

Understanding Fire Behavior and Ignition Techniques

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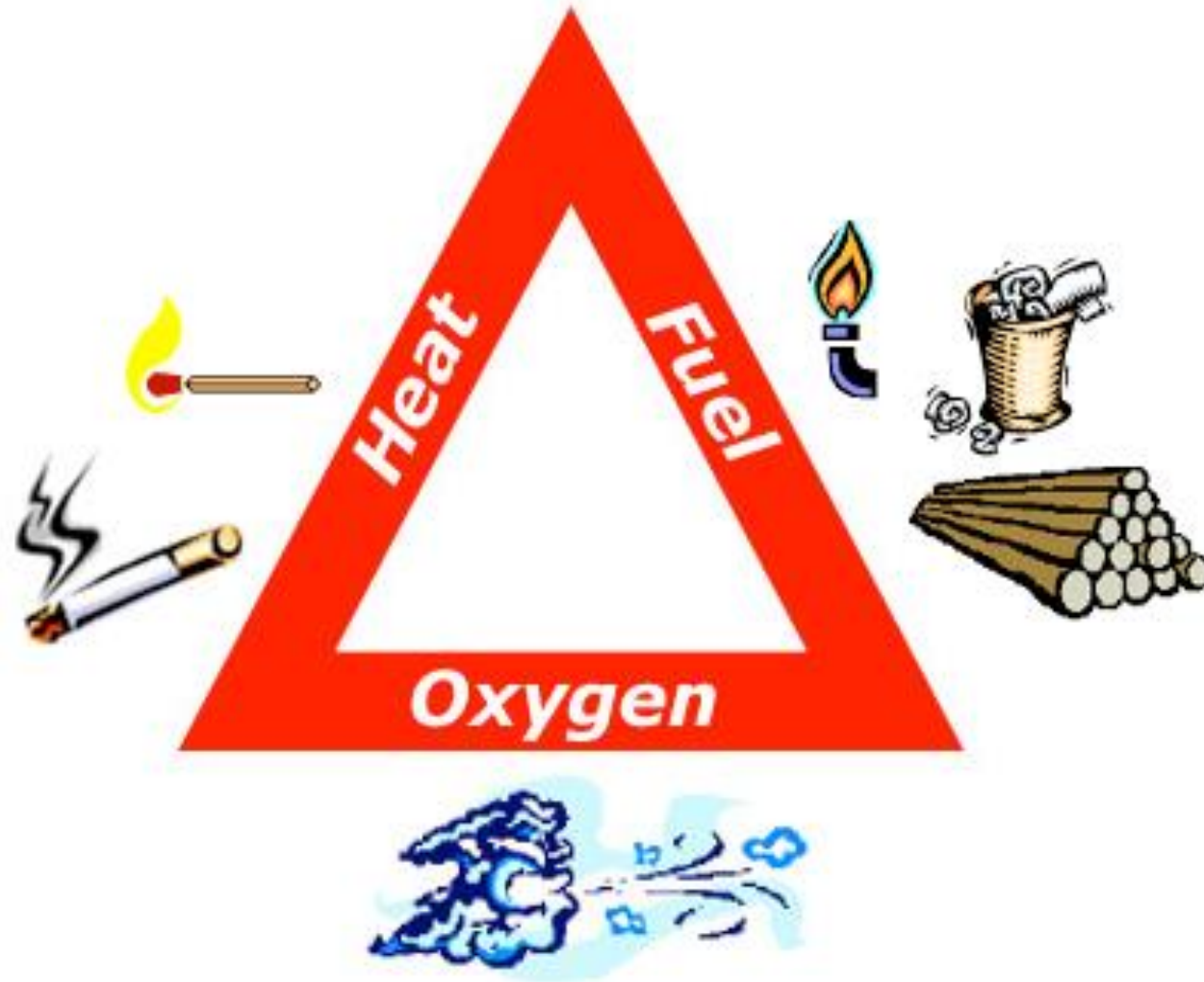
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SC-NRCS Training*

Understanding Fire Behavior and Ignition Techniques

The Fire Triangle



Why are Ignition Techniques and Fire Behavior Important?

