

Mowing and raking firebreaks



The mowed firebreaks are at least 10' wide and are usually 20'. A rotary hay rake is used to clear larger firebreaks.



Hand-raking is necessary to remove litter between the experimental prairie plots. An alternative to raking is using a water tank and hose to water down the litter.

Preparation for a burn

(3) Check for dead timber in savanna
and forest habitats

Checking for snags



Even with great firebreaks in place, potential fire hazards within a burn area are dead trees and trees that are still alive but are rotting out at the base. Dead trees that ignite create “chimney fires”. The hollow center creates a draft that pulls the flames up into the top of the tree where sparks can go shooting out. This may be an impressive sight, but the sparks can travel several hundred feet through the air, crossing firebreaks and igniting other trees. Once a chimney fire has started, the only way to stop it is to use lots of water or a chainsaw.

To avoid chimney fires, dead trees can be identified ahead of time in an effort to be left as “snags”, which provide valuable wildlife habitat. The trees must be raked around or watered down at the base of the tree prior to burning through the area.

The same thing can be done for smaller trees or shrubs that may be damaged by fire.

Preparation for a burn

(4) Write a burn prescription for each area

Burn prescription

Burn unit map

Equipment

Personnel

Weather parameters

Emergency contact information

The firebreaks are usually maintained months before a burn or at least a few days ahead of time. Dead trees can be raked around a day in advance, and/or watered down minutes before the area is to be burned. A burn prescription should at least be in draft form prior to establishment of firebreaks.

A burn prescription is a document that is specific to a burn unit. For example, at CERA, we can prepare a burn prescription specifically for the “Fall burn prairie” near the entrance. It contains a map of the burn unit and surrounding area, the preparation and location of firebreaks, equipment and personnel requirements, preferred ranges for weather parameters, a narrative describing how the burn will be conducted, contingency plans, and emergency contact information.

Burn prescription

Burn unit map

Equipment

Personnel

Weather parameters

Emergency contact information





Equipment

Personal safety

- All-cotton clothing
- Leather boots
- Hat, Bandana
- Safety glasses
- Leather gloves

Personal safety is the most important consideration for a prescribed burn. Anyone assisting with a burn should wear all-cotton or wool clothing from head to foot. Cotton clothing will ignite, but not as quickly as other materials and synthetics tend to melt on to your skin. Dressing in layers provides the option of cooling down when working close to the fire and staying warm when working away from the fire.

Leather shoes or boots provide good support and do not ignite easily; and a hat is recommended to avoid singeing your hair.



CERA has personal safety gear including fire-resistant suits, helmets with neck and face guards, and several pairs of leather gloves with long wrist bands. The helmets are comfortable and are fairly effective at keeping smoke out of your eyes, nose, and mouth. Safety glasses, a hat, and a bandana can be used in place of a helmet. If you assist the burn crew, we will provide a helmet, gloves, a face mask, and fire suit if one is available.

Equipment



Fire Ignition

Fire Suppression

For the actual burn, a drip-torch or flame torch is used to start the fire. However, a few matches can be used in combination with a steel rake to spread the fire line. The torches use a combination of diesel fuel and unleaded gasoline.

