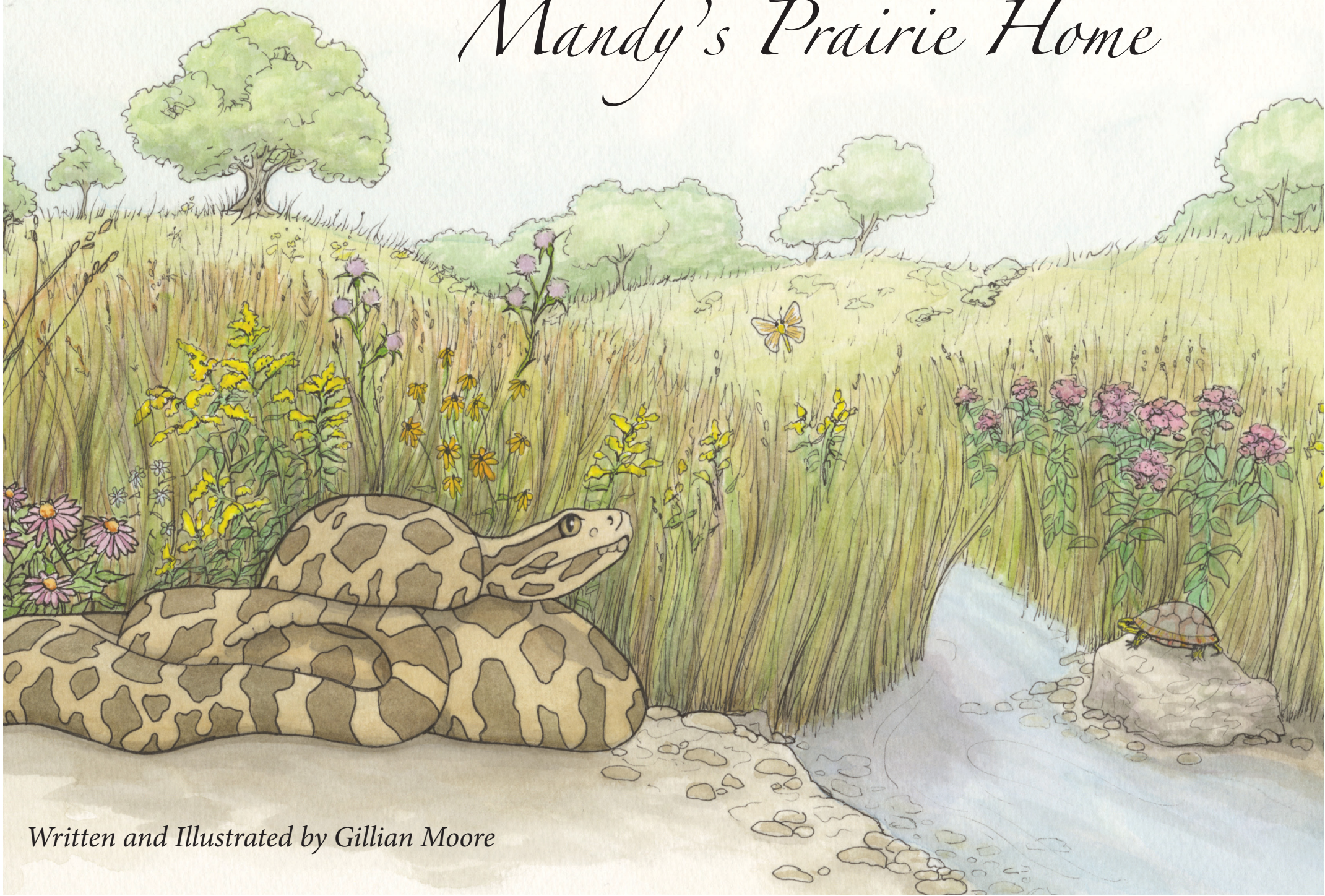
Mandy's Prairie Home



Written and Illustrated by Gillian Moore

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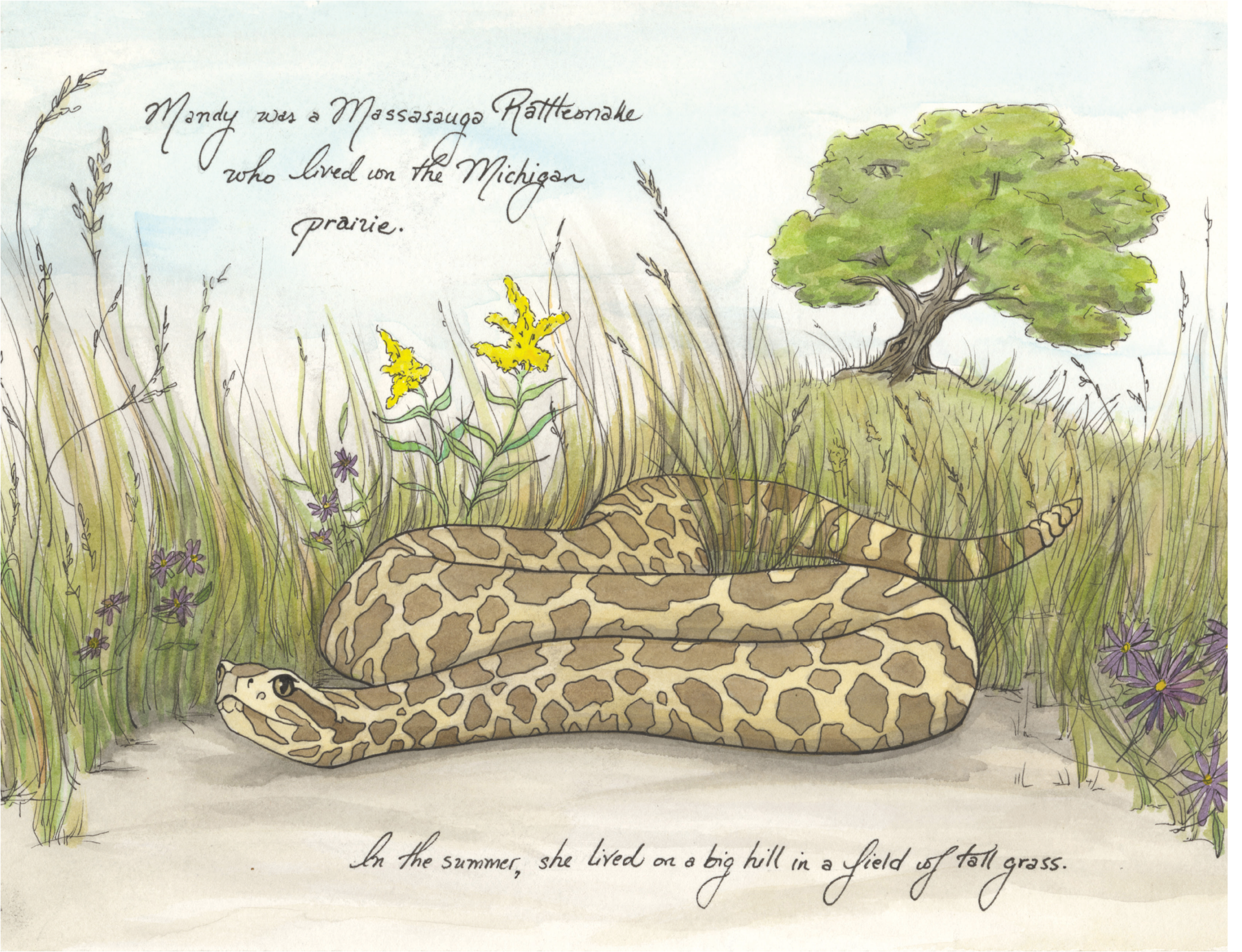
Acknowledgments

I would like to acknowledge the Keepers of The Three Fires: The Ojibwe, Ottawa, and Potawatomi peoples whose traditional burning and stewardship practices shaped the landscape of Mandy's prairie home. This book is dedicated to all who dedicate their efforts to understanding, protecting, and restoring the natural landscapes in which they live.