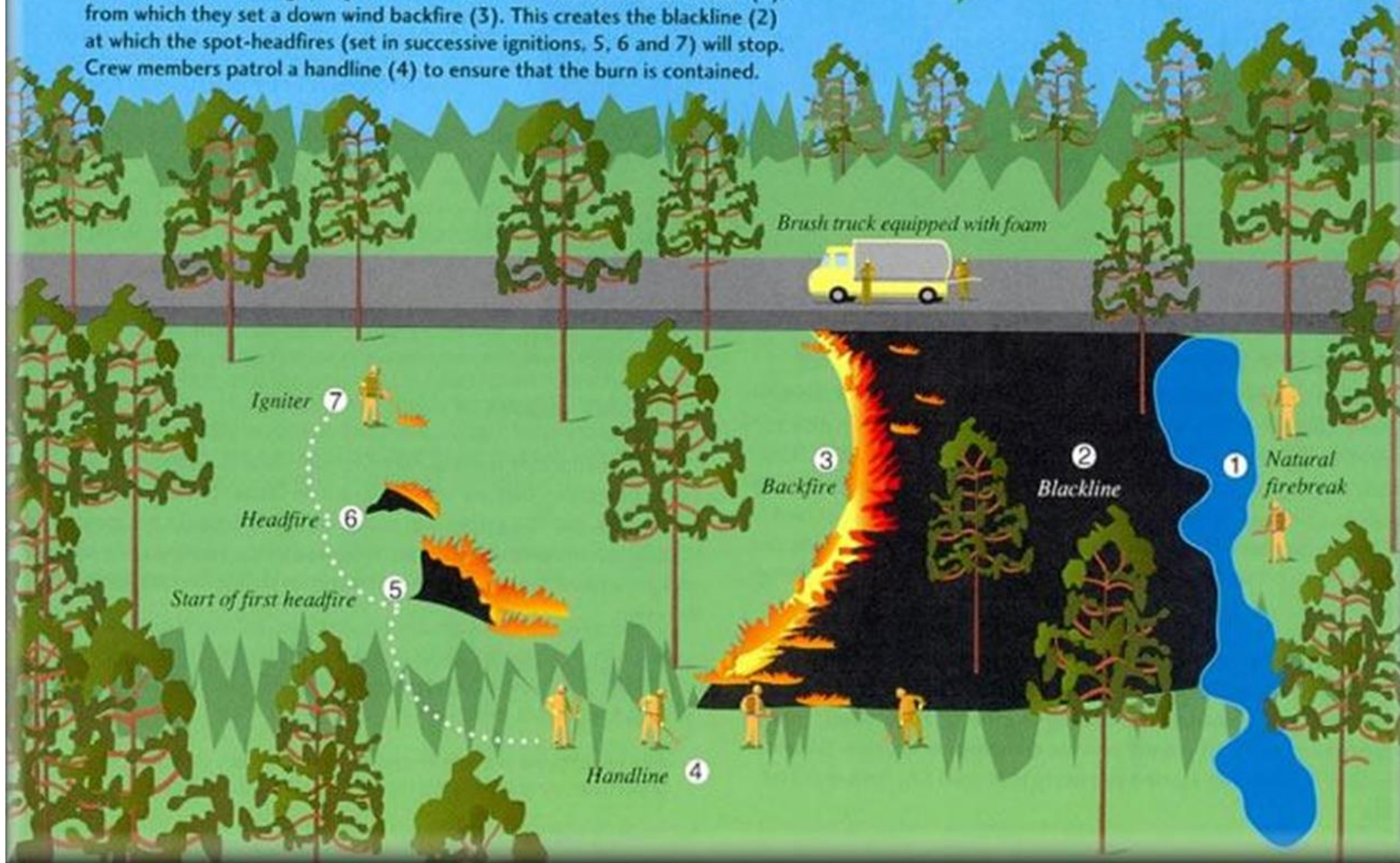
- Your prescribed fire goals and objectives are directly tied to your fire behavior.
- And...
- Your fire behavior is directly tied to your ignition techniques!



