



Rekindling Land and People



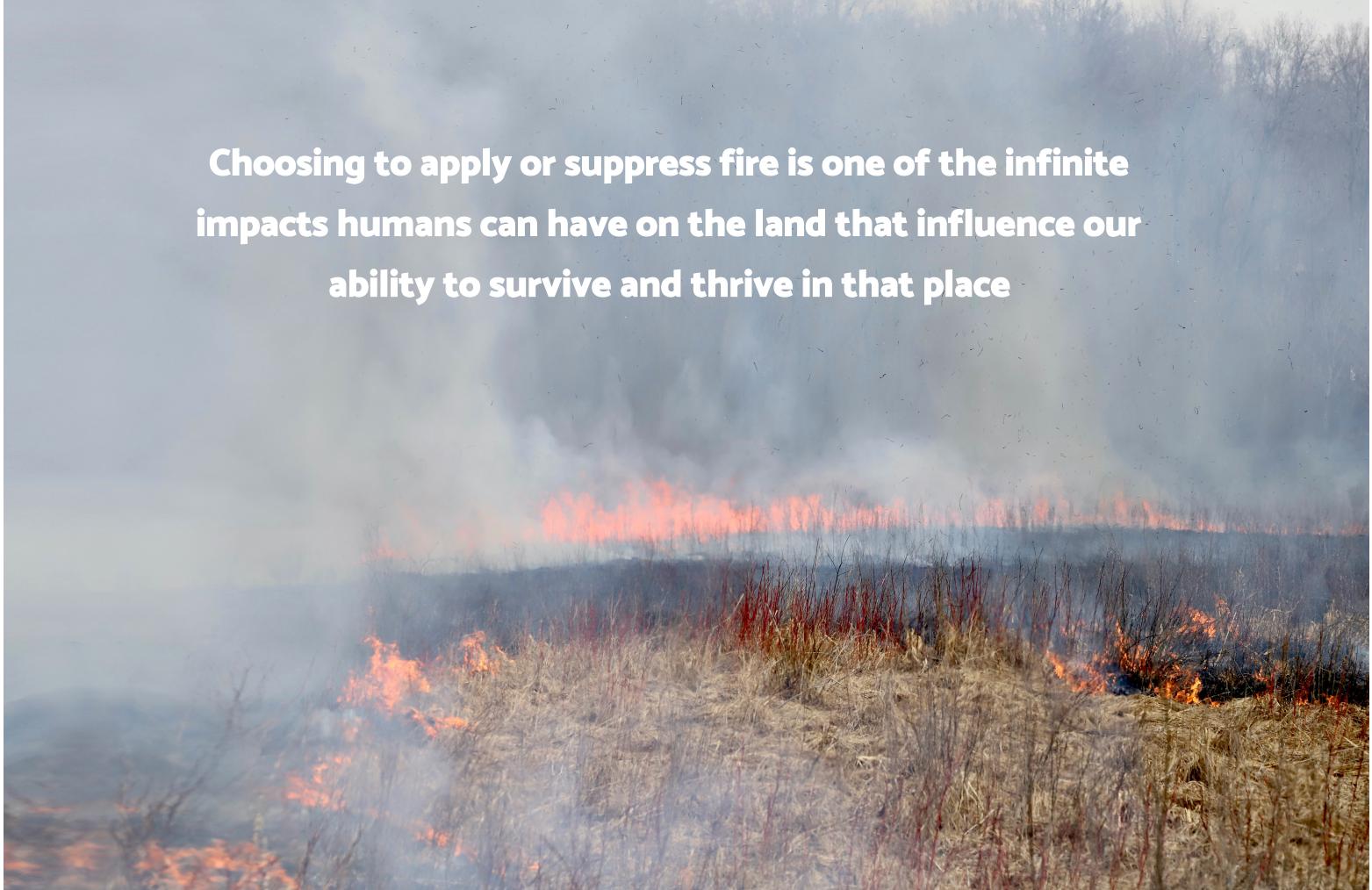
Kalamazoo Nature Center would like to thank the Terry Todd Family, the Tyler Little Family Foundation, and the Suzanne Upjohn DeLano Parish Foundation for their generous support. We would also like to thank Nora Duncan photography, Brent Harris, Damen Panek, and Mary Parr for their consultation and contributions

Exhibit Design by Alyson Cameron Studio

FIRE

Shaping Ecosystems

For thousands of years, wildfires have naturally occurred on the landscape; some species evolved to survive the regular disturbance of fire and now depend on it to remain healthy. Centuries before European settlers arrived, Anishinaabek land stewards of the Great Lakes region practiced prescribed fire as a management tool, understanding that cultural burning could promote diverse species and limit destructive wildfires. Kalamazoo Nature Center (KNC) staff, working with practitioners of fire science throughout the region, continue this practice today as a means to improve habitat health and advance climate resilience.