Fire ignition

Flame torch



Drip torch

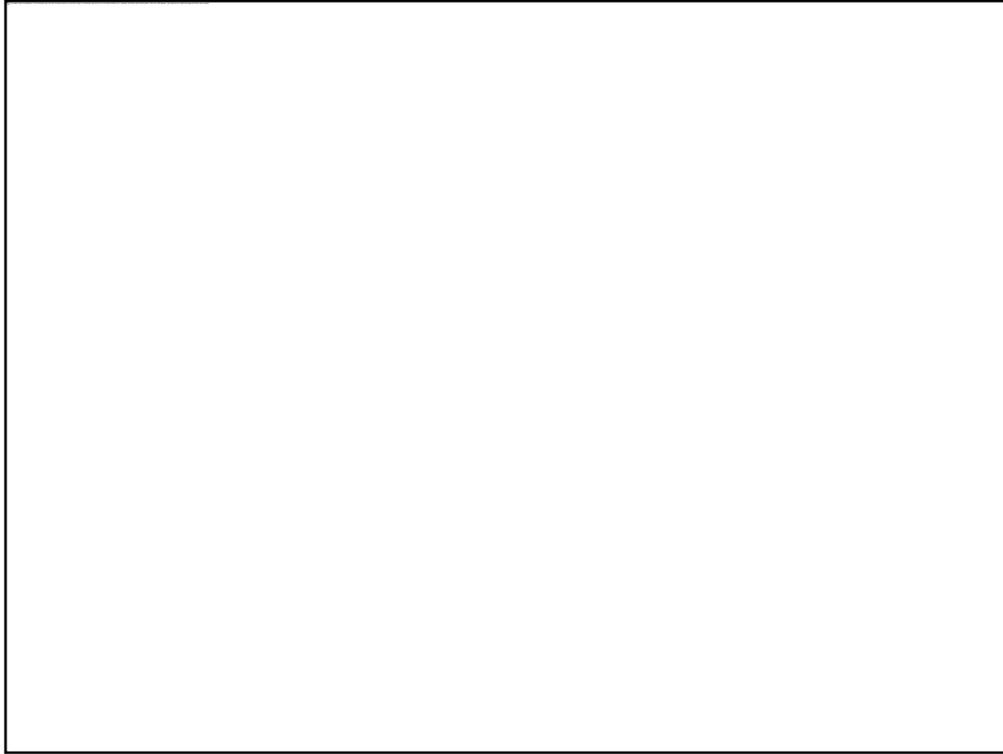




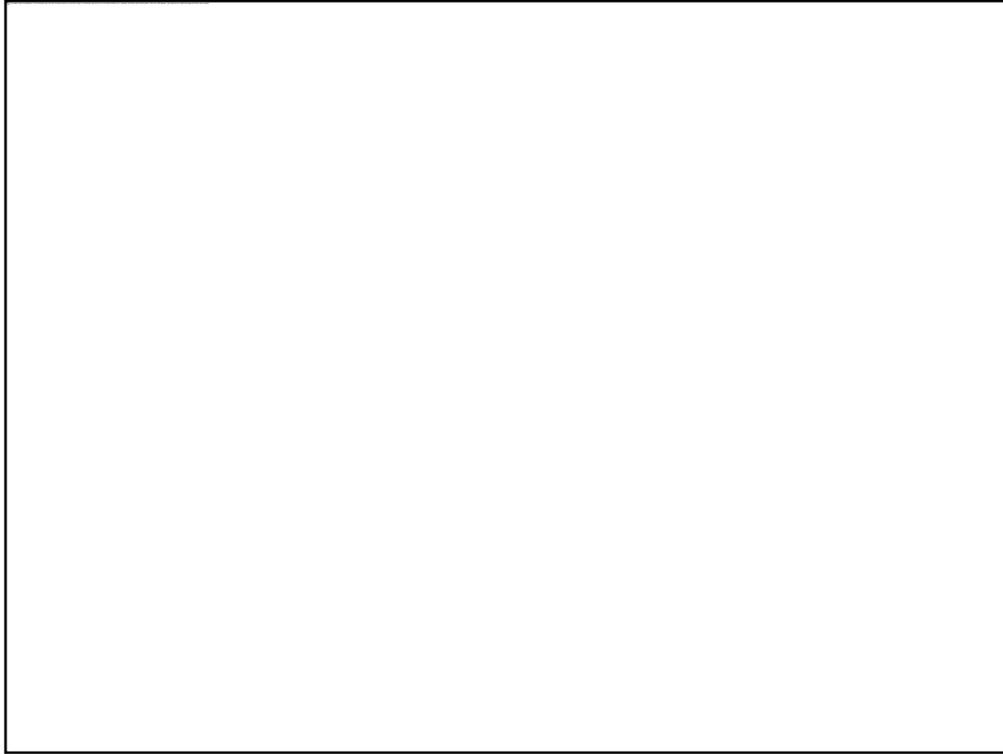
Fire suppression tools

(Disrupting the fire triangle—
heat, oxygen, fuel)

- 300 gallon water tank, pump
- 5 gal backpack water tanks
- Flappers/Swatters
- Fire broom (not often used)
- Leaf rake



In addition to the backpack tanks, we also have a 300-gal tank that's mounted in the back of a pick-up truck with a gas-powered pump and 1+” diameter hose. The tank is used to water down firebreaks, especially between experimental plots, and for emergency situations where fire has crept across a firebreak or a spot-fire has ignited. It can also be used to re-fill backpack tanks.



