

Crew Boss - A person who supervises 2-20 firefighters and is responsible for their performance, safety, and welfare.

Crown Fire - A fire that advances from top to top of trees or shrubs more or less independently of the surface fire.

Debris Burning Fire - A forest fire caused by the fire spreading from any fire ignited originally to clear land or burn rubbish, garbage, crop stubble, (excluding incendiary fires). The leading cause of forest fires in Michigan.

Detection - The act or system of discovering and locating fires.

Direct Attack - A method of fire suppression that treats the fire as a whole, or all its burning edge, by wetting, cooling, smothering, or mechanically separating it from the unburned fuel. All this suppression activity takes place at the immediate fire edge.

Diurnal wind - Daily changes in wind direction & speed due to daytime heating and nighttime cooling. In Michigan, diurnal winds are often seen within 3-4 miles of the Great Lakes. These winds are important because they can initiate suddenly, causing a change in wind direction and/or wind speed.

Division - ICS Term -- A unit established to divide an incident into geographical areas of operation.

Duff - A mat of partially decomposed organic matter immediately above the mineral soil. Consists primarily of fallen foliage, herbaceous vegetation and decaying twigs and small limbs.

Engine - ICS terminology for any ground fire vehicle providing specified levels of pumping, water, and hose capacity. They are broken down by Type. This usually denotes vehicle size and capability.

Equipment Caused Fire - Fire caused by motorized equipment other than railroad equipment.

Escaped Fire - Any fire that continues to burn out of control after all initial attack resources have been deployed, requiring dispatch of additional resources.

Extended Attack - Situation in which the initial attack crew cannot control a fire within a reasonable period of time. (Usually 24 hours.)

Extreme Fire Behavior - Implies a level of wildfire behavior characteristics that ordinarily precludes methods of direct attack action. This fire usually exhibits one or more of the following: high rate-of-spread, prolific crowning or spotting, presence of fire whirls, a strong convection column. These fires are unpredictable since they will behave erratically and sometimes dangerously.

Finance/ Administration Section - ICS - Set up for any incident that may require on-site financial management. (Time, procurement, compensation/claims, cost units.)

Fine Fuels - Fuels such as grass, leaves, pine needles and some smaller slash which, when dry, ignite readily and burn rapidly. May also be called "flash fuels."

Fingers - The long, narrow tongues of a fire projecting from the main body. These "fingers" have areas of unburned fuel between them and the main body, called "pockets."

Fire Behavior - The manner in which a fire reacts to the variables of fuel, weather, and topography.

Firebreak - A natural or constructed barrier utilized to stop or check fires. Sometimes called a "fireline."

Fire Control - All activities to protect wildland from fire. Includes prevention, presuppression and suppression.

Fire Manager - An individual who manages fire-related programs, such as a fire chief, a fire marshal, a fire prevention specialist, etc.

Fireline - The part of a control line that is scraped or dug to mineral soil.

Fireline Supervisor - Any individual who has supervisory responsibilities on a wildland fire.

Fire Season - The period or periods of the year when wildland fires are likely to occur, spread, and do sufficient damage to warrant organized fire control.

Fire Weather - The combined atmospheric elements that affect a wildland fire. This will include but not be limited to temperature, wind speed, relative humidity, etc.

Flame Height - Average height of flames measured on the vertical axis. Used as a gauge of whether a fire can be handled with hand tools or if heavy equipment will be needed.

Flaming Front - That zone of a moving fire within which the combustion is primarily flaming. Behind this flaming zone, combustion is primarily glowing coals.

Flank - The part of a fire running along either side. Right and left flanks are determined standing at the base of the fire and facing the head of the fire.

Flanking Action - Attacking the fire by working along the flanks from the anchor point at the rear of the fire, either simultaneously or successively and attempting to join at the head of the fire. It is customary to overload somewhat on the right flank since winds in Michigan tend to shift in a clockwise pattern.

Forest Fire - The term "forest fire" as used in this chapter means uncontrolled, wild, or running fires occurring on forest, marsh, field, cutover or other lands or involving farm, city or village property and improvements incidental to the uncontrolled, wild or running fires occurring on forest, marsh, field, cutover or other lands.

Fuel Break - A wide strip or block of land in which the native or pre-existing vegetation is such that fires burning into it slow down or go out. This is a good area to attack a fire.

Fuel Type - An identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics. General fuel types are grass, marsh, brush, hardwoods, pine, and slash.

General Staff - ICS term -- A group of incident management personnel comprised of the Incident Commander, Operations Chief, Logistics Chief, and Finance Officer.

Ground Fire - Fire that consumes organic material beneath the surface litter of the forest floor, such as a peat fire.

Ground Fuels - Combustible materials lying beneath the ground surface, including deep duff, roots, rotten buried logs, peat, and other woody fuels.

