Some like it hot

Many ecosystems require prescribed burns to thrive

As part of its land stewardship mission, the Edward Lowe Foundation conducts regular prescribed burns at Big Rock Valley (BRV), its 2,000-acre home in southwest Michigan.

People typically view fire as a destructive force due to the emphasis on fire prevention in today's society. Yet prescribed burning (planned, controlled fires) is a critical tool to maintain and improve habitats.

"Many ecosystems, such as prairies, savannas and even wetlands have adapted to and evolved with occasional fires," says Jarod Reibel, the foundation's director of physical resources. "In the absence of regular disturbance, such as burning, these habitats will eventually convert into hardwood forests, which are the region's climax ecosystem."

Preventing this natural succession is important since BRV is a bastion of biodiversity. Among its 2,000 acres are woodlands, croplands, meadows, prairies, savannas and wetlands. These diverse ecosystems are home to a wide variety of plants, animals and insects — with many species considered endangered, threatened or listed as special concern. Prescribed burns provide many benefits, such as:

- Reducing buildup of dead vegetation that can feed catastrophic wildfires.
- Stimulating native plants while retarding invasive plants.
- Improving the habitat for many wildlife species.
- Controlling brush and woody species that compete for nutrients.
- Releasing nutrients back into the soil.
- Promoting habitat diversity.

"Prescribed burning is one the most effective and efficient tools for improving the land and increasing its ecological value," says Dan Wyant, the foundation's chairman and president. "Prescribed burning is less expensive than bulldozing, cutting or using chemicals, and it's more protective of the environment, as chemicals can have unintended effects."

Owen Rice begins igniting a prairie burn on the foundation's property.

Typically the foundation's environmental team burns about 100-150 acres each year. "Burning a section just one time isn't going to be the magic bullet," Reibel says. "Yet each burn helps us shift the scale in the right direction. We've seen areas improve drastically over time, knocking back woody succession and invasives, while increasing the vigor of our native species."

Although the foundation conducts the majority of its prescribed burns in early spring, burns are also done in the summer and fall.

It's easier to burn in the spring due to more consistent fuel from dormant vegetation, observes Jay Suseland, the foundation's director of grounds maintenance. "Yet from a land management perspective, it's beneficial to alternate seasons because different plants can benefit at different times," he says. "Grasses thrive on spring burns, while fall burns can favor early and midseason forbs."

The foundation has a rotational schedule for burn units, and the time between reburning a unit usually varies between three and five years. Yet it's difficult to plan too far in advance, Suseland says. "The conditions will dictate when you burn."

Best conditions for a burn are when: relative humidity is between 20 and 50%, temperatures are between 35 and 80 degrees, cloud cover is below 35%, and winds are between 3 and 15 miles per hour. It's important to have enough wind to direct the fire, but not too much, or the fire becomes hard to control.

Adapting is key

Fire behavior and intensity can also vary depending on type of fuel (woody materials, grasses, shrubs, dead leaves), its moisture level, topography and configuration of a prescribed burn unit.

"Adapting is key," says Suseland. "You've got to adapt your burn strategy for the weather, the habitat you're burning, the species that live there and the existing fuel. Often you're not going to be able to burn everything you want — especially in a wetland area."

Because fire is a complex force, a tremendous amount of planning, education and communication goes on before any prescribed burn at BRV.

Prior to assisting on burns, foundation employees receive in-house training, and most have taken National Wildfire Coordinating Group certification courses. Because of the physical stamina required during burns, employees undergo conditioning before burn season and must pass certain physical tests depending on their level of participation. For example, those who serve as igniters and suppressors must be able to walk two miles in less than 30 minutes while carrying a

Basic techniques for prescribed burns

Fire managers use different techniques, depending on weather conditions, size of the burn unit and expertise of crew members. Among these:

Backfires are started on the downwind side of the burn unit so the fire burns into or against the wind. A backfire is a slower fire with shorter flame lengths and is typically combined with other techniques. The backfire can be very effective at killing woody plant species because it moves more slowly and flames spend more time on each stem.

Parallel or flank fires are ignited on the sides of the burn site at a 90-degree angle to the wind direction.