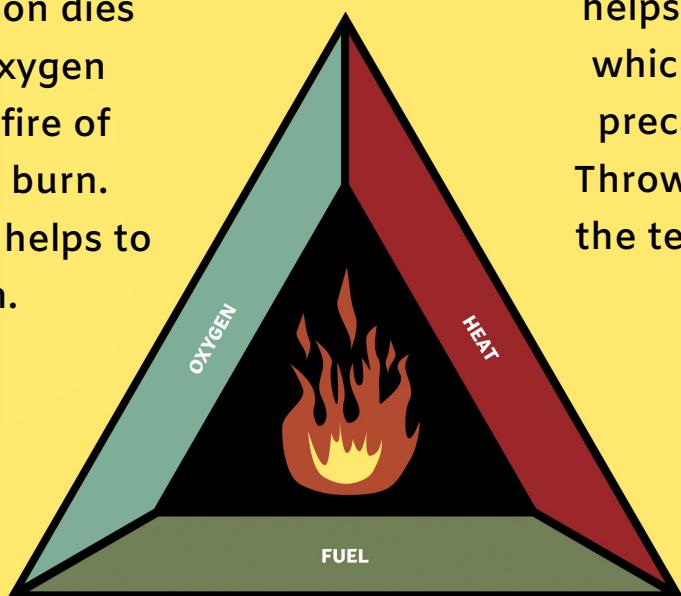


Choosing to apply or suppress fire is one of the infinite impacts humans can have on the land that influence our ability to survive and thrive in that place

How Fire Works

Oxygen is the active protagonist in a fire. It is oxygen, after all, that is pulling apart the carbons in wood and other fuels, as it recombines with these to make carbon dioxide. If we cover a candle with a glass, it soon dies out as it exhausts its oxygen supply. If we deprive a fire of oxygen, it will cease to burn. Throwing water on a fire helps to cut off the oxygen.

Heat provides the molecular motion needed to start and maintain a fire. Just like shaking a jigsaw puzzle, heat helps to strain the bonds that hold carbons together in fuel, and it helps to speed up the oxygen, which crashes through these precarious chains of carbon. Throwing water on a fire drops the temperature and stops the chain reaction.



Wood, wax, oil, methane and gasoline all burn because they have carbons that can combine with oxygen to make carbon dioxide, releasing heat and light in the process. If we deprive a fire of fuel, it will die out.

A precarious situation

The carbons in wood and other fuels are held together in ways that are stable under normal conditions wood does not spontaneously burst into flame. However, there is a strong affinity between the oxygen in the air and these carbon atoms. All it takes is a sufficient nudge (or spark) to cause the carbon atoms in wood to break their bonds with each other and recombine with oxygen to make carbon dioxide and water.

The spark

Heat is just the vibration and other movements of molecules. The faster a molecule is vibrating the warmer it feels. With the intense heat provided by a spark, oxygen speeds up, giving it the velocity it needs to break up the chains of carbon found in wood and to pair up with these newly released carbons to create carbon dioxide.

Chain reaction

Due to their strong affinity, each time an oxygen pairs with a carbon they come together with such force that they release heat, and this heat, in turn speeds up the molecules in the area, continuing the fire. The hotter it gets the more oxygens can recombine with carbons, the more oxygens that combine with carbon, the hotter it gets.