Anatomy of a Prescribed Burn

Prescribed burn managers try to find a natural firebreak, such as a creek (1), from which they set a down wind backfire (3). This creates the blackline (2) at which the spot-headfires (set in successive ignitions, 5, 6 and 7) will stop. Crew members patrol a handline (4) to ensure that the burn is contained.

WIND DIRECTION →



Fire Behavior Terms and Ignition Techniques

- Backing fire
- Flanking fire
- Head fire
- Strip head fire
- Point source fire
- Ring fire



Fuel types

- Grass
- Shrub
- Timber litter
- Timber understory
- Slash



Firebreak Types and Objectives

- Natural firebreaks
- Constructed firebreaks
- What makes an adequate firebreak?
- Environmental and physical concerns of firebreak installation



BACKING FIRE

A fire burning against the wind or down a slope; majority of the flame length is extending over already burnt fuel.



BACKING FIRE

- *Where Used:* Near control lines, heavy and shrubby fuels, around resources to be protected.
- *Advantages:* Low intensity, low scorch, minimal spotting potential, long residence time (*high consumption, heat girdling).
- *Disadvantages:* Slow moving, long residence time (*young pines, duff), poor dispersion, susceptible to wind shifts.







FLANKING FIRE

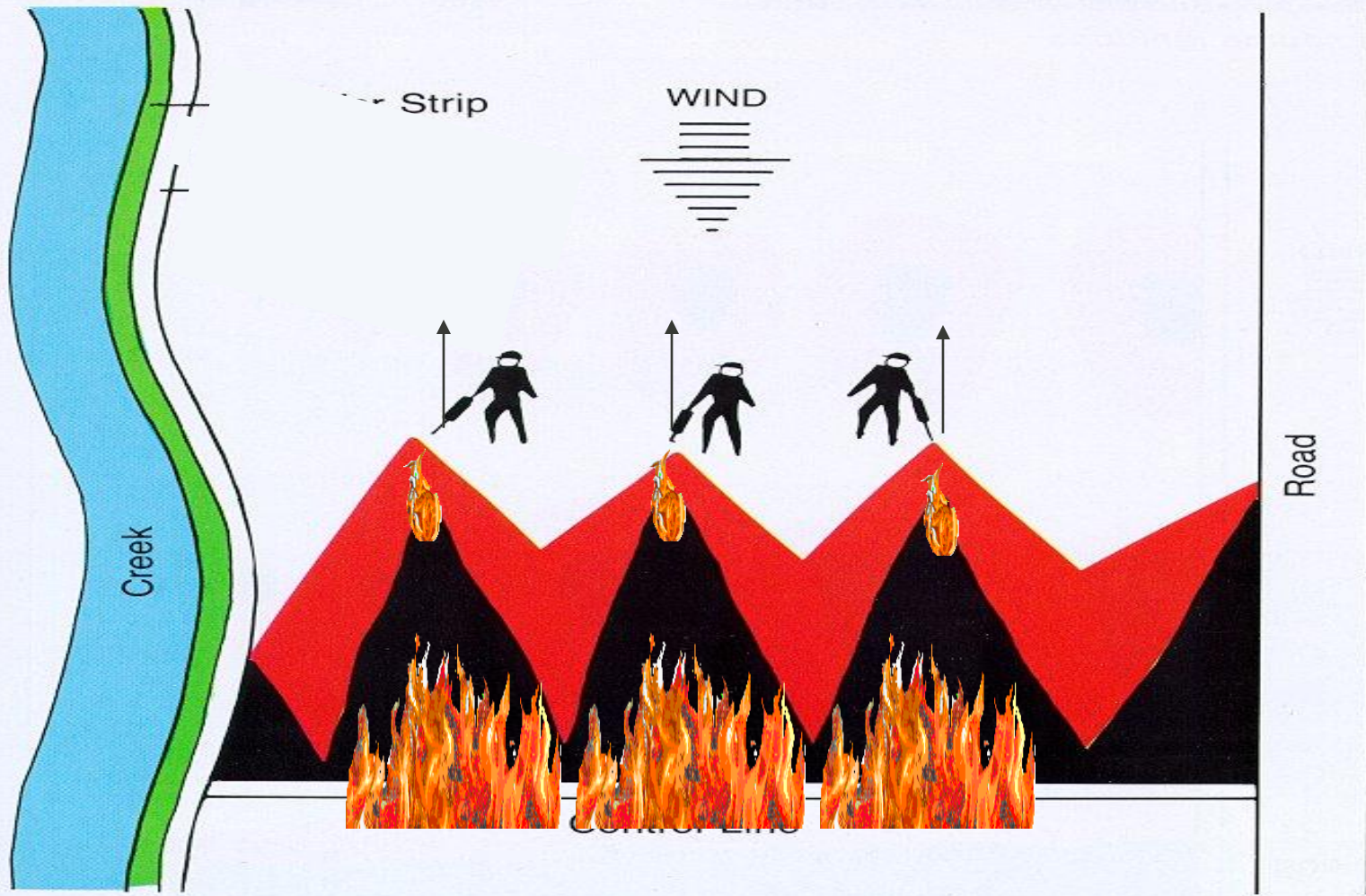
A fire that is burning parallel to the wind. Fire spreads laterally, consuming fuels between the flanking fires.