Perimeter or ring fires create a hotter fire. This technique begins with a backfire, followed by lighting the flanks. Then the last side of the site is lit. The resulting head fire moves rapidly toward the flanks and backfire. Head fires typically produce the tallest flames and spread the fastest.

Strip fires are short segments of a head fire. A series of 20- to 30-foot strips are lit — but only one at a time — burning with the direction of the wind. This works well for burning rectangular or odd-shaped parcels and is also good when working with a smaller burn crew.

Burn techniques also depend on topography. For example, burning on hills can be tricky because the fire may move uphill too quickly to achieve goals, such as trying to get rid of woody brush. The Edward Lowe Foundation uses backfires when practical because they result in a more complete burn and are easier to manage. If the foundation's environmental team is burning near a residential area, they may use different ignition sequences, such as lighting interior fires, followed by perimeter fires, to help pull the smoke up and away from nearby roads or houses.

In most burns, different fire types eventually meet each other, at which point the fire can become very volatile, creating large whirls, fire tornados and extreme flame heights. Prairies burns are the most dramatic, particularly when there are taller grasses. "If there is switchgrass in the prairie, it's almost like lighting gasoline," points out Owen Rice, a member of the foundation's land stewardship team. "It produces a tremendous amount of heat and flames can reach 20 feet or higher."

25-pound backpack.

When conducting burns, foundation employees wear fire resistant coveralls and hoods, leather gloves and boots, and helmets. All members of the burn crew carry two-way radios so they can communicate about the fire's progress and be ready to respond to any surprises.

"For example, flames could jump across the firebreak and need to be extinguished," says Michele Kline, the foundation's property manager. "Wind conditions could also shift, and you might need to close in the perimeter of the burn sooner than you originally planned."

A day or two before a burn, the foundation obtains a permit from the local fire department. (Prior to the spring burn season, the foundation submits a plan about burn objectives, technique and timing to local fire departments.) Letters are sent to landowners who have property within 300 feet of the burn unit and may be alarmed by the smoke. On the day of the burn, signs are posted along roads to notify passersby.

Just before ignition, the burn boss reviews the burn plan with the crew, which typically ranges from 6-12 people, depending on the size and complexity of the burn. In addition, the burn boss alerts the local 911 dispatcher that the burn is about to begin in case anyone mistakes the smoke for a wildfire.

Habitat preparation

Another aspect of safe, successful burns is getting the habitat ready to burn.

Prairies require little preburn preparation at BRV as the foundation's grounds maintenance team has planted clover or cool-season grass around prairie fields. Just prior to burning, these borders are mowed and wet down to create firebreaks. "This helps contain the fire," says Reibel. "As flames hit the wet, green vegetation, they burn out by themselves, or can be easily suppressed by our crew."

In woodland units the burn team uses existing roads, paths, creeks and clearings as firebreaks, although some additional breaks may need to be hand cut. This typically involves cutting a 4- to 6-foot wide trail with a chainsaw or brush cutter and then using a blower to remove leaves and other small burnable debris from the trail.

Wetlands are the most difficult areas to prep. Muddy conditions in wetlands often make it impossible to use large vehicles or heavy equipment. Many firebreaks must be cut by hand — and pumps and hoses must be carried in on foot or with an amphibious vehicle. The amount of man-hours required for preburn activities can easily outnumber hours required for the actual burn.

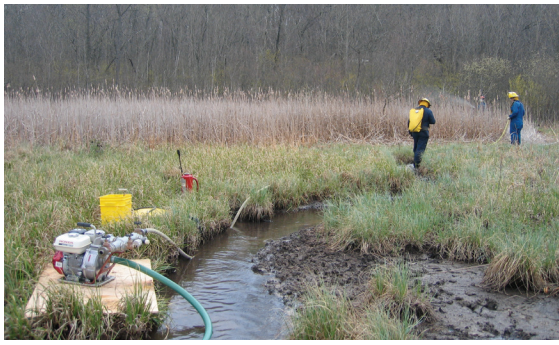
Other wetland issues

Wetlands are also challenging because they burn more erratically than other habitats. At times they may smolder and barely burn, and then shifting winds can cause roaring flames.

