

S100A Recertification

Test information

“It is every person’s legal obligation to immediately report an open fire that is burning on, or within 1km of forest land or grass land and appears to be burning unattended or uncontrolled.”

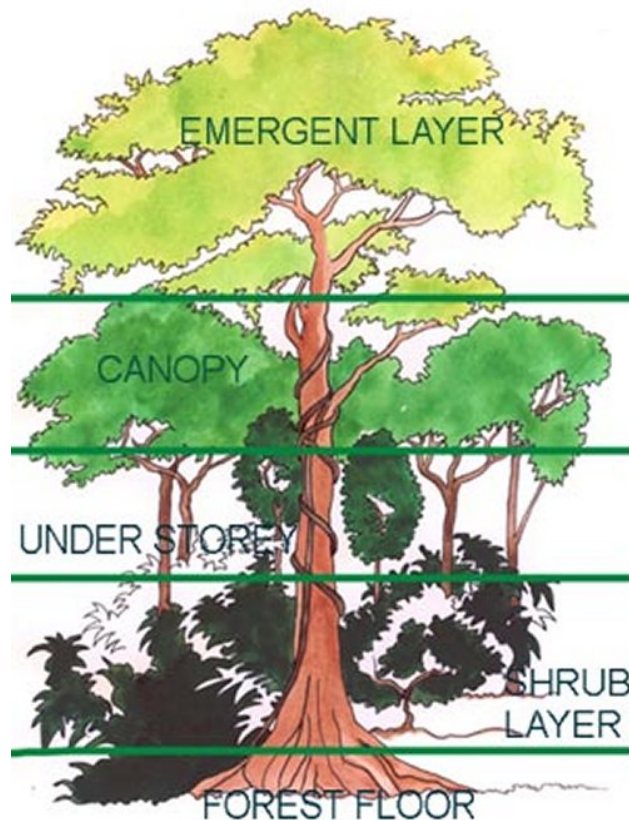
Forest Layers

A wildland fire consists of plant community dominated by trees growing on a forest floor. Forest Fuels any substance that will ignite and combust (burn) is a fuel. There are three types of fuel:

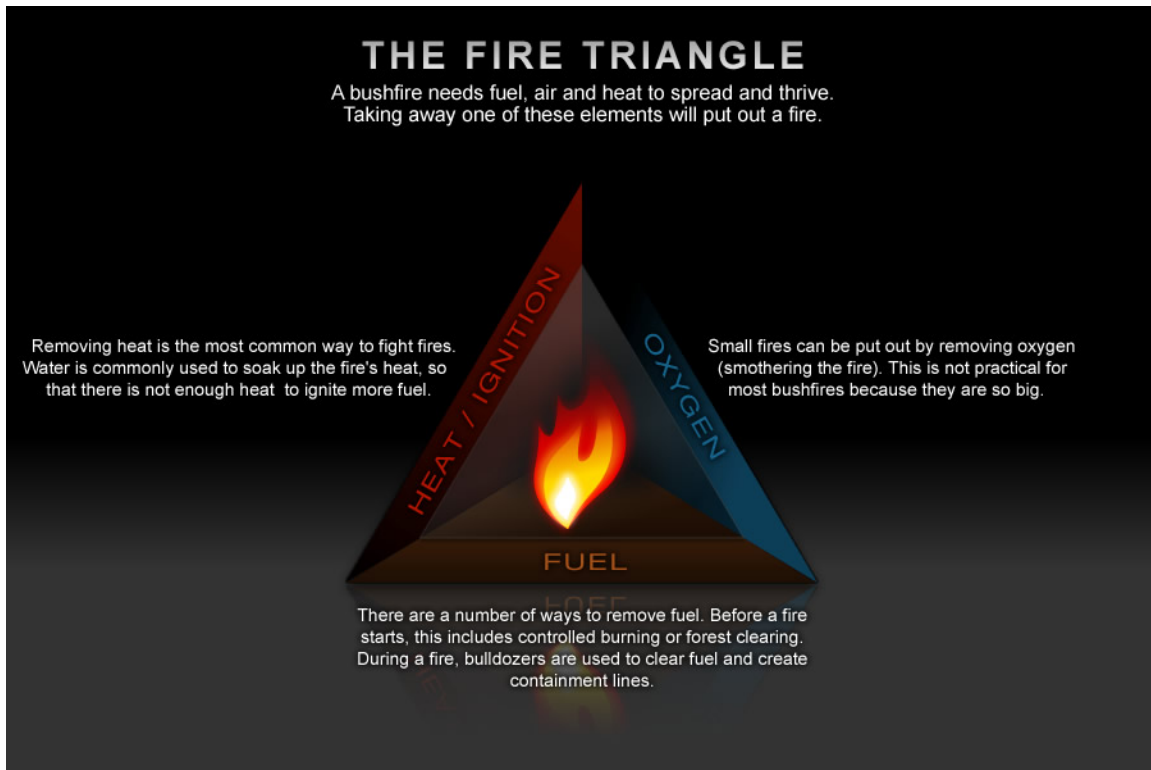
Aerial Fuel: combustible material higher than one meter (39 inches) above ground level;