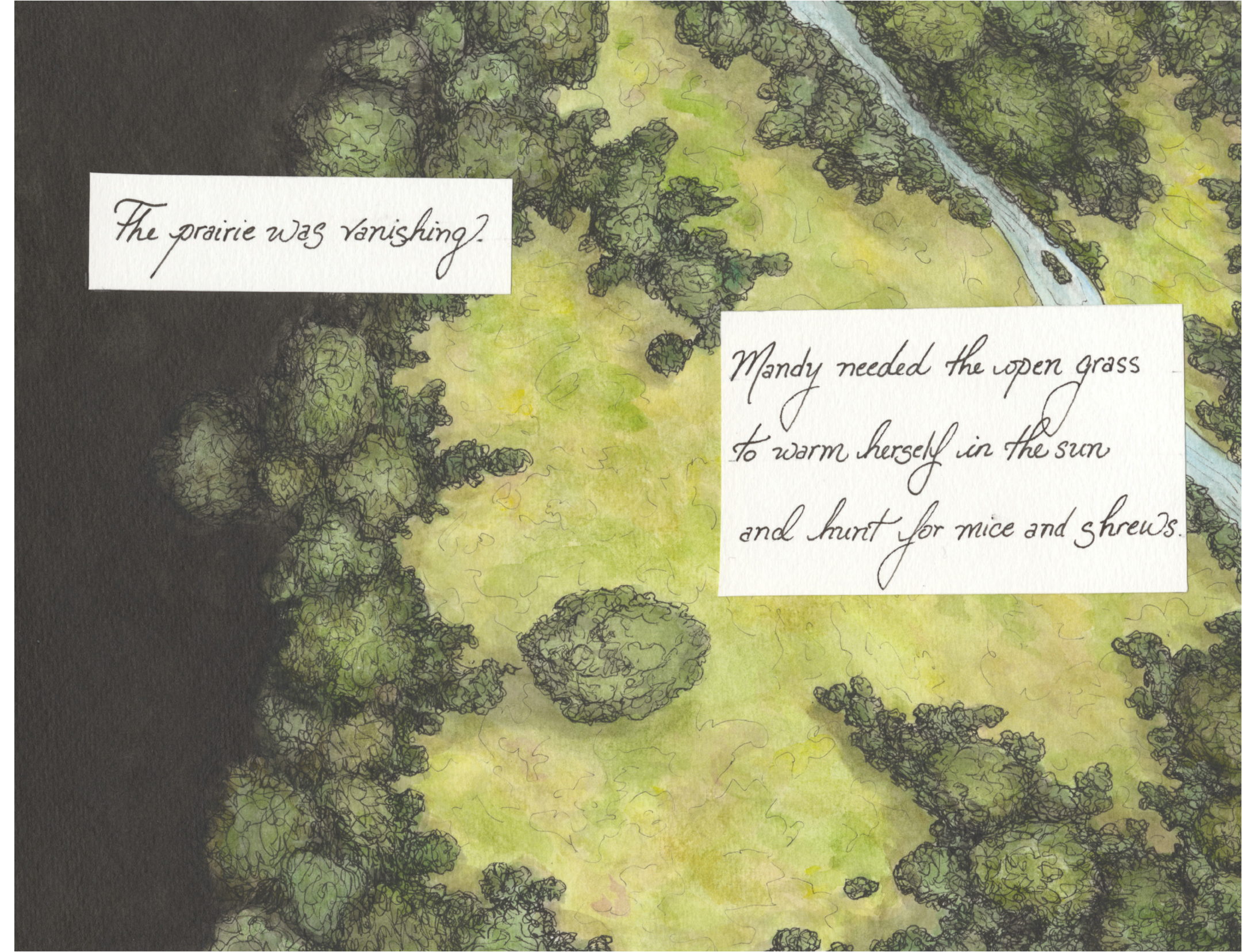
This book was created for the course titled "Restoration Ecology" taught by Sara Adlerstein at the University of Michigan School for Environment & Sustainability. The objective was to create a book that uses the topics learned in class to teach young readers about the importance of environmental stewardship—respecting and caring for Earth and the diversity of life it sustains.


Mandy was a Massasauga Rattlesnake who lived on the Michigan prairie.
In the summer, she lived on a big hill in a field of tall grass.

In the winter, she moved to the bottom of the hill.
There she hid from the snow and the cold wind in a burrow by the stream.