Head Fire - A fire spreading or set to spread with the wind.

Head of the Fire - The most rapidly spreading portion of a fire's perimeter. Usually the downwind or uphill side.

Heat Transfer - The transfer or exchange of heat energy by radiation, conduction or by convection.

Heavy Fuels - The big stuff, see "course fuels."

Hose Lay - An arrangement of connected lengths of fire hose and accessories on the ground beginning at the first pumping unit and ending at the point of water delivery.

Hot Spotting - Checking the spread of the fire at points of more rapid spread or special threat. This is usually the initial step in prompt control with emphasis on first priorities. Often done concurrent with the initial size up.

Humus - The organic portion of the soil formed by the partial decomposition of plant and animal matter. The parent material is usually not identifiable.

Incendiary Fire - A fire willfully set by anyone to burn vegetation or property not owned by the perpetrator and without the consent of the owner or his agent. (Arson)

Incident Action Plan - ICS - The plan to provide all incident supervisory personnel with direction for future actions.

Incident Commander - ICS Term--The individual responsible for the management of all incident (fire) operations.

Incident Command Post - The location at which the primary command functions are executed and usually co-located with the incident base.

Incident Command System -	ICS--The combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure, with responsibility for the management of assigned resources to effectively accomplish stated objectives pertaining to an incident.
Indirect Attack -	A method of suppression in which control line is located along natural firebreaks, favorable topography breaks, or constructed fireline at a considerable distance (depending on fire size) from the fire and the intervening fuel is burned out.
Information Officer -	ICS - The point of contact for the media or other organizations seeking information directly from the incident or event.
Initial Attack -	The control efforts taken by resources which are the first to arrive at the scene.
Islands in a Fire -	Small unburned areas inside the fire perimeter.
Ladder Fuels -	Fuels that by their arrangement and continuity allow the fire to carry from surface fuels into the crowns with relative ease.
Liaison Officer -	ICS - Contact at an incident for representatives of other agencies involved in the incident.
Lightning Fire -	A fire caused directly or indirectly by lightning.
Line Officer -	Any individual who has supervisory responsibilities over fire fighters at any time. Can include fire department officers and local governmental officials.
Litter -	The top layer of the forest floor, composed of loose debris, dead sticks, branches, twigs and recently fallen leaves or needles, little altered in structure by decomposition.
Logistics Section -	ICS - Responsible for all of the services and support needs of the incident. Consists of Service Branch (communications, medical, and food units) and the Support Branch (supply, facilities, and ground support units).
Miscellaneous Caused Fires -	Fire causes that do not fall into another more specific category.

Mop-up - The act of making a fire safe after it is controlled, such as extinguishing or removing burning material along or near the control line, felling snags, trenching logs to prevent rolling.

Mutual Aid - Any form of free direct assistance from one fire department to another during an emergency, based upon a pre-arrangement between the agencies involved and generally made at the request of the receiving agency.

Natural Firebreak - As opposed to a "constructed" firebreak, this is a naturally occurring fire resistant phenomena that can serve to halt the spread of a fire. Such as a river, road, or fuel change.

National Fire Danger Rating System (NFDRS) - A system that uses weather observations and forecasts, fire history, man caused risk and fuel conditions to appraise the fire potential during the fire season. This national system is used as a management tool to establish the degree of fire hazard and risk of fire outbreak.

Operations Section - ICS - Run by the Operations Chief who will develop and manage the section to accomplish the incident objectives. Often broken down into Divisions, Groups and Branches.

Origin of a Fire - The original ignition point of the fire.

Patrol - To go back and forth watchfully over a length of control line during or after its construction to prevent slop overs, control spot fires, or extinguish overlooked hot spots.

Perimeter of a fire - The outside edge of the fire.

Planning Section - ICS - Group that collects, evaluates, and displays information about the incident. This information is used to develop incident action plans for each operational period as well as long range plans. (Resources, situation, documentation, demobilization, and technical specialist units.)

Precipitation - Moisture, either liquid (rain) or solid (snow, hail) large enough to fall from the atmosphere and reach the earth's surface.

Prescribed Burning - The burning of forest or range fuels on a specific area under predetermined conditions so that the fire is confined to that area to fulfill silvicultural, wildlife management, sanitary, or hazard reduction requirements, or to achieve other predetermined objectives.

Pre-suppression - Activities in advance of fire occurrence to insure effective suppression action. Includes recruiting, planning, training, and equipping a suppression force. Also procuring, and maintaining fire equipment and improvements.

Prevention - Activities directed at reducing the number of fire starts. Includes public education, law enforcement, personal contacts, and reduction of fuel hazards.

Progressive Hose Lay - A hoselay in which gated wyes are included in the main line and lateral lines are run off these to the fire, thus permitting continuous application of water during the extension of the lay.