Surface Fuel: includes all combustible less than one meter above ground level and one years litter accumulation; and

Ground Fuel: includes all combustibles substances below the surface litter of the duff.



The Fire Triangle



Three elements: fuel, oxygen and heat must be present to start and maintain a fire. In a forest fire: Fuel is the forest. Air provides the oxygen. Lightning or people introduce heat into the environment.

The fire triangle's elements are linked; if one of the three elements is removed then the fire will be extinguished.

Heat Transfer Process Radiation: Is the transfer of heat from warm surfaces to cooler surroundings. Example heat from a fire place, or a campfire.

Convection: Is when heated molecules pass from one place to another. Example As warmer air rises cooler air rushes in creating a circular current.

Conduction: The transfer of heat through another object or mass. Example boiling water on the stove. The element is heated and warms the pot which boils the water.

Factors Influencing Fire Behaviour

Fuel	Weather	Topography
Moisture	Wind	Slope
Size	Precipitation	Terrain
Spacing	Relative Humidity	Aspect
Fuel		Elevation

Fuel

Fuel Moisture:

Fuel moisture is the most important fuel related factor affecting fire behaviour.

Fire will ignite easier and spread faster in fuels with lower fuel moisture.

How to determine fuel Moisture:

- The amount of precipitation: Snow, rain. These are weather related factors that have a direct relationship with fuel moisture.
- Type and condition of fuel: If the fuel is alive, it will not burn as fast as if it was dead. As well as the type of fuel (logs, grass, and brush) all have different burn rates.

Heavy fuels: Can be categorized as slow burning fuels. These are things such as logs, stumps, deep duff, and large trees. These are harder to ignite, and burn longer and burn slower.

Light Fuels: Can be categorized as fast burning fuels. These are grasses, small brush and trees, dead material, and needles. This fuel type has fast ignition time, and fast burn rate, but burns for a short duration.

The Moisture content change due to weather has a faster affect on Light fuels than heavy fuels. Heavy fuels take longer to change moisture content. Since it has a larger surface area, and volume.

Relative Humidity:

Relative humidity influences fire behaviour by affecting fuel moisture.

Relative humidity is calculated by the percentage of water to air (the amount of water vapour present in the air.).

- Low Relative Humidity; tend to dry out forest fuels faster.
- High Relative Humidity tends to make forest fuels wetter, and heavier.

Relative humidity will decrease during the day (dry out) and increase at night.

Fire Types



1. **Ground fires:** are fires that are contained to the ground, usually less intense fires, and are the first stages of the fire.



2. **Surface fires:** are more active fires, that spread over a larger area, and have open and active flames.



3. **Crown Fire (Intermittent):** Large active fires spreading from the ground into the crown. It's a fully involved fire and should be re-essed as it can be unpredictable at times.



