



Preventing & Responding to Bush Fires

Community Health
Education
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Purpose: To prevent and respond to bush fires (wildfires) in fields, communities and forests.

Objectives: Participants will understand how to prevent and respond to bush fires (wildfires) in fields, communities and forests.

Overview For Trainers: This lesson has been proven to save lives. You are playing a major role in preventing fires and saving lives and property when you teach this lesson.

Please be reminded to give the community the correct number or numbers to call for emergencies in your local area (Fire and Medical emergencies).

Time: 1-2 hours

Story:

The children Saul and Flora wanted to catch animals in the fields after harvest for food. They were having trouble catching the animals and decided to light the field on fire so they could catch more. Soon the fire was out of their control and the children began to run.

SHOWD Questions

S – What do you see?

H – What is happening?

O – Does this happen in our place?

W – Why does this happen?

D – What will you do about it?

Method (facilitator: ask these questions)	Time	Knowledge (facilitator: after participants have answered, add on to their answers with this information)
<p>Benefits of Fire What are some benefits of fire in fields, communities and forests?</p>	5-10 minutes	<p>Benefits of Fire</p> <ul style="list-style-type: none"> • Lighting. • Starting cooking fires. • Clearing fields, getting animals for food • Helps to keep areas clear of unwanted areas of undergrowth and weeds. • Can help enrich soil when fire is used correctly.
<p>Dangers of Bush Fires in fields, communities and forests What are the dangers of bushfires in fields, communities and forests?</p> <p>What causes dangerous fires in fields, communities and forests?</p>	5-10 minutes	<p>Dangers of Bush Fires in fields, communities and forests What are the dangers of bushfires in fields, communities and forests?</p> <ul style="list-style-type: none"> • Fires can burn down homes and other structures • Fires can damage land • Uncontrolled fire will spread to buildings and communities • Fire can damage crops • Could kill livestock or damage their grazing areas. • Could cause loss of life for people. <p>What causes fires in fields, communities and forests?</p> <ul style="list-style-type: none"> • Most fires are started by people carelessly using fire when cooking, clearing fields, discarding cigarettes, leaving burning/smoldering debris unattended, lighting homes, etc. • Arson – intentional fire setting to cause harm to someone or to cause property damage. • Lightening – fires can start from natural causes • Help the participants think of other things that might cause fires.
<p>Fire Prevention of Bush Fires in fields, communities and forests What are ways we can prevent bush fires in our fields, communities and forests?</p>	5-10 minutes	<p>Fire Prevention of Bush Fires in fields, communities and forests</p> <ul style="list-style-type: none"> • You CAN prevent dangerous bush fires. • Always be careful with fire • Always watch controlled fires (fires for warmth or cooking can get out of control and need to be supervised) • Make sure that controlled fires are <u>completely</u> out before leaving it. Soak coals with water or use dirt/sand to ensure the fire is out. • Make sure that lanterns, stoves and heaters are completely cool before refueling. • Avoid spilling combustible liquids and store fuel away from appliances.

		<ul style="list-style-type: none"> • Do not light fires on windy days or days that are hotter than typical. • When lighting fires, keep a shovel, water and dirt/sand nearby to keep fires in control if needed. • Be certain that cigarettes, matches or smoking materials are completely extinguished before disposing of them. • Ensure children know the dangers of playing with fire. • <i>(See Preventing Fires in our Homes Lesson for additional information)</i>
<p>How does weather impact fires in our fields, communities and forests?</p>		<p>How does weather impact fires in our fields, communities and forests?</p> <ul style="list-style-type: none"> • Fires spread and grow the most on days that are windier, drier and hotter than usual. • Lightning can also lead to dangerous fires. • On days when it is windier, drier and hotter it is recommended to minimize the use of outdoor fires and to avoid lighting fires for land clearing. • On these days pay extra attention to cooking fires and use of candles and lamps.
<p>How would you get to safety if there was a dangerous bush fire?</p>		<p>How would you get to safety if there was a dangerous bush fire?</p> <ul style="list-style-type: none"> • Get to safety (don't stop to collect your personal belongings and don't return) • Seek safety – if the fire is moving fast, don't try to outrun the fire – get to an area that does not have combustible materials. • Find a low area with water or little vegetation and lie low to the ground. If possible, cover your body with wet clothing, a blanket or dirt. Stay low until the fire passes. • Protect your lungs by breathing air closest to the ground (through a moist cloth, if possible) to avoid inhaling smoke • Go an agreed upon meeting place/assembly point. • Make sure everyone is out (take a head count). • Unless you are helping to put out the fire, stay back from the fire and help to guide the fire brigade into the community when they arrive.