Backpack water tanks are an absolute necessity for prescribed burning. They hold about 5 gallons of water and have a slide-action pump that can shoot water several feet. Full tanks weigh about 50 lbs. The tanks can either be carried or placed at intervals along firebreaks for emergency use. We now have collapsible tanks that can hold about 4 gallons and are more comfortable to use for longer periods of time.

Hand tools

Rubber flapper
(smothers--removes oxygen)

Leaf rake
(removes fuel—leaf litter)

Fire-resistant broom
(breaks up fuel—deep litter)



Each individual, with the exception of the person igniting, may carry a backpack tank, but will also have a fire swatter/flapper or rake. A flapper is especially useful to smother grass fires. Rakes can also be used with grass fires or woodland fires. Leaf litter is raked away from the fire into areas that have already burned (these are called “black areas”).

Burn prescription

Burn unit map

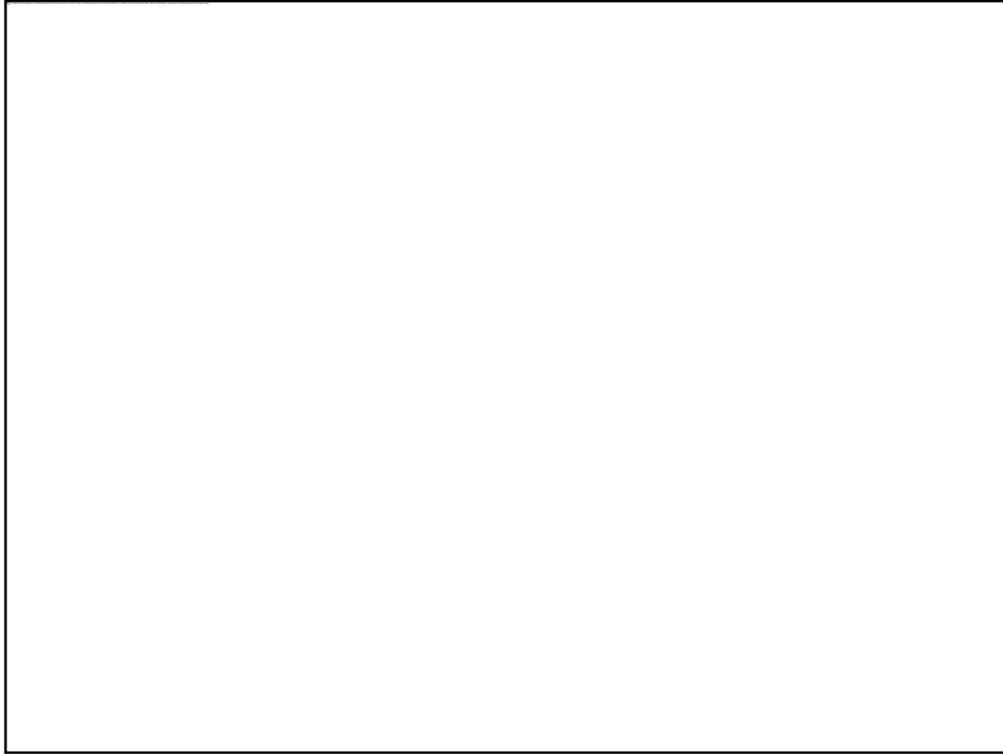
Equipment

Personnel

Weather parameters

Emergency contact information

At least 3 people are needed to safely conduct **most** prescribed burns at CERA. One person ignites, two extinguish the backfire, and as the fire-line progresses, one continually patrols back along the firebreak to make sure the break is secure.



Prescribed burns over larger acreages simply require larger crews to patrol longer fire-lines. The crew may be split into two groups, each igniting along two edges of a burn unit. Since it's not always possible to see or call out to all members of the crew when covering larger areas at CERA, we have short-range radios to facilitate communication among individuals stationed around a burn unit.

Burn prescription

Burn unit map

Equipment

Personnel

Weather parameters

Emergency contact information

In addition to personnel safety, various weather parameters are critical to the success of a burn.