4. **Crown Fire:** Fully involved fire, and can leap from one are to another are. As well it is unpredictable and must use all safety precautions when working around such an active fire.

Major Factors affecting fire Behaviour

Topography:

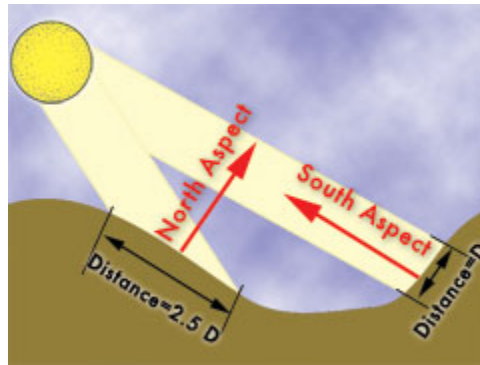
There are three main topographical factors that have the greatest influence on fire behaviour.

1. Slope
 - a. Aspect
2. Terrain
3. Elevation



Slope: Is the single most important factor in the topographical effects on fire behaviour.

- Slope make flames closer to the fuel source (uphill side).
- Convection heat rises upslope drying out the fuel source ahead of the fire.
- Fire can be swept up slope from the draw of the convection heating from the fire itself. Creating spot fires ahead of the fire itself (uphill, due to the draw of the convection heating.).
- Burning debris and ambers can roll down hill igniting fire down slope and making the fire dangerous to fight.
- Cooling at night causes the winds to change directions, moving the fire down slope, and warms during the day increasing the convection effect.



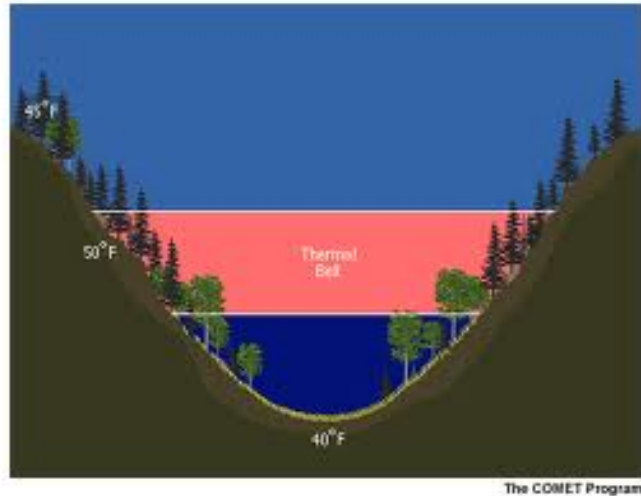
Aspect: Is a very important part of the slope factor. Aspect is the direction for which the slope faces. Southeast aspect, Northwest aspect.

- Southeast slopes get the most sun, and dry out faster than any other slope. This gives southeast facing slopes higher temperatures and dryer fuels.



Terrain: Affects fire behaviour by affecting the pattern and flow of the wind. Terrain and change the wind directional and speed.

- Terrain creates eddies or turbulence, on leeward sides, from wind blowing across high features, such as ridges, cliffs, and other like features.
- Wind speed increases as it come into tight valleys and knolls. This can help spread the fire faster upslope and through valley's.
- Steep sided gullies can create the “chimney effect” which raises the uphill wind speed dramatically.



Elevation: The higher the elevation the cooler the temperature. Certain atmospheric conditions a rise certain **Thermal Belt**, this is a layer of warm dry air trapped between the cooler higher elevation air and the warm moist air the valley bottoms. Here is where the moister and air temperature can create extreme fire conditions when least expected.

Safety Note: Use extreme caution when fighting fire in higher elevations and steep ground. Make sure all safety resources are properly communicated, and that all fire fighters know the evacuation routes and procedures.