Flanking Fire

- *Where Used:* Shrublands, light fuels, lighting downhill.
- *Advantages:* Flame lengths between backing and head fire, good consumption, can cover a lot of ground with few igniters.
- *Disadvantages:* Susceptible to wind shifts, requires experienced firing personnel.





Flanking fire technique



Flanking Firing



Head Fire

A fire that is burning with the wind behind it. The fire is being carried into unburned fuel by the wind and/or slope. Flame length is bending over unburned fuel.



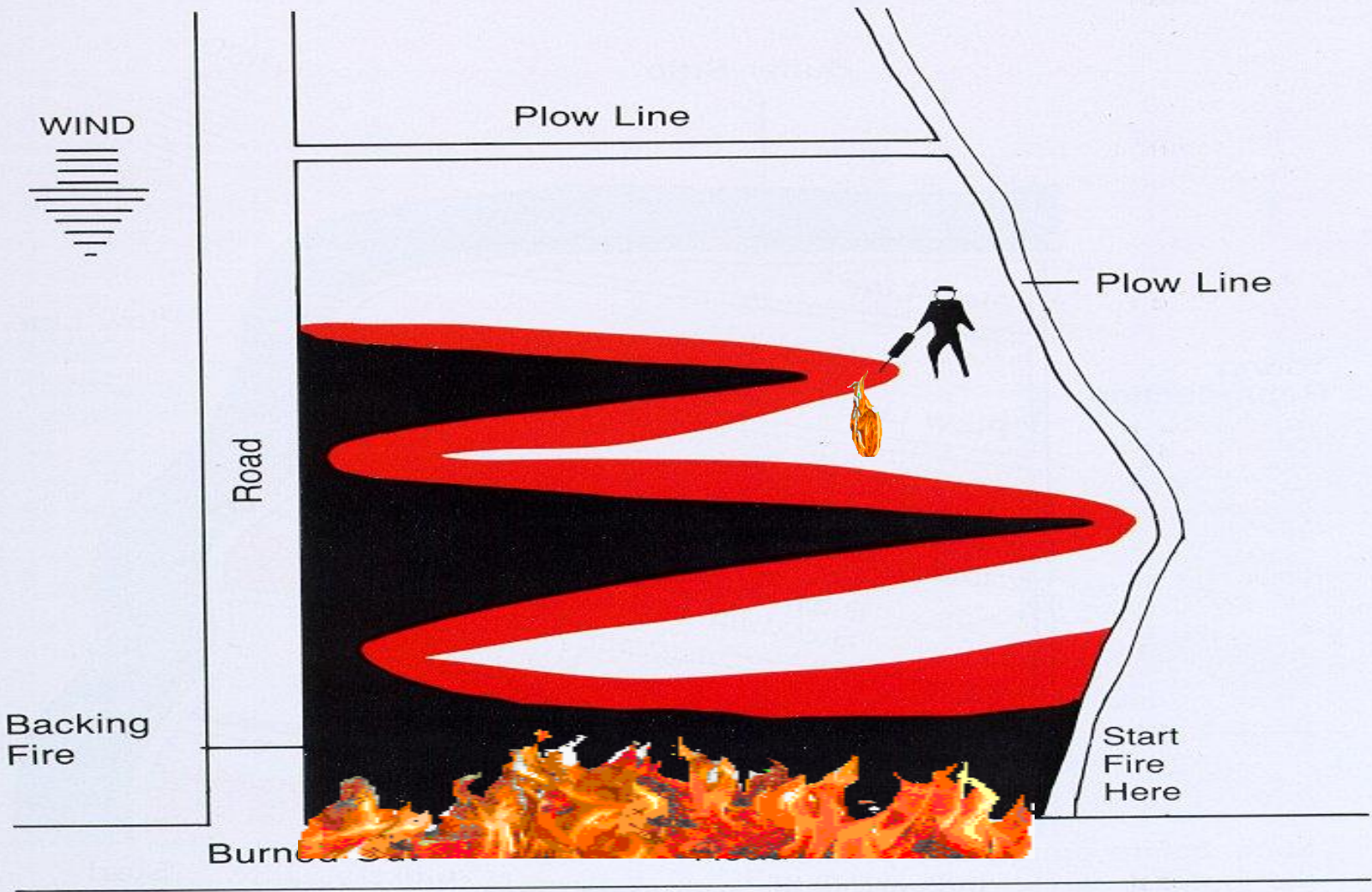




Strip Head Firing

- Solid lines of fire are lit interior to the baseline or control line, sending head fire towards unburned fuel, until it reaches “black”.
- Successive lines of fire continue to be lit, parallel to the last line of fire.
- Intensity is moderated by how near or far apart each line is set. The wider the spacing, the larger the flame lengths and greater the fire intensity.