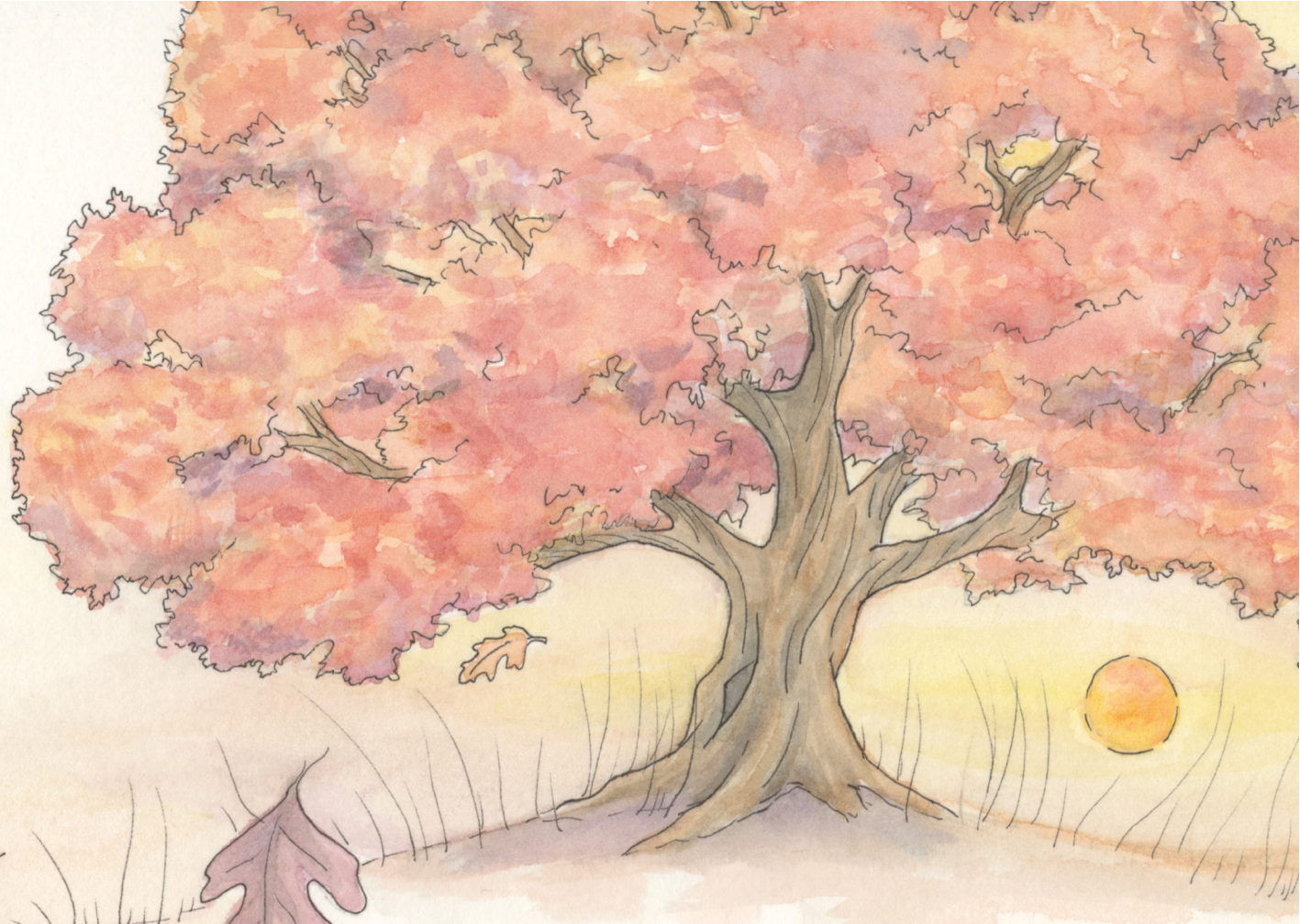
Mandy loved her prairie home...

But something was wrong.


The prairie was vanishing.
Mandy needed the open grass
to warm herself in the sun
and hunt for mice and shrews.

Now instead of grass, strange bushes and trees were invading the meadow.
These plants grew into a cold, dark forest that held no food for a hungry snake.

As the weather got colder,
Mandy knew it was time
to leave her sunny hillside
for the winter.