<p>Fire Response for Bush Fires in fields, communities and forests What are ways we can respond to dangerous bush fires in our fields, communities and forests?</p>	<p>5-10 minutes</p>	<p>Fire Response for Bush Fires in fields, communities and forests</p> <ul style="list-style-type: none"> • Before you fight the fire you and others need to be safe. • If the fire is small and you know what to do, try to extinguish it if you can do that safely. • Sound the alarm - Tell others by yelling “FIRE FIRE FIRE” • Contact the local fire brigade or others that can assist. • If you are going to help with the fire, wear protective clothing and footwear to protect yourself from flying sparks and ashes. • Fight the fire from the coldest part of the fire and work up the sides. • Never attack the fire from the most active part of the fire. • If it is too hot or too smoky use extreme caution and/or wait for additional help from the fire brigade. • Some fires are very difficult for people to put out and you may need to wait until the fire naturally goes out or the weather changes the intensity of the fire.
<p>What tools can be used to help stop fire in our fields, communities and forests?</p>		<p>In order to put out fire, Water is a tool that can be used for putting off bush fires, but often water is not readily available. Use available resources to help put out the fires such as:</p> <ul style="list-style-type: none"> • Sand/Dirt • Rakes • Shovels • Branches • Burlap sacks
<p>What should you do if you burn your skin?</p>	<p>5 minutes</p>	<p>If You Burn Your Skin:</p> <ul style="list-style-type: none"> • Cool the burn. • Put the burn in cool water immediately. • Keep it there for three to five minutes. This helps stop the burning. • Cover it with a clean, dry cloth. If the burn is bigger than your palm, get medical help.

<p>What should you do if your clothes catch fire?</p>	<p>5 minutes</p>	<p>If Your Clothes Are on Fire</p> <p>Stop, drop and roll.</p> <ul style="list-style-type: none"> • Stop where you are immediately. • Drop to the ground, and cover your face with your hands. • Roll over and over, or roll back and forth. Keep doing this until the fire is out. • (see lesson on Stop Drop and Roll)
<p>How does the fire help or hurt the land? (for farming) (the forest)?</p> <p>What time of year is most dangerous for bush/wild fires in your area?</p>	<p>5 minutes</p>	<p>How does the fire help or hurt the land? (for farming) (the forest)?</p> <p>Wildland fires are a part of nature. They play a key role in shaping ecosystems serving as an agent of renewal and change. Some ecosystems are dependent on fire for seed dispersal and the reeducation of competition. But fire can be deadly, destroying homes, wildlife habitat, timber and pollute the air with harmful toxins such as carbon dioxide and other greenhouse gasses. Wildfires can also reduce carbon storage in the ground, decreasing the productivity for future agriculture productions.</p> <p>What time of year is most dangerous for bush/wild fires in your area?</p> <p>The dry season is the most dangerous time for brush/wild fires. This time of year it is hot, and there is less moisture in the air increasing the chances and severity of fires.</p>
<p>What is the number for contacting the fire brigade in your community?</p>	<p>5-10 minutes</p>	<p>Provide the number for the fire brigade and other emergency services.</p>
<p>Your local fire brigade wants to help the community.</p> <p>Do you know the firefighters that respond to your community?</p> <p>What do you think about them?</p>	<p>10-15 minutes</p>	<ul style="list-style-type: none"> • Firefighters want to help you and your community. • Some fire brigades do not have enough resources to get to the fire quickly but they are coming to help. • When the fire brigade arrives, make space for them by clearing the area so that the fire truck can get through. • Throwing rocks at the firefighters or their equipment, cutting the fire hose, damaging or stealing equipment means that the firefighters can not help you as easily when they come & may cause them to leave.