Wildlife Impacts

Ectotherm

animals such as snakes and frogs that rely on heat sources in their environment to control their internal temperature



Eastern Massasauga Rattlesnake

Many ectotherms (formerly referred to as "cold-blooded") like snakes and turtles prefer open wetland, prairie and early successional habitats with a mix of open and closed canopy where they can move between sunny and shady spots to regulate their body temperature. One such ectotherm that depends on prairie fen habitats for its survival is the endangered eastern massasauga rattlesnake. In 2020, KNC received a grant from the National Fish and Wildlife Foundation to restore the prairie fen habitats. Prescribed fire is one of the tools that KNC land stewards use to prune back the woody plants that would create a completely shaded environment ill-suited to massasauga rattlesnakes and other ectotherms of the fen. In addition to removing shrubs and woody growth by hand and with fire, KNC also conducts annual surveys to monitor eastern massasauga rattlesnake populations.

Mitchell's Satyr Butterfly

The Mitchell's satyr butterfly, a federally endangered species whose range encompasses parts of southern Michigan, inhabits delicate wetlands called prairie fens. Prairie fens are predominantly composed of sedges, grasses, and forbs. Within these prairie fens, the Mitchell's satyrs are often observed in smaller pockets within arm's reach of native shrubs or trees like tamaracks. One of the many threats to Mitchell's satyr butterfly is habitat loss. Both natural ecological succession and the spread of invasive plants can negatively impact habitat and host plant availability for this critically imperiled butterfly. Fire can be used as a management tool to prevent encroachment from invasive plants and to maintain the diverse mosaic-like vegetative structures of the Mitchell's satyr's preferred habitat.



Kirtland's Warbler and Jack Pine Forests

Fire plays a crucial role in maintaining habitat for the once critically endangered Kirtland's warbler. This songbird, which migrates through southwest Michigan on its way from the Bahamas to its northern Michigan summering grounds, breeds almost exclusively in jack pine forests and builds its nest in the sandy soil under the protective cover of young jack pine trees.



When jack pine trees mature, they lose their lower branches and no longer provide adequate cover for the nestlings. Periodic fire removes older jack pine trees and provides the intense heat needed to open the jack pine cones, allowing for the release of seeds and regrowth. Fire also fosters the productivity of blueberries, a staple of the warbler's diet. In these ways, fire creates the ideal conditions for the Kirtland's warbler.

Fire suppression policies throughout the 20th century contributed to the loss of young jack pine forest habitat, and the Kirtland's warbler population fell to less than 200 known pairs, dangerously close to the brink of extinction. Prescribed burns, along with other forest management strategies, and unplanned wildfires have generated new habitat and helped the Kirtland's warbler return to abundance.

HUMANS

A Fire-Adapted Species



"Camp Fire" Winslow Homer

Every animal on earth is constrained by its energy budget; the calories obtained from food will stretch only so far. Our evolutionary ancestors, as well as modern primates, spent a large portion of their available energy on chewing and to power digestive tissue in their guts. Cookfires allowed early humans to share the energy burden of digestion with fire itself. Humans also figured out how to get fire to do some of the heavy lifting required to keep our bodies warm, resulting in additional energy savings. We used our larger brains and extra time to develop language and culture which make us distinctly human. Olympic flames, honored positions of firekeepers, fireside chats, and architecture designed around the hearth all pay homage to the flame which made them possible.