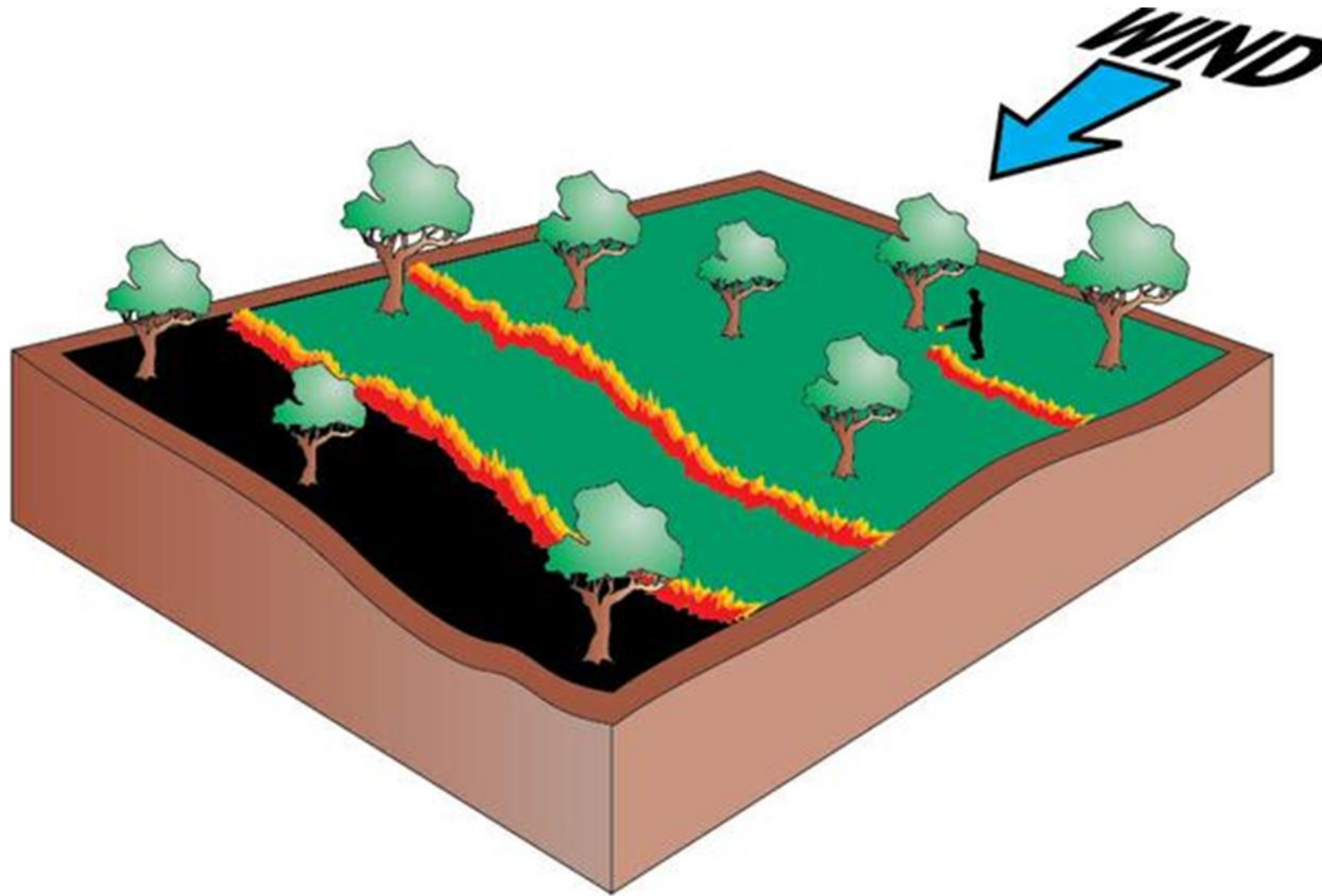
Strip-heading fire technique



Strip Head Fire Ignition



Strip Head Firing



Strip Head Firing

- *Where Used:* Large units, shrublands, grasslands, timber understory, young longleaf
- *Advantages:* Fast moving, low residence time, igniters can readily adjust intensity
- *Disadvantages:* Requires access across the unit, fires will interact, entrapment can occur if not well coordinated