How can you help them when they come to fight a fire in your community?		<ul style="list-style-type: none"> You can help make the community safe for firefighters to come and assist you by telling others that firefighters are there to help you.
Would you be interested in volunteering to help fight fires in your community or to help others learn about fire prevention?	5 -10 minutes	Provide information about volunteer brigades or community fire prevention and response activities.
<p>Summary: Think back to the story at the beginning of this lesson, what could have prevented the bush fire in the story?</p> <p>What have you learned that you can teach others in preventing bush fires?</p>	5-10 minutes	<p>Summary: Participants provide answers.</p> <p>Families would do well to talk to each other about the dangers of bush fires and be thankful for the blessing that fire provides.</p>

Attitude: Facilitator understands the dangers of bush/wild fires and how to prevent and safely respond to them.

Skill: Participants will be able to discuss bush/wild fires and how to prevent and safely respond to them.

Evaluation: Participants should be able to name ways to prevent and respond to dangerous fires. Participants will know how to contact the fire brigade in case of fire.

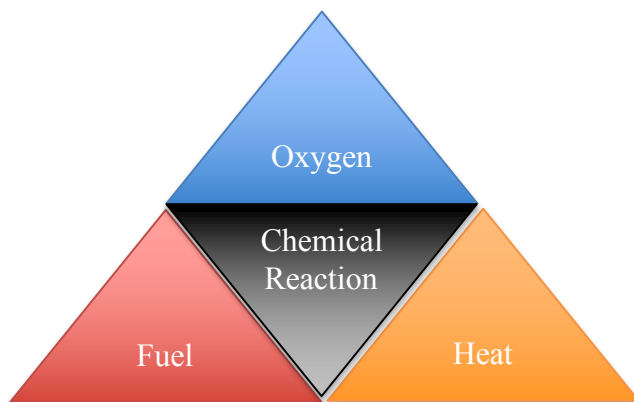
Materials: Newsprint, Markers, Emergency Numbers

Wildland Fire

What causes fire to grow?

Fire Triangle; the following 4 elements have to be present to start a fire

- 1) Oxygen- sustains the fire
 - a. Rapid oxidation occurs in two forms, smoldering fires and free burning fires
- 2) Heat- raises the material to its ignition temperature
 - a. Sources, open flame, sun, lightning, sparks, friction, electrical energy,
- 3) Fuel – combustible material
 - a. Solid (dust, coal, wood, paper, cloth, plastic, grain), liquid (gasoline, kerosene, alcohol, olive oil) or gas (natural gas, carbon monoxide)
- 4) Chemical reaction- exothermic reaction resulting in fire



What causes fire to get smaller?

To break the fire triangle the combustion process has to be interrupted. This is done by disrupting one or more of the three elements

- remove fuel
 - o clearing space
- remove oxygen
 - o limited to smothering small fires with dirt that does not contain combustible organic material
- remove heat source that is sustaining the chemical reaction
 - o Use water or Class A foam

What causes fires in fields, communities and forests?

Humans are the main causes of wildfires. Wildfires can be set by accident from cooking fires, burning debris, discarded cigarettes, clearing fields or acts of arson ("Wildfire Causes and Evaluations (U.S. National Park Service)" n.d.).

The natural cause of fire is lightning. There are two types of lightning, cold and hot lightning. Cold lightning is a series of strokes (the actual production of the lightning bolt/flash) with an intense electrical current for a relatively short duration. Hot lightning has currents with less voltage but last for a longer duration of time. Majority of fires caused by lightning are abnormally long lasting hot lightning bolts ("Wildfire Causes and Evaluations (U.S. National Park Service)" n.d.).

In regard to fields a common method of clearing a forest or heavily vegetated area is to **slash and burn**. Areas of forest are burned and cleared for planting, and the ash serves provides some fertilization and the plot is free of weeds. The constant use of slash and burn results in the degradation of grasslands or forest (Tinker, Ingram, and Struwe 1996). A few hidden dangers of slash and burn practices are the reduction in soil quality, and the decrease in the health of native species and the local community. A major repercussion of slash and burn is the creation of an uncontrollable wildland fire.