Weather Conditions

Relative humidity (25-60%)

Air temperature (varies)

Wind speed

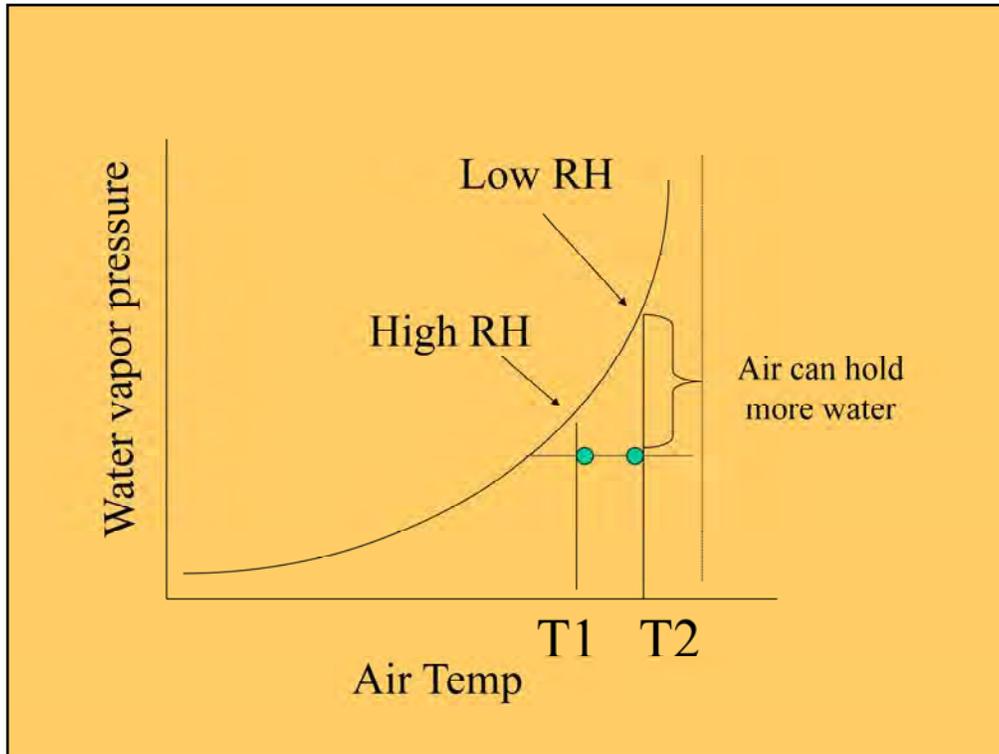
Wind direction

Precipitation (rain, snow)

Of these 5 weather parameters, relative humidity is by far the most important. It reflects how much moisture is in the air, as well as in the vegetation. The lower the %RH, the lower the absolute amount of moisture in the air. At lower %RH, less than 60%, the drier air absorbs moisture from the vegetation. Drier vegetation ignites quickly, and burns faster and hotter. At higher RH, the vegetation may not ignite at all.

The preferred range for controlled burning is 25-60% RH. Above 50%, higher wind speeds may be necessary to drive the fire into the vegetation. Some of the energy from the fire is used to dry the vegetation before it'll ignite.

Relative humidity is generally lowest during the middle of the day, between 2-5 p.m.



Relative humidity is directly related to air temperature. As air temperature increases, it can hold more water. At a given absolute level of humidity, the %RH will be lower as the temp rises.

GENERAL RULE OF THUMB:

As air temperature increases by 20
degrees F,
relative humidity will drop by 1/2

A general rule of thumb is that for every 20 degree F increase in temp, the %RH will drop by 1/2.

Weather Parameters

Relative humidity

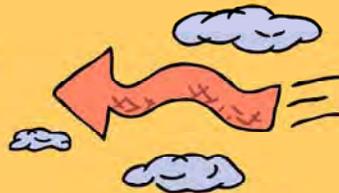
Air temperature

Wind speed (steady!)

Wind direction

Rain

5-15 mph open habitats
15-20 mph forest habitats



Wind speed and direction are also extremely important parameters that determine whether or not a burn can be conducted safely and effectively. Generally, a steady wind at 5-15 mph is ideal. At wind speeds less than 5 mph the fire isn't driven in a predictable direction. At speeds greater than 15 mph, it becomes more likely that embers may be carried with the wind across firebreaks. Higher wind speeds can be okay if the RH is also high. In addition to forecasted wind conditions, we use a simple hand-held anemometer for measuring wind speed on site or a pocket weather station.