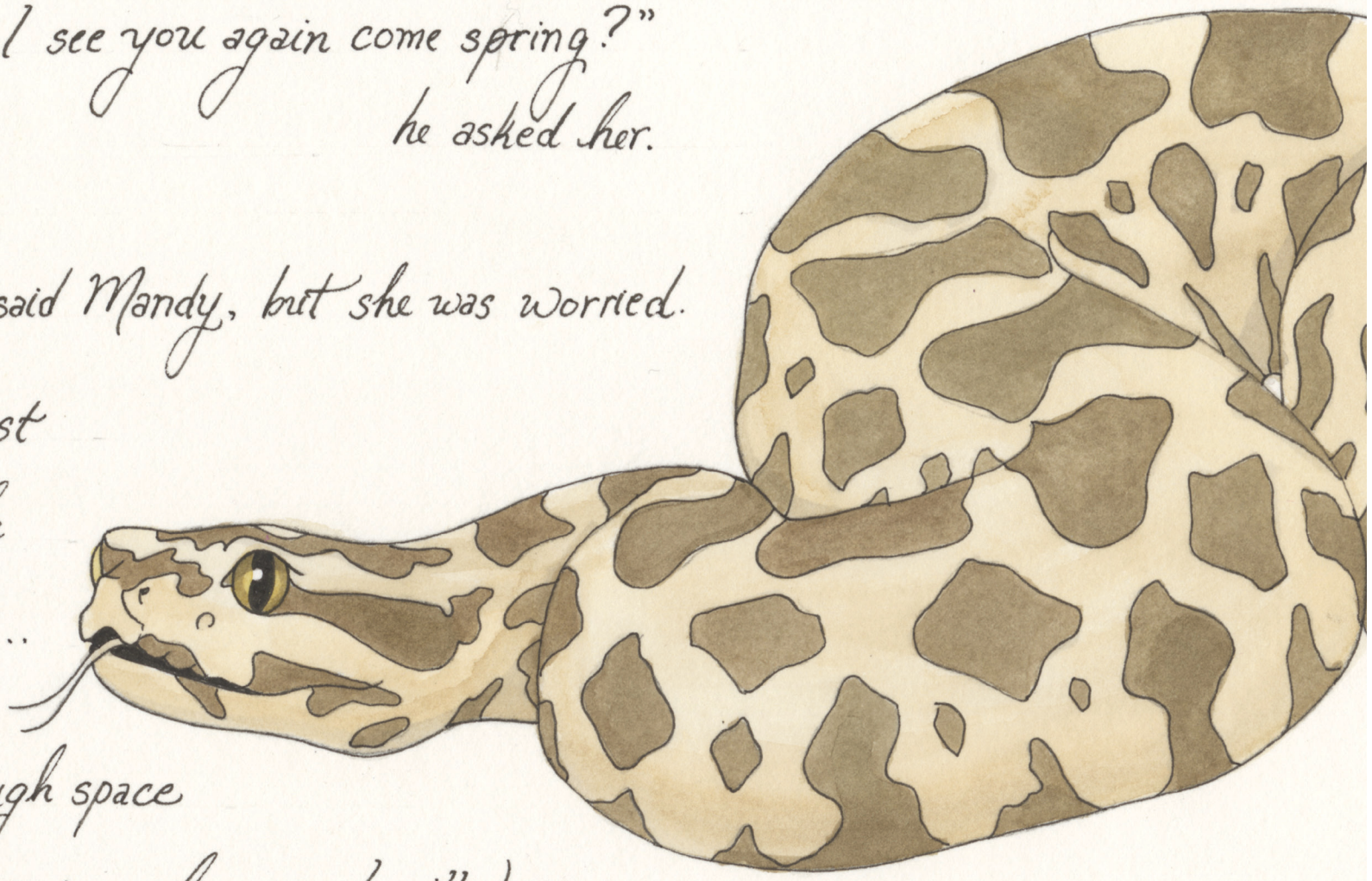
She stopped to say goodbye to the Wise Old Oak
who stood at the top of the hill.

"Goodbye friend," she told him.

"Will I see you again come spring?"
he asked her.

"I think so," said Mandy, but she was worried.

"Each year, the forest
gets bigger and the
prairie gets smaller...



I hope there is enough space
for me here in the spring, for soon I will have
no home at all."

"I hope so too," said the Wise Old Oak.

Honeysuckle, Buckthorn, and Autumn-Olive are the bushes who are taking over our home. They traveled here on the wind from far away. They are selfish plants who grow quickly and take all the sunlight for themselves.