Anishinaabek Fire Use

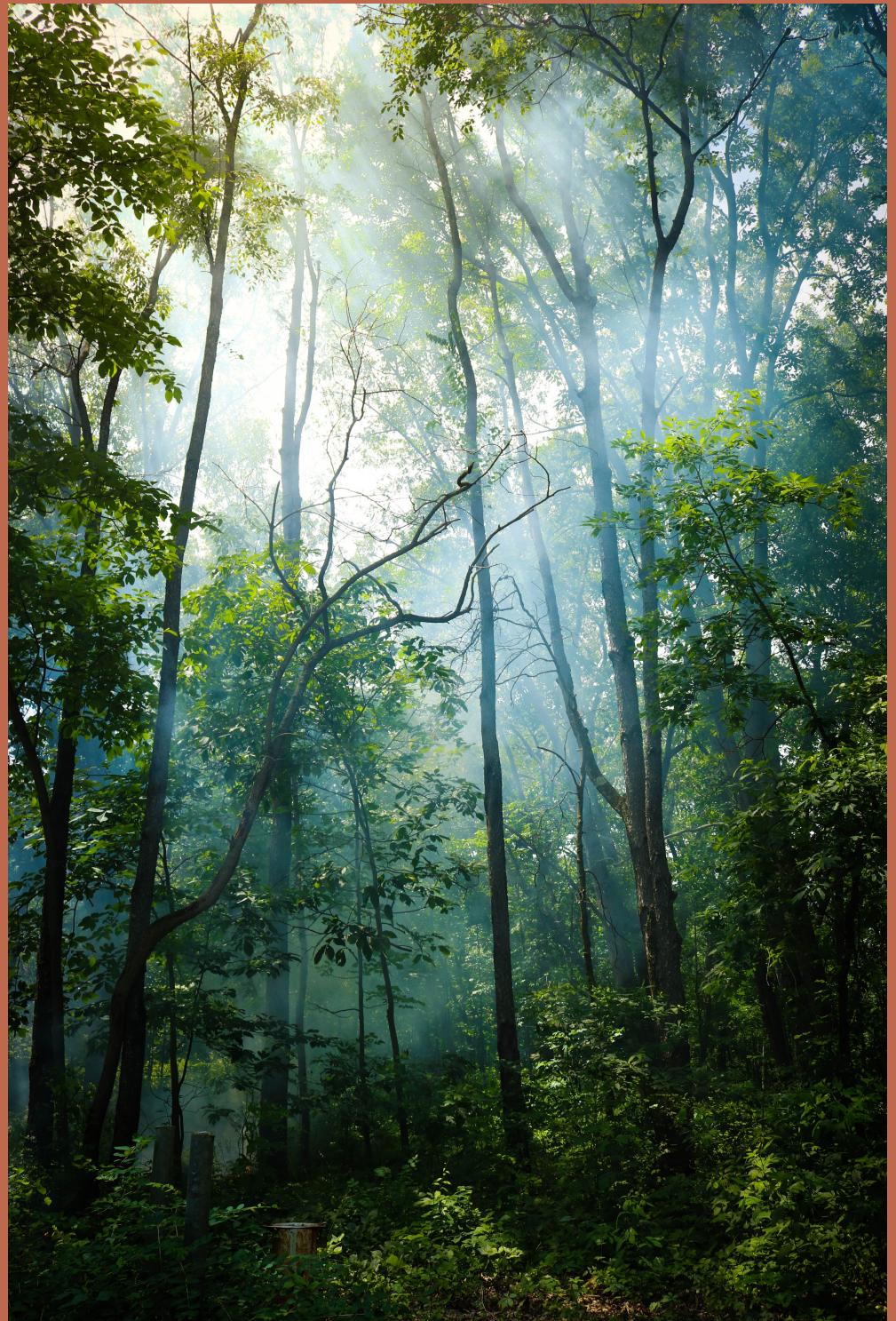
Ishkode (fire) is viewed by the Anishinaabek as an animate being, with which they have an ongoing and reciprocal kinship relationship. One expression of this relationship is the use of ishkode in land stewardship.

Indigenous tribes in the Great Lakes Region historically used recurring fire for a variety of purposes. This cultural use promoted fire-adapted and fire-dependent ecosystems. The foods, medicines and species abundance that were enhanced by the strategic application of fire are what Anishinaabek culture is rooted in. Examples include...



To improve habitat and production of wild blueberries, other foods and medicinal sources by releasing nutrients and clearing understory