Progressive One-Lick Method - A very effective and quick line construction method using handtools whereby each firefighter takes one swath "lick" with a tool and moves on. Each successive firefighter then takes a "lick" until the line has been cleared to mineral soil and is wide enough to meet the control objective.

Radiation - The process by which energy is propagated through any medium by virtue of the wave motion of that medium. A method of heat transfer.

Railroad Caused Fire - Fires caused by the activities of a railroad company.

Rate of Spread - The activity of the fire in extending its horizontal dimensions. Expressed as a rate of increase in fire perimeter, as forward spread of the fire front, or increase in area size depending on the use of the information. Usually in chains or acres per hour.

Rear of the Fire - That portion or edge of the fire that is usually upwind and is spreading the slowest.

Reburn - Subsequent burning of an area that has already had the fire pass over it. Happens with quick fires that do not totally consume local fuels.

Relative Humidity - The ratio of the amount of moisture in a given volume of air to the amount that air could contain were it saturated. Expressed in percent.

Safety Zone - An area used for escape in the event the line is outflanked or in case a spot fire causes fuels outside the control line to render the line unsafe. Line building and firing

operations should identify or construct safety islands close at hand.

Safety Officer - ICS - The individual that monitors safety conditions and develops measures for assuring the safety of all personnel assigned to an incident.

Scout - A person assigned the duty of checking ahead of the fire for potential fuels, potential problems, and reporting back on the location and behavior of the fire, control progress, and physical conditions that may affect the planning and execution of the suppression job.

Simple Hose Lay - A hose lay consisting of consecutively coupled lengths of hose without laterals. Inserting additional hose lengths between the pump and the nozzle completes the lay.

Size-up - The preliminary and ongoing appraisal of the overall fire situation for the purpose of determining appropriate control action.

Slash - Debris left after logging, pruning, thinning, or brush cutting. Also debris from wind storms or fire. May include logs, chunks, bark, branches, stumps, and broken understory trees and brush.

Slopover - A fire edge that crosses a control line or natural barrier intended to confine the fire. Also known as a breakover.

Smoking Fire - A fire caused by disposal or careless handling of "smoking" materials, i.e. cigarettes, pipes, cigars and the items used to ignite them. As opposed to illegal drugs.

Snag - A standing dead tree or part of a dead tree from which at least the leaves and smaller branches have fallen.

Span of Control - The maximum number of subordinates who can be directly supervised by one person without loss of efficiency. In fire suppression this is usually one leader for every 5-7 firefighters.

Spot Fire - Fire set outside the perimeter of the main fire by flying sparks or embers or by firebrands rolling downhill and igniting unburned fuels beyond the zone of direct ignition by the main fire.

Spotting - Behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire.

Squad Boss -	A working leader responsible for efficient and productive work of usually 3-7 firefighters.
Staging Area -	ICS - Location to temporarily locate resources awaiting assignment.
Strike Team -	Specified combinations of the same kind and type of resources, with common communications and a leader. *(The key is "s" in Strike Team, means the "same" kind of resources, i.e. all hand tools, all tractors, all fire departments.)*
Strike Team Leader -	Individual in charge of a strike team.
Suppression -	All the work of confining and extinguishing a fire beginning with the discovery.
Surface Fire -	A fire that burns surface fuels such as litter, debris, leaves, and small vegetation.
Surface Fuel -	All materials lying on or immediately above the ground. This includes needles, leaves, duff, grass, small dead wood, downed logs, stumps, large limbs, and low brush or reproduction.
Tactics -	The operational aspects of fire suppression such as placement of lines, personnel, equipment, supply rates and the direction these elements will take during their action on the fire.
Task Force -	Any combination of resources (mixed resources) with common communications and a leader. *(As opposed to a Strike Team.)*
Task Force Leader -	The individual in charge of a Task Force.
Topography -	Natural features on the landscape, hills, streams, lakes, etc. The "lay of the land."
Torching -	Fire burning principally as a surface fire that intermittently ignites the crowns of individual or small groups of trees or shrubs as it advances.
Urban/Wildland Interface -	Line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. (Same as Rural/Urban Interface.)

Wet Line -	A fire control line, usually temporary, prepared by treating the fuels with water and/or chemicals that will halt the spread of the fire.
Wetting Agent -	A chemical that reduces the surface tension of water and causes it to spread and penetrate more effectively.
Wildfire -	1. An unplanned fire requiring suppression action, as contrasted with a prescribed fire burning with prepared lines enclosing a designated area, under prescribed conditions. 2. A free-burning fire unaffected by fire suppression activities.
Wildland -	An area in which development is essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities.
Wildland Fire -	A wildfire that is burning in a wildland area.
Wind -	The horizontal movement of air relative to the surface of the earth. (What makes leaves move and fires spread.)
Working Fire -	Any fire that has, or will require, fire suppression forces being committed.