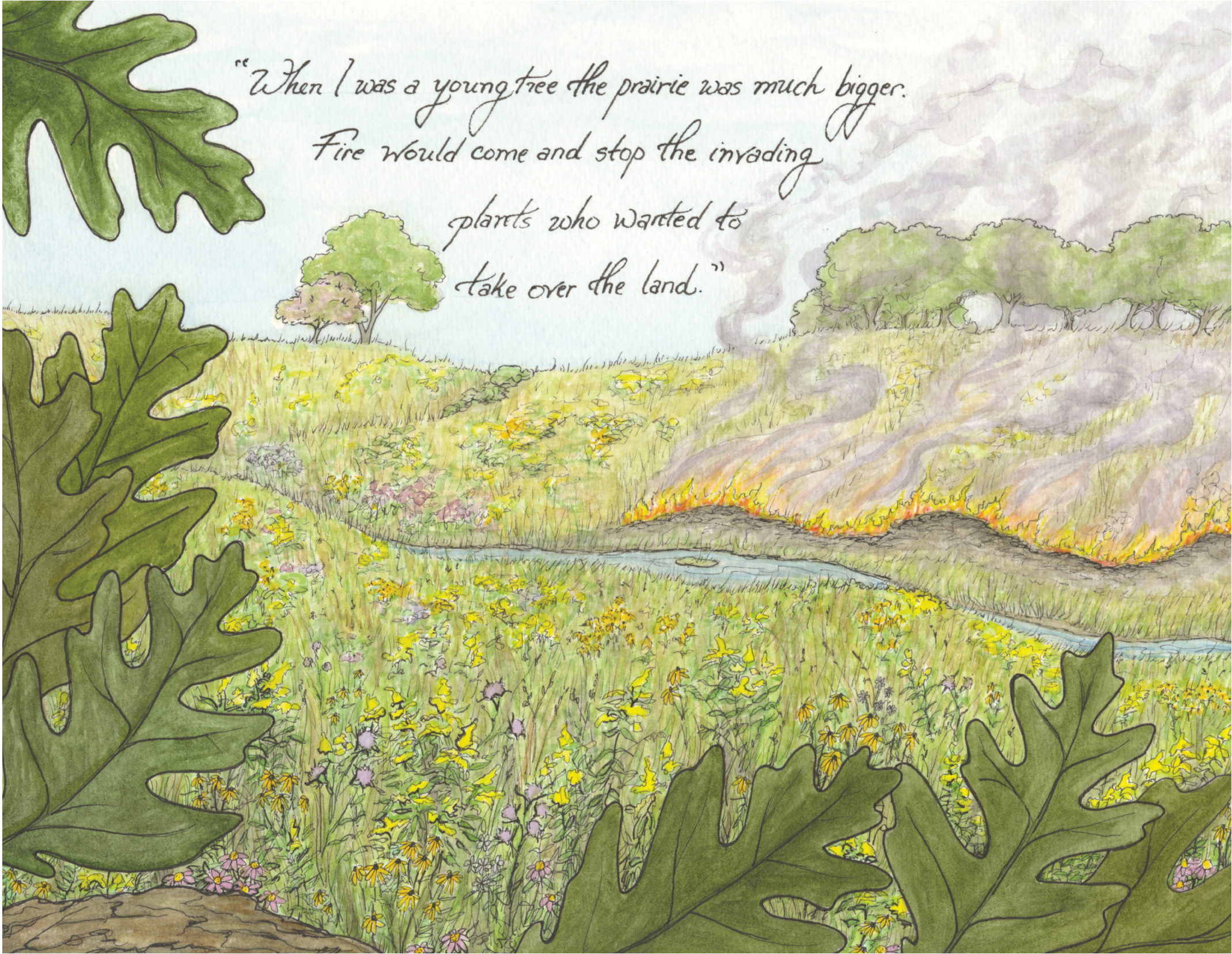
For many years, I have watched my acorns fall into their shade. Not one has become a seedling, and so I have no children."

The Wise Old Oak rattled his leaves sadly. "When I die, there will be no oak trees left on this hill."

Mandy couldn't imagine a world without the Wise Old Oak.
He had been there for as long as she could remember.

"Why is this happening to us?"
she asked.

The Wise Old Oak sighed...


"When I was a young tree the prairie was much bigger.
Fire would come and stop the invading
plants who wanted to
take over the land."

"I have not seen fire for many years," the Wise Old Oak said.
"It is the only thing that can save us now."

Mandy had never seen fire. She had many questions,
but it was too cold to stay on the hill any longer.

She crept down to her burrow and fell asleep.

Mandy slept for many months through the cold Michigan winter.

She dreamed she was lost in the forest. She tried to escape to the sunshine of the prairie, but could not find her way through the dark, tangled foliage.

One spring day, Mandy awoke to the smell of smoke. She peeked outside of her warm burrow.


High on the hill, she saw bright flames dancing through the grass.
Strange, tall creatures moved across the prairie, catching the grass and bushes on fire.

The Wise Old Oak stood tall with fire all around him.

His bark shimmered in the heat, but he did not seem afraid.

When the flames burned out, Mandy climbed the hill.

"Are you alright?" she asked her friend.

The Wise Old Oak laughed.

"This is how it should be! Many creatures are afraid of fire. They see only the blackened grass and the smoke that blocks the sun...

But look around Mandy! The fire brings new life to the prairie! It gives nutrients to the grasses and chases away the invading plants who steal the sunlight!