Wind directions are chosen to manipulate how the fire moves through an area. It may be desirable to have the wind push a head fire in the direction of the most reliable firebreak like a wooded ravine, for example, or keep smoke away from neighbors' homes or from crossing major roads. It is dangerous to burn when the wind is gusting or shifting directions, which can happen in the course of an hour.

Weather Parameters

Relative humidity

Air temperature

Wind speed

Wind direction



Rain or snow—can hinder or help

Lastly, precipitation just prior to a scheduled burn may mean that the burn will have to be cancelled. However, if it rains overnight and the following day is warm with lots of sunshine, the vegetation may dry enough to be burned in the afternoon. Forecasted rain can be advantageous if it occurs the evening after a burn. In wooded areas where branches and logs may smolder for days, the rain prevents a smoldering log from flaring up.



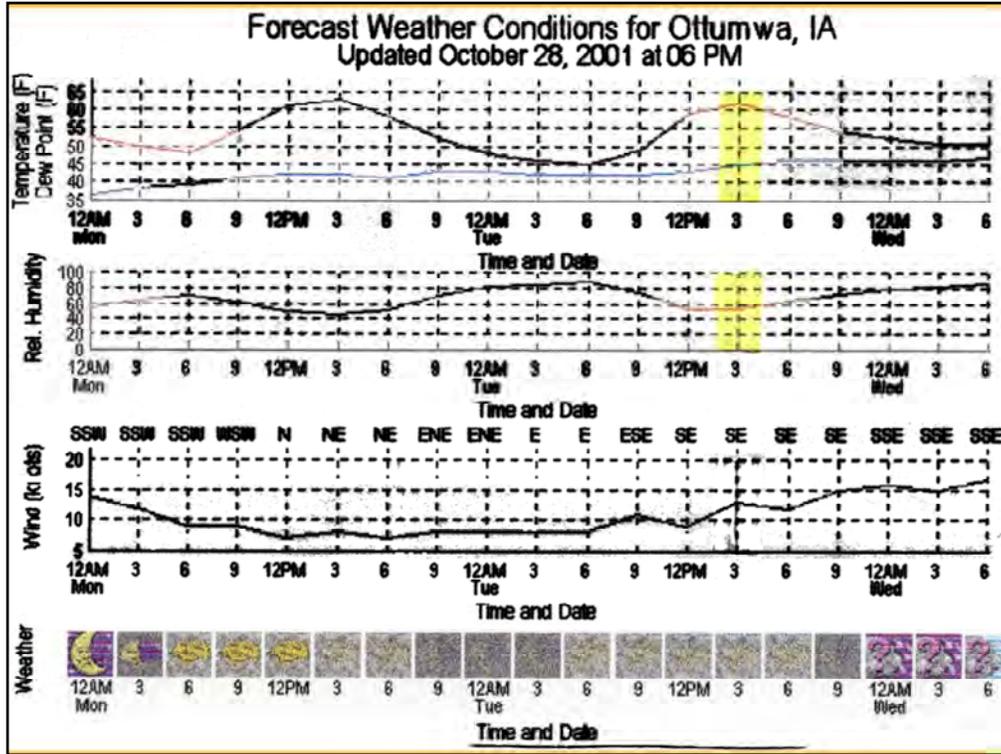
These are logs that ignited during a fall burn at CERA. Five days later, they were still smoldering. You can see exactly where one of the logs used to be. It is desirable to allow the logs to continue to burn; it just requires regular monitoring.

Weather information

- Evening forecasts
- Websites
- On-site measurements



We use weather forecasts from the typical sources to assess burn weather conditions. Meteorologists on television stations, websites, and on-site measurements.



A particularly valuable website that I refer to most frequently is www.wunderground.com. At this site, you simply search for a zip code of the city closest to the area you're burning in. I select Kellogg. I can get daily and weekly forecasts this way in addition to graphs of hourly forecasts for air temperature, relative humidity, wind direction, wind speed, and cloud cover. In this way, I can set the ignition time for a burn.

Burn prescription

Burn unit map

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Prior to every burn, I contact the Jasper County Sheriff's office and inform them of our intent to burn, what we're burning (acreage and vegetation type, grassland, woods, etc), approximate start time and approximate end time. In the event of an emergency, a 911 call would go in to them and they can contact the volunteer fire department in Kellogg. On occasion, people driving on I-80 will notice the smoke and make a 911 call from their cell phone. By notifying the office in advance, they know that unless they receive a call from us, the fire is under control. By giving the office an approximate end time, they will also know that if they receive a report during the middle of the night, they need to send someone out to respond. I keep a cell phone with me during all burns.