Benefits of Fire

What are some benefits of fire in fields, communities and forests?

- Cleans the forest floor
 - o Fire removes the low growing underbrush, and woody debris. It opens the area up to sunlight and nourishes the soil. The reduction reduces competition and helps established trees to grow stronger and healthier. With less woody brush it also decreases the frequency of fires
- Providing habitat
 - o The fires clear the heavy bush leaving open areas for grasses, herbs and shrubs to reestablish and provide food and habitat for wildlife species.
- Killing disease
 - o Fire kills diseases and insects that prey on tree.

Wild Fire Behavior

Parts of a wildfire

The fire starts at the **origin**, it is the point where the fire spreads. How the fire moves will depend on the fuels, wind and the terrain. The **head** of the wildland fire is the part of the fire with the greatest forward rate of spread. It is possible to have a fire with multiple heads, but ultimately you have to control and prevent the formation of new heads to suppress the fire. **Flanks** are the sides of a wildland fire. Control the flanks as soon as possible because a shift in wind direction can change the flank into a head.

Any area that is not burnt adjacent to the fire is the **green**. Fuels in the green may be vegetation with varying levels of moisture. The moisture levels will dictate how the vegetation will burn. The lower the moisture the more combustible the material is. Dense golden, yellow grasses have very low moisture and will burn vigorously along with dried, and dead vegetation. The **black** is the area that the fire consumed or "blackened". The black can be a safe location in the midst of a wildland fire BUT it depends on a few factors

Hazards of the Black

- Steep terrain
- Exposure to adjacent unburned fuels can cause a re-burn
- Residual heat and smoke
- Hot spots and smoldering standing dead trees, stumps and downed trees
- Falling tree limbs

Fuel types

Each fuel will vary by geographical area. Potential fuels include

- Grasses
 - Burn hottest and fastest of all fuel types
- Grasses-shrubs
 - Plains and high deserts
 - Contribute to fire spread
- Shrubs
 - May be prone to fires/ highly combustible
- Timber-understory
 - Large trees both deciduous and evergreens
- Timber litter
 - Small matter such as needles, leaves, twigs and natural debris
- Slash and blowdown
 - Dead residual material left on the forest floor, including logs, treetops, limbs and stumps

Fuel Characteristics

- Loading
 - o Amount of both alive and dead fuel
- Size and shape
 - o Will affect heat transfer and change in moisture content, will help predict the rate of speed of the fire
- Continuity
 - o Horizontal and vertical spacing of fuels. Influences the spread of the fire, will help predict how the fire will behave
- Vertical arrangement
 - o Will influence fire behavior
- Moisture
 - o Moisture content will change frequently
- Temperature
 - o Heat from surrounding air, sun and wildland fuels will lower moisture level and bring fuels closer to ignition temperature
- Compaction
 - o The spacing between fuels
- Uniform fuels
 - o influencing fire behavior is fuel continuity
 - o will increase rate of speed of the fire and the direction of the fire is less predictable
- Patchy fuels
 - o Concentrations that are separated by bare ground or ground that has little to no combustible materials.

Fuel Position

- Subsurface and ground
 - o Lie underground or on the ground examples: roots, deep duff, rotten buried logs, peat, decomposed organic matter
- Surface fuels
 - o All combustible materials that are on the ground or immediately above the ground examples include grass, duff, small dead wood, downed logs, and stumps. These can be flashy fuels, they easily ignite and burn almost completely when environmental conditions are prime
- Ladder fuels
 - o They provide a path or "ladder" from the surface to the tree tops. Examples include shrubs, low-hanging branches, tree moss, tall grasses, downed dead limbs
- Aerial fuels
 - o Also called crown fuels, separated from the ground and sometimes from each other. Examples include tree tops, leave on branches, snags, tall shrubs. They will burn rapidly once they ignite due to air circulation. The horizontal distance will affect the fires rate of speed.