To clear travel
corridors



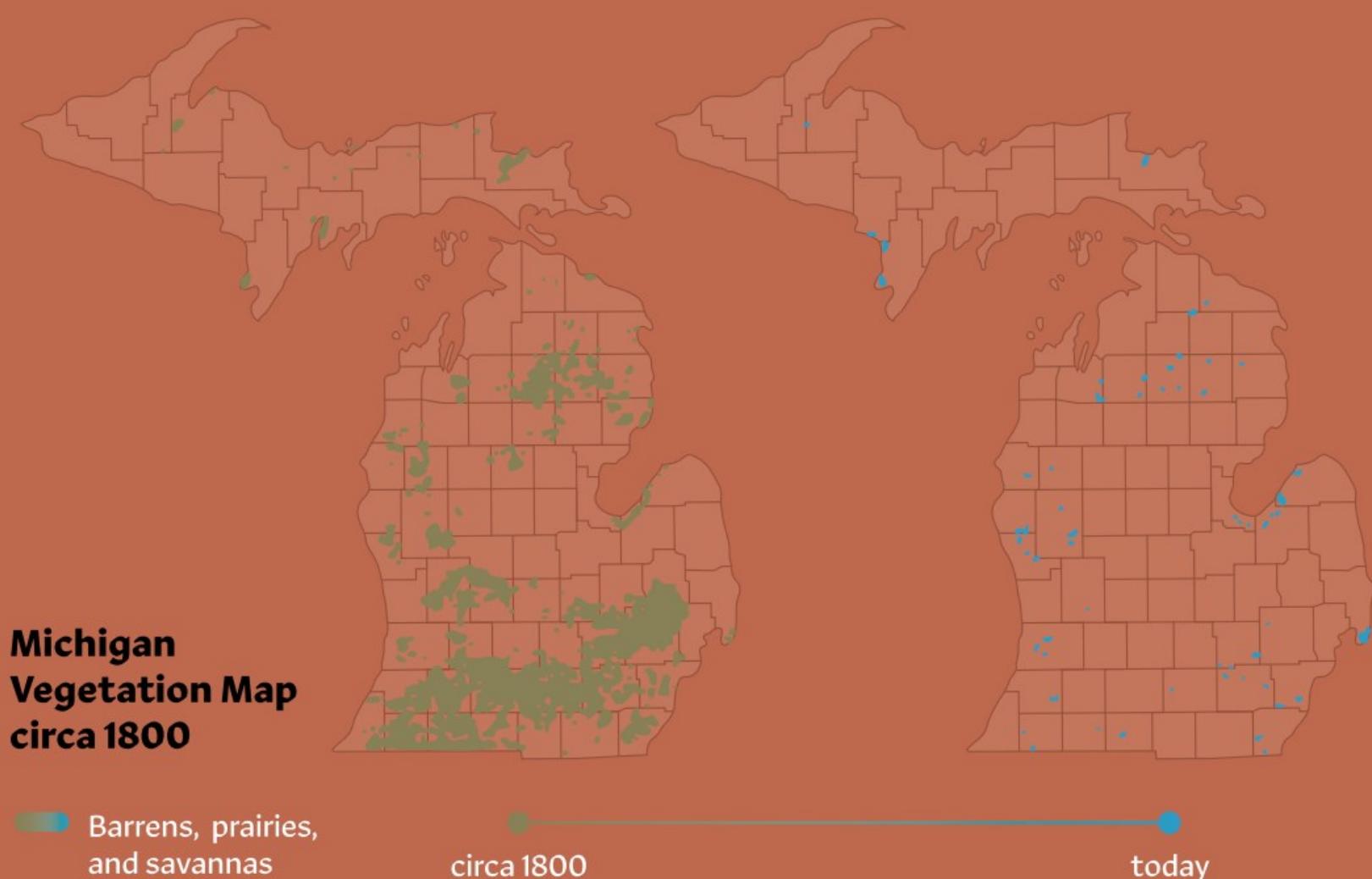
To attract large herbivorous game animals that are
enticed by nutrient-rich fresh grass and charcoal
which they used as mineral licks

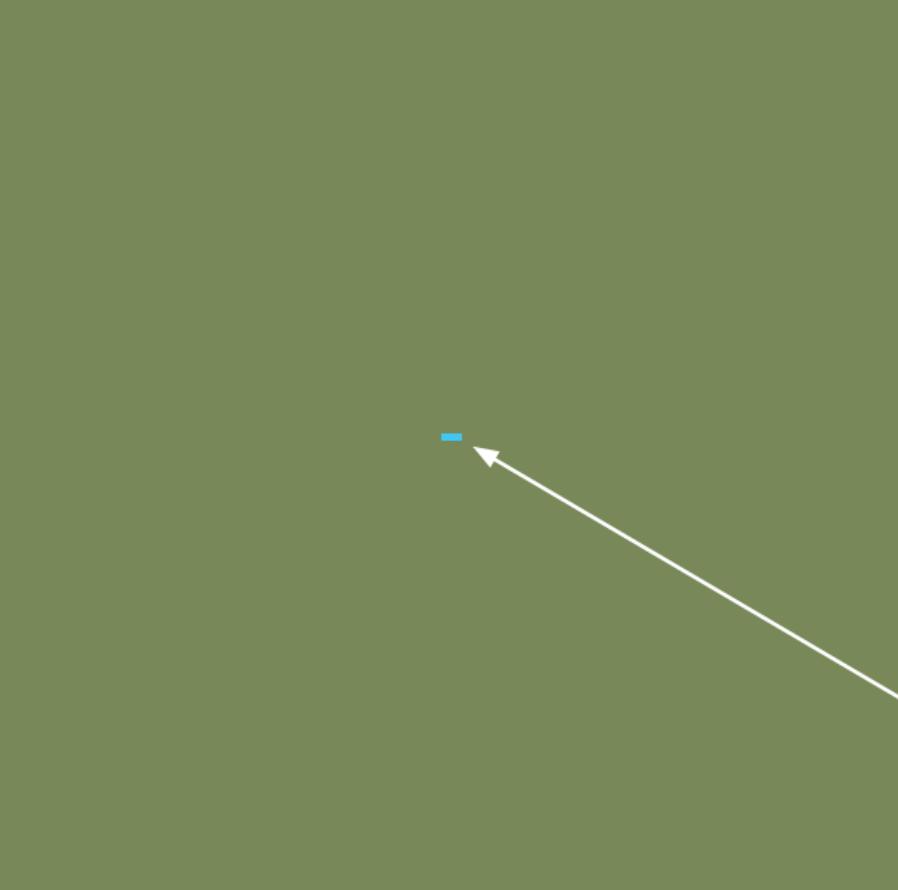
Loss of Fire-adapted Ecosystems in Michigan