Mandy knew he was right.

Everywhere she looked, there were little stalks of new grass poking through the blackened ground.

The Honeysuckle, Buckthorn, and Autumn-Olive bushes drooped with withered leaves.

They could no longer invade the prairie.

As seasons came and went,
fire returned to the prairie many times.

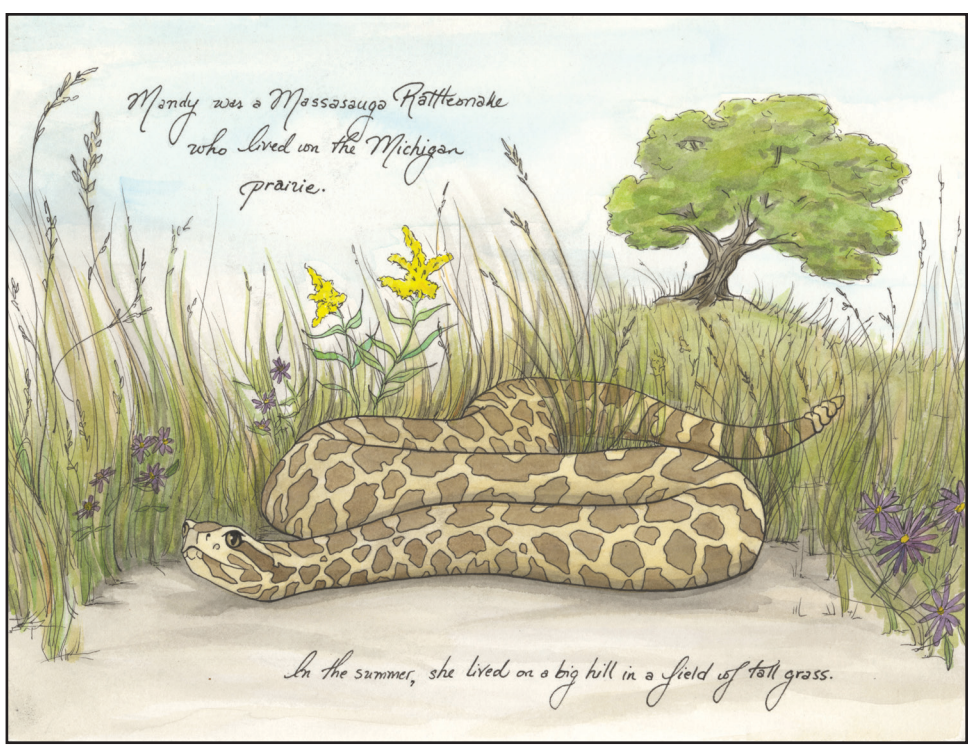
The Wise Old Oak swayed joyfully
in the breeze as his acorns grew
into seedlings.

In time, Mandy brought her own
children to visit them, and the whole
prairie bustled with new life.


So long as fire returned,
Mandy never worried about losing her home again.