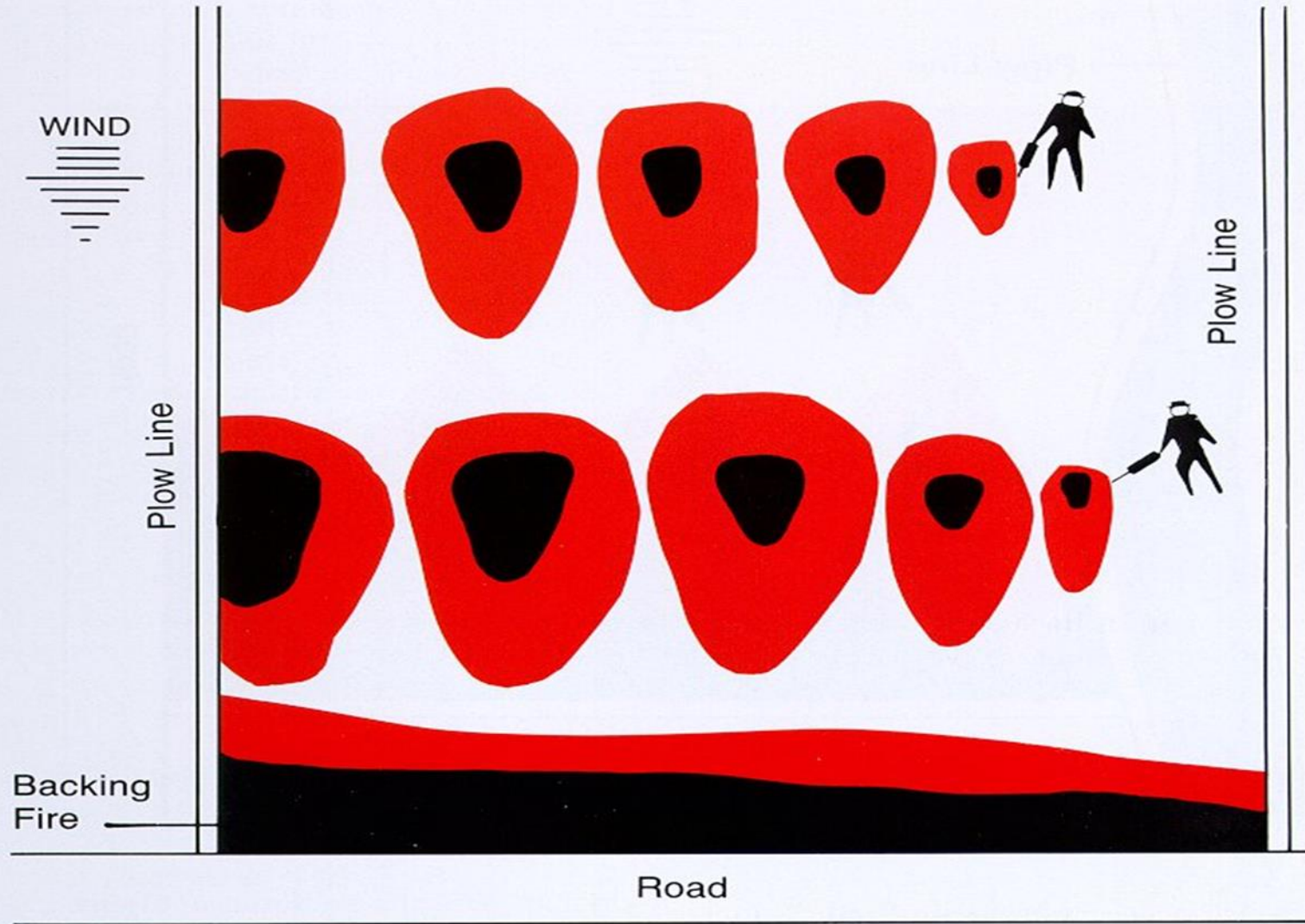
Strip Head Firing on the Baseline



Point-Source Ignition

- Pattern is similar to strip head fires, in which igniters light small patches of fire in lines across unit, and on the upwind side of the baseline fire.
- Point-sources of fire spread in all directions until they consume all available fuels and run into adjacent point-source fires.





Grid or point source ignition technique



Point Source Ignition

- *Where To Use:* Large units, units with continuous fuels, timber understory burns, young longleaf stands.
- *Advantages:* Efficient, intensity is highly adjustable, variable fire behavior with fire spread occurring in all directions.
- *Disadvantages:* Need access across the unit, could result in patchy burn if fuels are not contiguous.





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From: NC State Extension Forestry
Go.ncsu.edu/efire



Point Source Ignition, aka
grid ignition, from the air.