Weather Conditions

Weather conditions will directly affect the fires behavior. Weather is the most changeable factor affecting wildland fire behavior. Erratic fire conditions can be caused by atmospheric stability, drops in temperature, strong winds, seasonal and daily weather cycles. Seasonal and diurnal changes in temperature can be small or large depending on latitude, elevation, topography and the proximity to moderating influences of nearby lakes. In a wildland fire the direct sunlight can preheat fuels bringing them closer to their ignition point. Air temperature will affect the amount of moisture air can hold. Long dry spells will decrease the moisture content in the vegetation making it prone to fires. So generally low humidity increases fire activity, intensity and rate of speed, while high humidity will decrease fire activity. Belt weather kits are helpful to measure local temperatures and the relative humidity. Be a aware of microclimates that may alter local weather patterns.

Wind Conditions

Wind can be defined as the horizontal movement of air relative to surface of the earth; it is measured in terms of direction and speed. Wind is highly variable and changes are unpredictable wind speeds will affect the rate and direction of the fire, it is necessary to anticipate changes in the wind. Wind will directly affect the fire by

- Intensifying the burning by increasing the amount of oxygen available to the fire
- Bending flames, preheating and drying adjacent fuels
- Carry embers and spark over long distances (more than 1.6 km)

Indirect effects include

- strong, dry winds that absorb moisture from the fuels. cool winds can help fuels retain their moisture
- change in wind-induced fire behavior
- will affect how long the flaming front of the fire remains in the area

Fire behavior terms

The **flaming front** is the part of the fire that has a continuous flaming combustion. **Smoldering** fires move slowing and burn without a flame. A wildland fire that is intense and escalates may contain a crowing fire. A **crowing** fire is when the flames advances independent to the surface fire across the tops of trees and shrubs. If the wildland fire moves at increase of rate of spread a blowup may occur. A **blowup** is a violent convection that can behave like a fire storm intensifying the fire, cause smaller fires, or isolate portions of the larger fire.

Points of Attack

Create a fire line. A fire line is a cleared strip of portion of the control line where all combustible material has been removed by scraping or digging down to the mineral soil. The control line refers to all constructed or natural fire barriers. It is important to have a strong anchor point where you start the construction of the fire line. The anchor point is a safe point that minimizes the chance of being outflanked by the fire.

Barriers can be used as protection on the fire line. Barrier is define as any obstruction to the spread of fire. Examples include rivers, lakes, rock outcroppings, burned areas, swamps, road, highways, and reservoirs.

Containment and control

Full control of a fire means the following actions have taken place

- complete the control line
- all spot fires are put out
- burn out unburned adjacent lands
- cool down all hot spots that are immediate threats to the control line
- mop up
 - o extinguish or remove all burning or smoldering material 30 m from the control line
 - o be very diligent, a small spark or flame can rekindle for hours or days possibly starting another fire

Topography

Includes terms such as scenery, landscape, geography, and countryside. Topography affects a fires Intensity, rate and the direction of spread. Topography is described in terms of slope and aspect. A slopes aspect includes the compass direction of the slope faces. The aspect of the slope will determine the effect of the sun's heat on plants, air temperature, and moisture retention in the soil.

- North facing slopes have more shade, heavier fuels, lower temperatures, higher humidity and higher fuel moisture. North aspects will have less fire activity compared to the south
- South in the Northern Hemisphere south facing slopes receive direct sun rays. The south tends to have higher temperatures, lower humidity, rapid loss of fuel and soil moisture, drier, and lighter flashy fuels (grass).
- Eastern and south eastern slope exposures have equal solar heating as the sun moves across the sky. With the sunrise, east slopes will have early heating and easier cooling
- Western, southwestern slope have similar heating, west facing slopes will have later heating and cooling during the course of the day

Slope relates to the incline of the terrain whether natural or human made. Without considering wind fire usually moves faster uphill. The steeper the slope that faster the fire moves. The uphill side of a fire the flames will dehydrate, preheat and ignite the vegetation further up the hill.

Warning- topographic elements such as V shaped drainage or depressions between two adjacent hilltops can dramatically accelerate fires, alter the flow of winds causing erratic behavior and change the rate and direction of the fire.