Different patches of fuel found in wetlands can also quickly alter the intensity of a burn. For example, fire may move through an area of sedges at a steady rate. Yet as the fire enters a cattail section, it will burn much hotter with higher flame length and produce more burning embers, which can jump the firebreak.

Fuel in wetlands also affects the duration of burns. For example, rotten logs, ant mounds or dried peat hummock will smolder for a long time after the majority of fire is out. Before burn-crew members can leave the scene, they must make sure all fire has been extinguished.

Wetland burns also expose participants to greater risks. For one thing, escape is difficult because the crew is typically on foot and conditions are muddy. Many wetland plants,



(From top down) In preparation for a wetland burn, pumps are taken off trucks and placed in creeks; ignition begins on a prairie burn; flames increase in height and intensity as the head fire meets the backfire; and, the site immediately after the burn.

especially cattails, will produce heavy black smoke that can make breathing and vision difficult. What's more, most of the wetland areas at BRV also have poison sumac bushes, which can cause severe rashes if smoke from burning bushes makes contact with skin.

Benefits of wetland burns

Although wetlands require considerable time and effort to burn, Reibel views them as some of the most important to burn.

"Several of our rare species live in and rely on wetlands," he says. "Across the country much of this type of habitat has been lost or severely degraded. Burning our wetlands is crucial for maintaining high-quality habitat for these species."

Most soils in wetlands are organic materials like peat, which will burn when they are dry. If the area gets hot enough, flames can actually burn some of the organic soil and lower the grade of the wetland. This results in the soil surface being closer to the waterline and staying wetter, which helps slow down natural succession and keeps the wetland habitat intact longer.

"Vegetation from previous growing seasons can quickly build up into a thick layer on the soil surface, which can prevent plants from germinating," Reibel explains. "Removing this vegetation with fire can expose the seed bank and rejuvenate the plant community."

Today natural fires don't occur as often because of the many firebreaks created by man, such as roads, drainage ditches and cultivated fields, Suseland points out. "If lightning strikes a tree and sets it on fire, the fire isn't going to spread like it used to," he says. "Essentially, prescribed burns are an attempt to mimic Mother Nature and leverage the benefits of fire on habitats."

To learn more about the foundation, visit our website at www.edwardlowe.org.

Custom equipment makes burns safer, more efficient

The foundation has developed a variety of custom equipment to improve efficiency and safety during prescribed burns.

For example, a field sprayer has been converted into a versatile fire-suppression trailer known as the "War Wagon" because of the many options it gives burn crew members.

The War Wagon features an innovative plumbing system that pulls water from the bottom of a 500-gallon tank into a pump and then distributes it to three different valves at the rear of the trailer.

One of these valves has a special fitting to hook up a one-inch fire hose, another connects to a ¾-inch garden hose, and the third valve feeds into a U-shaped line with seven different nozzles. Three of these nozzles direct water beneath the trailer, while the other four nozzles are located on the sides of the trailer and can spray water horizontally.

"We typically use the bottom nozzles to run wet lines around the perimeter of the burn just before ignition," said John Nevill, the foundation's mechanic, now retired, who created much of the War Wagon's plumbing system, along with other burn equipment. "The four nozzles on the sides can be used to spray taller grasses during a burn if the flames get too high."

What's more, a Plexiglas heat shield has been installed on one side of the trailer, which enables the burn crew to get closer to fires to suppress flames.

Other equipment developed for prescribed burns includes work platforms that attach to the rear of pickup trucks. Constructed from steel tubing and metal mesh, the 3-by-6-foot platforms have been outfitted with railings, safety chains and step plates to provide safer, more ergonomic platforms for crew members to access hoses and the 325-gallon tanks that are stored on the trucks.

The War Wagon shown wetting a firebreak during a burn. (Inset) Three valves on rear of the trailer feed into a series of custom nozzles.

In addition, all pumps used for prescribed burns have been outfitted with custom manifolds and fittings so they are interchangeable. Pumps can be taken off the truck and placed in creeks for wetland burns; hoses can then be attached to run out to designated areas.

Photos by Michele Kline and Mike McCuistion