Oak savannas, barrens, prairie fens, and tallgrass prairies are all fire-adapted ecosystems and were prevalent in Southern Michigan before 1830. These landscapes exemplify “pyrodiversity,” the abundant habitats ideal for supporting humans and other species, which Anishinaabek cultural burning was so adept at maintaining.

In the early 1800s, cultural fire began to disappear from the land as Native American populations were impacted by the introduction of European diseases.

During the 1840s most remaining Pottawatomi people were pushed off the land by federal Indian removal policy. Cropland, settlements, roads and railways created fire-breaks which stopped annual fires. Michigan's savannas were either converted to agriculture or quickly became oak thickets and then forests.





This large green square represents the area of Michigan that was covered by savanna, prairie, and barrens in 1800



This tiny blue rectangle represents the area of these habitats that is left today—.02% of the original area

“ The practice of the Indians was to burn the land over every fall, which had the effect not only of keeping the annual vegetation burned off but the young tree growth also. ”

W.J. Geib in a USDA Soil Survey of Cass County, Michigan 1907

1872

...though the rural beauty of the country is still unrivaled, little remains of the original character of the openings. This is a result partly of the progress of civilization, and partly of the thick growth of small timber that has covered all the uncultivated portions since the annual fires have ceased, which kept down the underbrush.

B. Hubbard in *House Document No. 24, Lansing, MI*

1848

As the periodical fires had now ceased for many years, underbrush was growing in lieu of the natural grass, and in so much these groves are less attractive than formerly; but one easily comprehends the reason...

James Fenimore Cooper
in his book, *Oak Openings*

1838

The ordinary character of the “openings” is that of a majestic orchard of stately oaks, which is frequently varied by small prairies, grassy lawns, and clear lakes. These magnificent groves were, until within a few years, kept free from underbrush by the passage through them of annual fires, allowing successive growths of herbage to spring up luxuriantly, covering the surface with a profusion of wildflowers and verdure...

B. Hubbard, Michigan State Geologist

MODERN USE

Prescribed Fire at KNC & Beyond



Today, prescribed burns are used both as a tool to manage habitats and ecosystems, and as a strategy for reducing the severity and frequency of wildfires.

The ecological benefits include increased soil health, decrease in invasive species, and an increase in biological diversity. Prescribed burns used for wildfire management are said to "fight fire with fire" because they reduce fuel, like leaves and other easy to ignite plant matter, and minimize the frequency and severity of a wildland fire.

KNC: Carrying the Torch

For at least three decades, the KNC has trained staff and volunteers to responsibly conduct prescribed fire for restoration and stewardship.

With support from the Michigan Prescribed Fire Council and State and Federal agencies, KNC's local fire leadership has grown to include planning and implementation of training events, networking conferences, and regional capacity-building. As a nature center, KNC is also uniquely suited to share its fire activities through outreach and demonstrations that inform thousands of Southwest Michigan residents.