10 Standard Firefighting Orders

1. Keep informed of the weather
2. Size up the fire and know what it's doing to do
3. Base actions on current expectations of fire behavior
4. Identify escape routes and safety zones and make them known to everyone
5. Post a look out to inform about the fires movement when there is possible danger
6. Be alert, Keep calm, Think Clear, Act decisively
7. Maintain communications with all responders
8. Use clear, oral and concise instructions
9. Maintain control of the controllables
10. Fight the fire aggressively and stay safe

Personal Protective Equipment

1. Cotton pants and long sleeve cotton shirt
 - a. Synthetic fibers will melt
 - b. Try not to wear structure fire outerwear, it is hot and cumbersome
2. Leather Boots
3. Leather Gloves
4. Helmet
5. Eye protection
6. Water
7. Fire shelter

Suggested tools

1. Shovel to dig fire lines
2. Rake for mop up
3. Pulaski/axe for fire line
4. Hoes
5. Water

Tips, How To attack

1. Fire sized up and initial attack

Consider- individual safety, fuels and terrain, weather, assess smoke column, access routes and know their limitations, identify and use fire barriers, locate potential water sources, consider history of fire in the area, public safety concerns

2. Assess flame length

Figure 2-Fire Suppression Limitations Based On Flame Length*

Flame Length	
4'	Fires can generally be attacked at the head or flanks by persons using hand tools. Handline should hold the fire.
4'-8'	Fires are too intense for direct attack on the head by persons using hand tools.
8'-11'	Fires may present serious control problems; torching out, crowning and spotting. Control efforts at the head will probably be ineffective.
>11'	Crowning, spotting and major fire runs are probable. Control efforts at the head of the fire are ineffective.

***This may be modified for local fuels and conditions.**

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3. Use water or dirt to cool and extinguish hot spots
 4. Anticipate future control action
 5. Construct fire line
 6. Do not leave significant areas of unburned material close to fire line
 7. Utilize existing barriers to full extent
 8. Fire spreads out of control notify others and work on another section of the fire
 9. Stay updated with weather conditions and fire direction
 10. Safety comes first

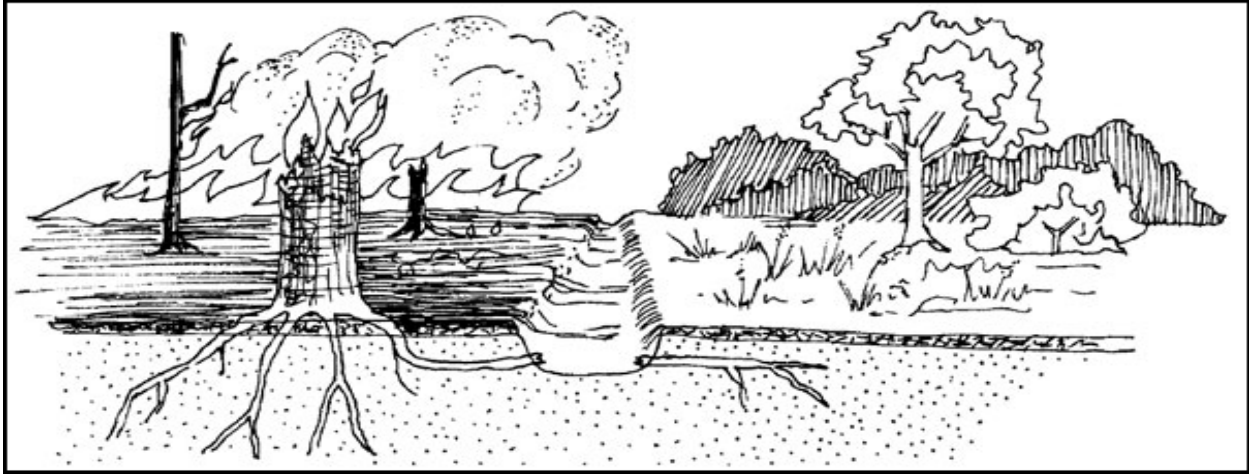


Figure of fire line cleaned to mineral soil.