What you need to do to help

- ✓ Sign up to receive email notifications
- ✓ Meet at CERA at time and place indicated in email notification, tardiness is NOT OK
- ✓ Wear appropriate clothing
- ✓ Bring your own drinking water
- ✓ Review the burn crew volunteer information sheet

What we will provide

- ✓ Additional personal safety gear
- ✓ Fire suppression tools
- ✓ Map of CERA with burn unit outlined
- ✓ Orientation to burn plan, including strategy and contingency plans

Prescribed Fire Terminology

(please mark on handout)

- Blackline
- Control line => Firebreak, Fuelbreak, Wet line
- Duff/Litter
- Ignition
- Head fire
- Flanking
- Creeping
- Flare-Up
- Spot fire / Spotting
- Slope winds (common at CERA)
- Snag
- Surface fire (all CERA fires)

Your assignment is to learn these terms.

Brief intermission--
stand up and stretch!!

Ignition patterns (Burn strategies)

BACKING FIRE

RING FIRE

STRIP HEAD FIRES

Backing fire to flank fire

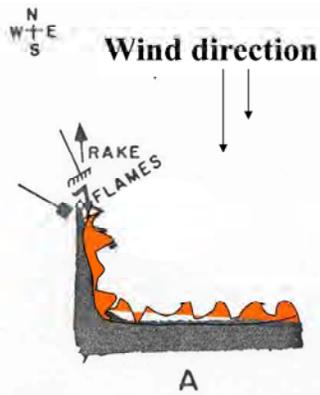


Figure 3. These two illustrations represent a changing situation where the wind shifts from the north (A) to the northwest (B) and gets behind a flank fire to fan it out of control. The fire heads toward the firebreak on the south border, while the fire control crew puts out flames on the north side.

Wayne Pauly, 1988

Ring Fire

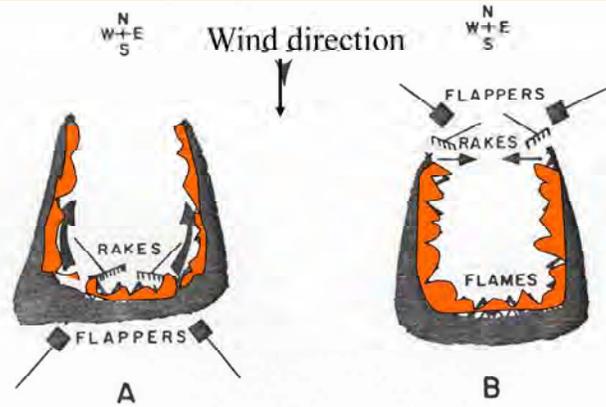


Figure 4. In the first illustration (A), backfire and flank fires are set along the inside of the south, east, and west firebreaks. In the second illustration (B), a head fire is set along the north border, while the fire control crew extinguishes flames backing into the north wind.

Wayne Pauly, 1988

Strip head fires

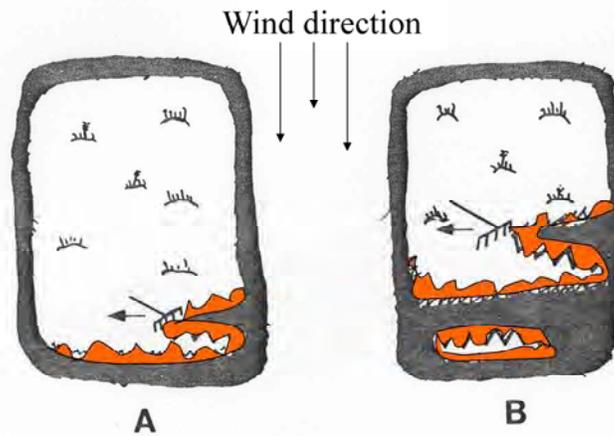


Figure 5. In the first illustration (A), the strip head fire is dragged across the width of the prairie and burns toward a backing fire along the downwind firebreak. In the second illustration (B), the first strip head fire is almost burned out while a second one is ignited and burns toward the backing fire of the first strip.

Wayne Pauly, 1988