Nora Duncan



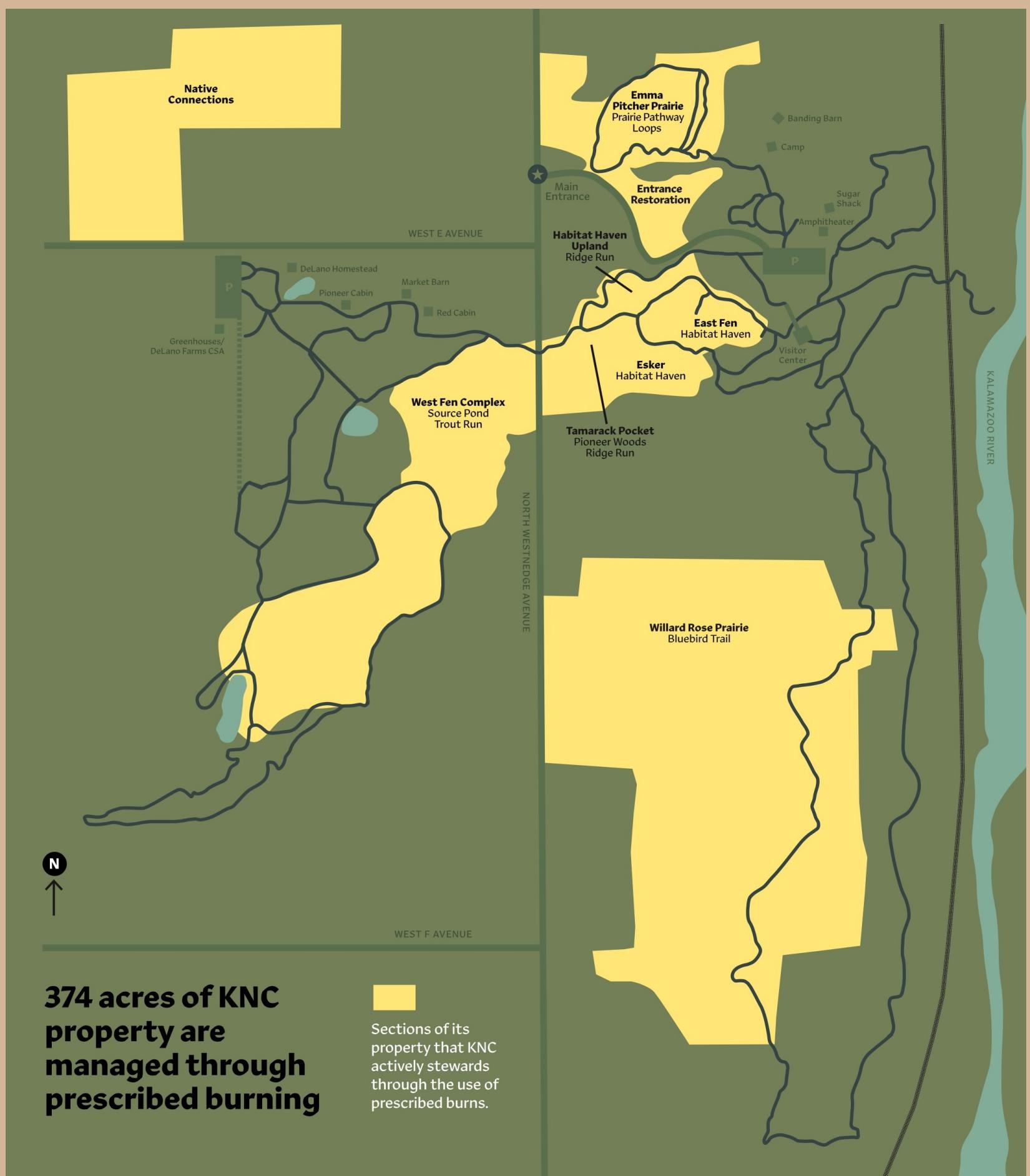
PODCAST

Off the Trail: Bring your own blowtorch
by Nora Duncan

KNC's staff, volunteers, and partners annually apply prescribed fire across hundreds of acres of Federal, State and private lands to improve ecological health, maintain fire-dependent ecosystems, and reduce fuel loads.

Kalamazoo Nature Center

At KNC, we manage nearly 400 acres of fire-adapted ecosystems—including prairies, fens and oak forests.