Point-Source Ignition as an Interior Ignition Technique



Ring Firing

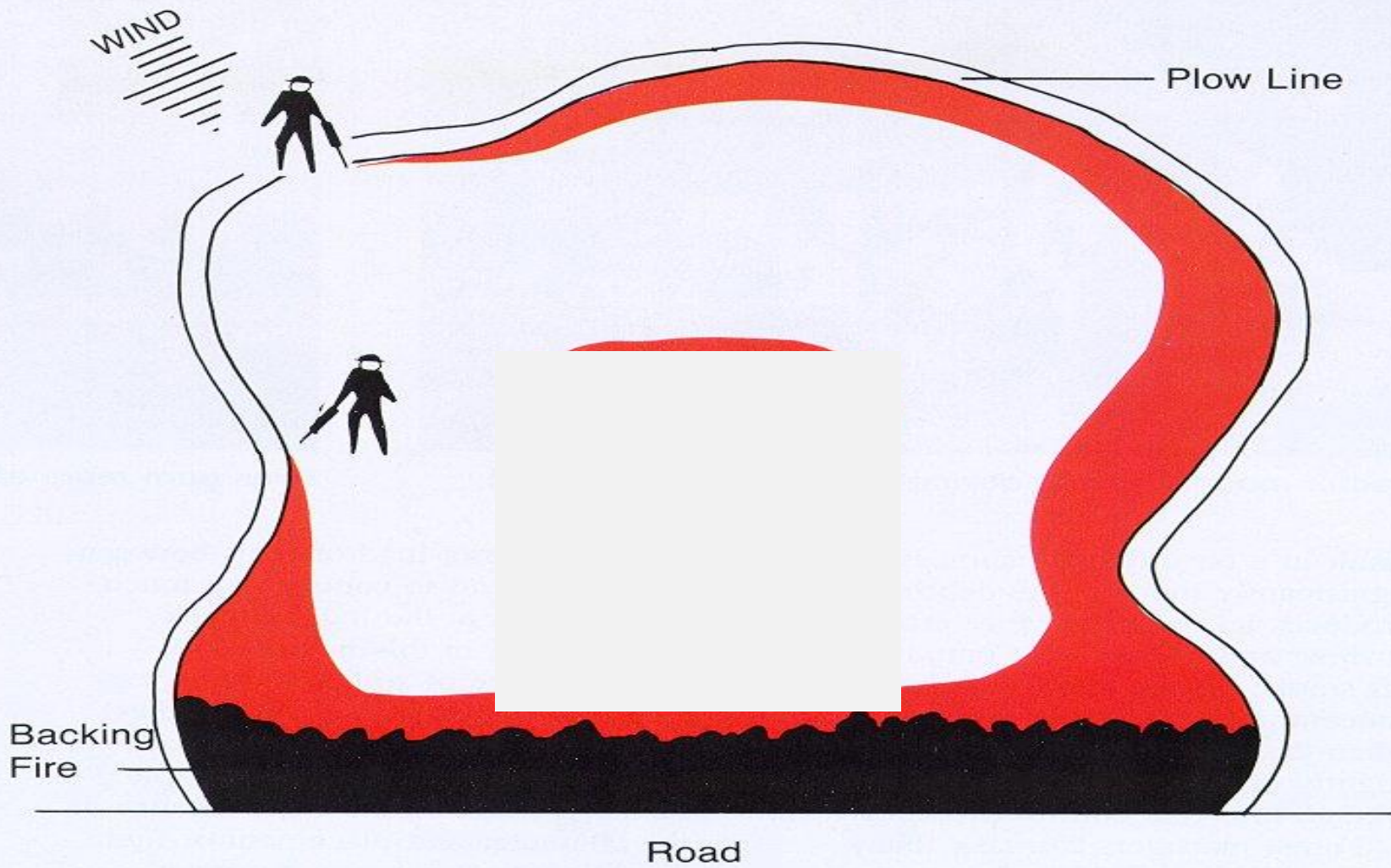
Primary ignition:

Fire is lit from the control lines, beginning on the downwind side, proceeding up the flanks, and finishing on the upwind side.

Secondary ignition:

Technique may also be used to ring pockets of fuel in the interior.





Ignite t

Ignite back fire first then flanks and then head.

Center firing technique



Ring Firing

- *Where Used:* Shrublands, grasslands, interior jackpots, pile burning.
- *Advantages:* Fast ignition time, very high intensity burn, good convective potential.
- *Disadvantages:* Strong convection column may develop, spotting potential may be high, does not allow for escape by wildlife (when done quickly over entire unit).



Techniques, Terms and Tools

- Types of fire breaks, considerations for containment, access
- Fuel types—Grass, Shrub, Timber Litter, Timber Understory, Slash
- Firing patterns—Strip head fire, Backing, Flanking, Point source or grid, Ring fire
- Fire behavior types— Backing fire, Flanking fire, Head fire

...to be continued!



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