Figure 3—Direct Attack

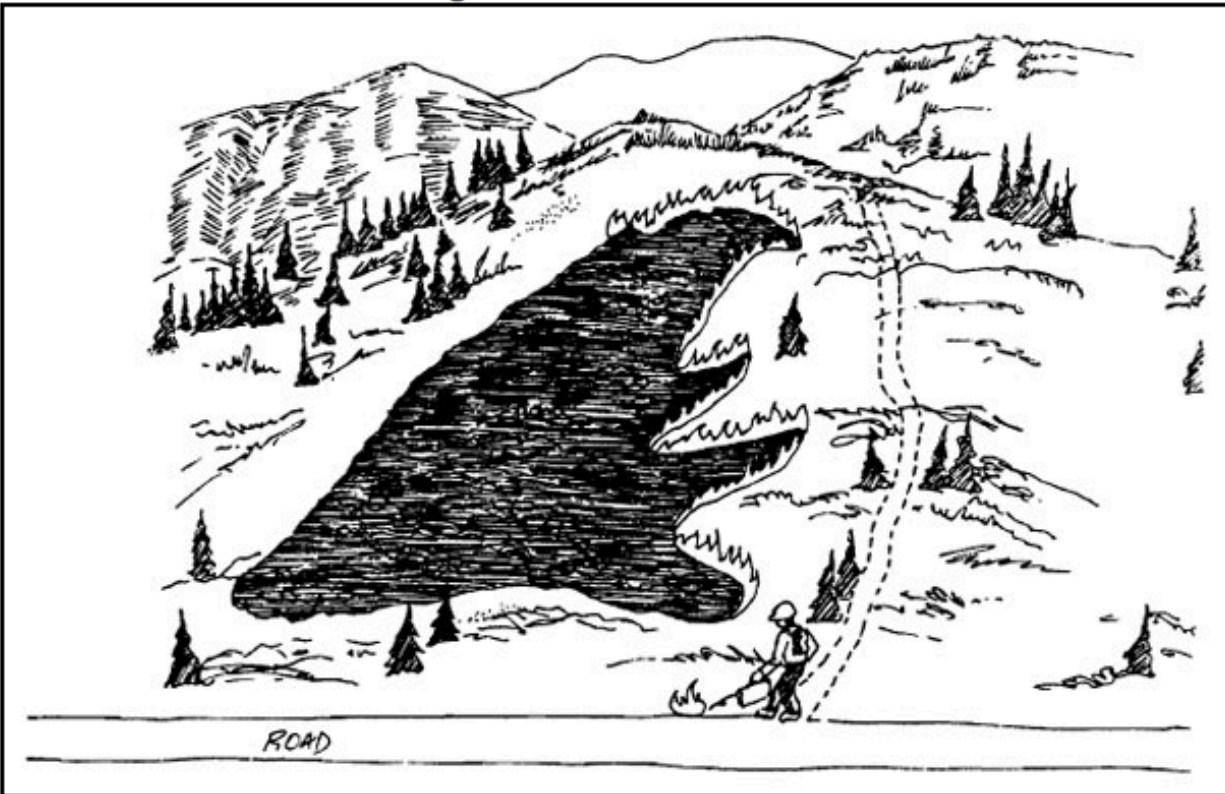


Direct attack generally works best on fires burning in light fuels or fuels with high moisture content burning under light wind conditions. Direct attack works well on low intensity fires (flame lengths less than 4 feet) which enable firefighters to work close to the fire.

A major advantage of direct attack is firefighter safety. Firefighters can usually escape back into the burned area for a safety zone. This is known as “keeping one foot in the black.”

Parallel attack is made by constructing a fireline parallel to, but further from, the fire edge than in direct attack (see Figure 4). This tactic may shorten fireline construction by cutting across unburned fingers. In most cases the fuel between the fireline and the fire edge is burned out in conjunction with fireline construction.

Figure 4—Parallel Attack



Indirect attack is accomplished by building a fireline some distance from the fire edge and backfiring the unburned fuel between the fireline and the fire edge (see Figure 5). Indirect attack takes advantage of using natural and human-made barriers as fireline and allows a choice of timing for backfiring. Indirect attack is generally used on hot fires with high rates of spread where direct attack is not possible.

Fire Suppression Principles: <https://www.coloradofirecamp.com/suppression-tactics/how-to-attack.html>

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