Fort Custer Army National Guard Training Center

Fort Custer Training Center, located approximately 20 miles east of Kalamazoo, is one of the largest and healthiest ecosystems in southern Michigan, partially due to the contract work that KNC's Ecological Services team conducts. Over 6,000 acres of Fort Custer's land is managed with fire to reduce fuel levels and maintain the health of natural resources throughout the landscape. Given that Fort Custer is an active military training facility with regular ignition events, prescribed fire is an essential tool used by land managers to reduce the risk of catastrophic wildfire.



KNC participates in the Michigan Prescribed Fire Council whose mission it is to “protect, conserve and expand the safe use of prescribed fire on the Michigan landscape.”

The Effects of Fire



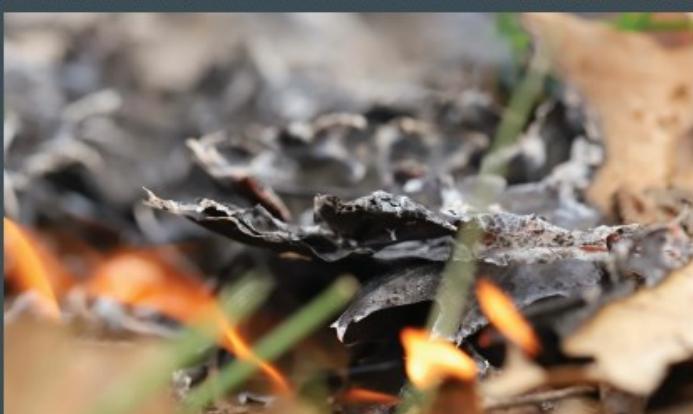
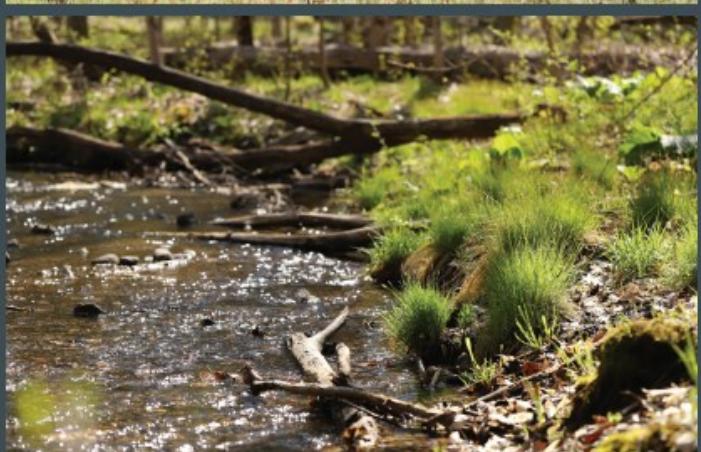
How can you tell what impact fire is having in an ecosystem?

KNC's prescribed fire monitoring program serves to evaluate the impacts of specific prescribed burns against our desired management goals.

Habitat Haven Burn, March 2023



Habitat Haven Regrowth, April 2023



REKINDLING KINSHIP

**“Kinfolk are made by reciprocity...
This is how re-membering begins.”**

-Robin Wall Kimmerer

We live in a relationship with everything around us: water, air, land, plants, and animals. The relationship between their health and our own health is reciprocal. In acknowledging our interdependence, we recall that we too are members of our ecosystems, or as Pottawatomi ecologist and writer, Robin Wall Kimmer, puts it we “re-member.”

It may seem obvious that to plunder our natural world denies the essential reciprocal relationship we have with our planet. Perhaps less obvious, the practices and policies which “protect wilderness” by adopting a hands-off approach also deny the reciprocal relationship humans have with all parts of the ecosystems to which we belong. To re-member is to become a relative of the natural community who is both respectful and engaged, as all healthy relationships require us to be.

We continue to advance in our collective understanding of the extent to which the traditional occupants of this land took intentional action such as cultural burning to positively impact the ecosystems of Turtle Island, also called North America. Humans can have positive impacts on the environment. Fire is both a tool for helping us steward and a mode of remembering that we belong to this natural world.

KNC is working to understand our own role on the land within the context of history. We are learning how to listen to the land, to contemporary science, and to traditional ecological knowledge of the Anishinaabek to choose with care which actions our ecosystems need us to take.