Fire Intensity Ranking System:

Rank

- 1. No open flame, white smoke, smouldering ground fire.(below)**

- 2. Visible open flame, surface fire only
Unorganized flame front, little or no spread. (below)**

- 3. Organized surface fire
Moderate rate of spread
Vigorous surface fire. (below)**

- 4. Organized surface flame front, disorganized crown involvement.
Moderate to fast rate of spread on the ground
Short range spotting
Grey to black smoke**

- 5. Organized crown fire front
Moderate to long range spotting
Independent spot fire growth
Copper to black smoke**

- 6. Organized crown fire front
Moderate to long range spotting
Independent spot fire growth
Presence of fire balls and fire whirls**

LCES

LCES stands for **lookout(s), communication(s), escape routes and safety zone(s)**. These are the same items stressed in the FIRE ORDERS and “Watchout” Situations. I prefer to look at them from a “systems” point of view, that is, as being interconnected and dependent on each other. It is not only important to evaluate each one of these items individually but also together they must be evaluated as a system. For example, the best safety zone is of no value if your escape route does not offer you timely access when needed.

A key concept – the **LCES** system is identified to each firefighter prior to when it must be used. The nature of wildland fire suppression dictates continuously evaluating and, when necessary, re-establishing LCES as time and fire growth progress. I want to take a minute and briefly review each component and its interconnection with the others.

Lookout(s) or scouts (roving lookouts) need to be in a position where both the objective hazard and the firefighter (s) can be seen. Lookouts must be trained to observe the wildland fire environment and to recognize and anticipate wildland fire behavior changes. Each situation determines the number of lookouts that are needed. Because of terrain, cover and fire size one lookout is normally not sufficient. The whole idea is when the objective hazard becomes a danger the lookout relays the information to the firefighter so they can reposition to the safety zone. Actually, each firefighter has the authority to warn others when they notice an objective hazard which becomes a threat to safety.

Communications(s) is the vehicle which delivers the message to the firefighters, alerting of the approaching hazard. As is stated in current training, communications must be prompt and clear. Radios are limited and at some point the warning is delivered by word of mouth. Although more difficult, it is important to maintain promptness and clearness when communication is by word of mouth.

Incident intelligence (regarding wildland fire environment, fire behavior and suppression operations) both to and from Incident Management (i.e. Command & General Staff) is of utmost importance. But I don't view this type of communication a normal component of the LCES system. Entrapment occurs on a fairly site-specific level. Incident intelligence is really used to alert of hazards

(e.g.. “Watchout” situations) or to select strategical operations. LCES is primarily a Division function: responsibility should be here.

Escape Routes are the path the firefighter takes from their current locations, exposed to the danger, to an area free from danger. Notice that escape routes is used instead of escape route(s). Unlike the other components, there always must be more than one escape route available to the firefighter. Battlement Creek 1976 is a good example of why another route is needed between the firefighter’s location and a safety zone.

Escape routes are probably the most elusive component of LCES. Their effectiveness changes continuously. As the firefighter works along the fire perimeter, fatigue and spatial separation increases the time required to reach the safety zone. The most common escape route (or part of an escape route) is the fireline. On indirect or parallel fireline, situations become compounded. Unless safety zones have been identified ahead, as well as behind, firefighters retreat may not be possible.

Safety Zone(s) are locations where the threatened firefighter may find refuge from the danger. Unfortunately shelter deployment sites have been incorrectly called safety zones. Safety zones should be conceptualized and planned as a location where no shelter is needed. This does not intend for the firefighter to hesitate to deploy their shelter if needed, just if a shelter is deployed the location is not a true safety zone. Fireline intensity and safety zone topographic location determine safety zone effectiveness.

Again, a key concept – the LCES system is identified prior to when it must be used. That is lookouts must be posted with communications to each firefighter, and a minimum of two escape routes form the firefighter’s work location to a safety zone (not a shelter deployment site) every time the firefighter is working around an objective hazard.

Safety and tactics should not be considered as separate entities. As with any task safety and technique necessarily should be integrated. The LCES system should be automatic in any tactical operation where an objective hazard is or could be present.