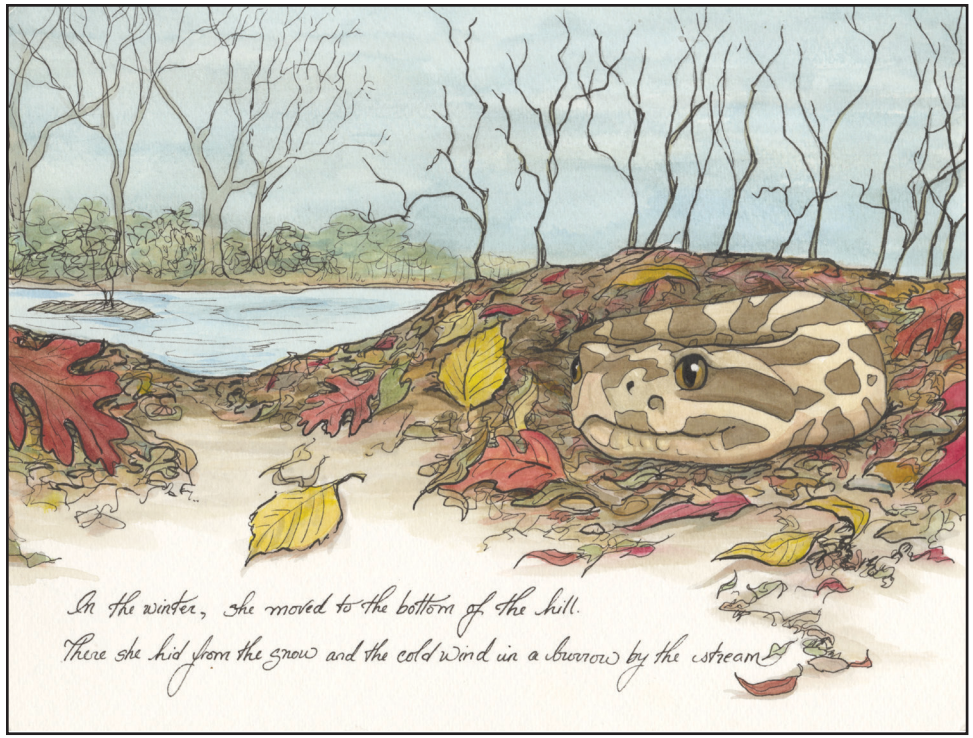
Annotations

Mandy's Prairie Home was originally conceived as part of coursework for a graduate-level Restoration Ecology course at the University of Michigan School for Environment and Sustainability. Written and illustrated as a children's book for all audiences, an Eastern Massasauga Rattlesnake named Mandy and her friend, the Wise Old Oak, grapple with the loss of their prairie home in the face of fire exclusion and invasive species. The annotations provided here about the biology, ecology, and history of the species and places featured in the story deepen the narrative for readers who wish to learn more.



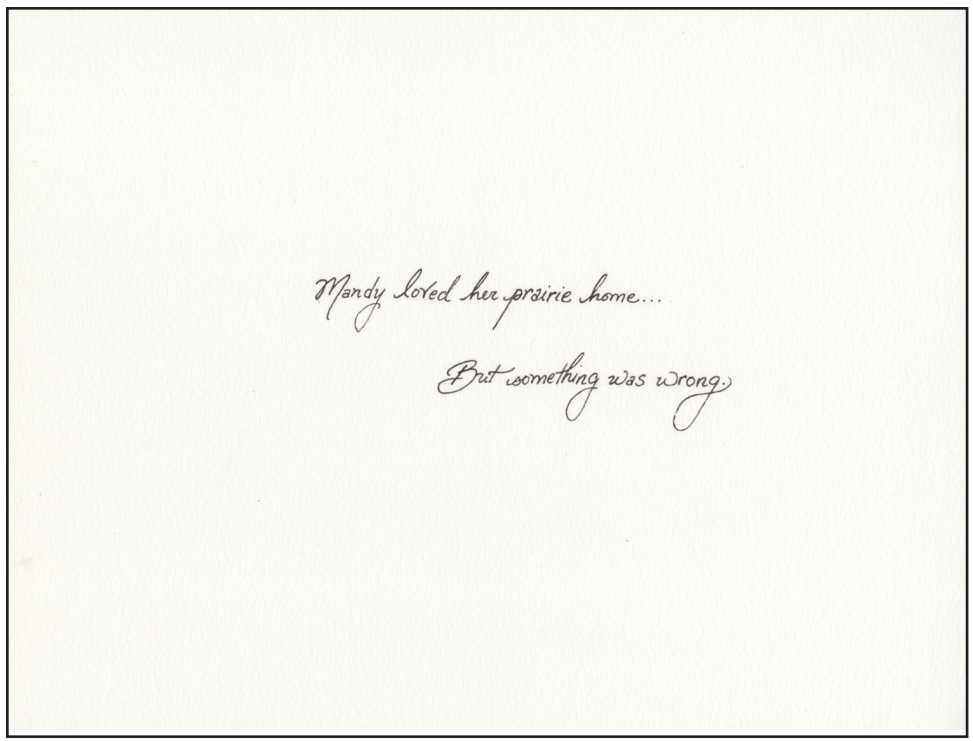
Eastern Massasauga rattlesnakes (Sistrurus catenatus) are small, docile snakes that once inhabited large portions of the upper Midwest from Western New York to Minnesota. Less than half of historical populations are estimated to persist today, primarily due to habitat loss and landscape fragmentation. Massasauga rattlesnakes are considered a keystone species because of their significant ecological impact both up and down the food chain even in small numbers. They are currently recognized by the state of Michigan as a species of special concern and by the U.S. Fish and Wildlife Service as a threatened species under the Endangered Species Act.

Spot these species in the illustration:
New England Aster (*Symphytotrichum novae-angliae*)
Tall Goldenrod (*Solidago altissima*)
Indian Grass (*Sorghastrum nutans*)
White Oak (*Quercus alba*)



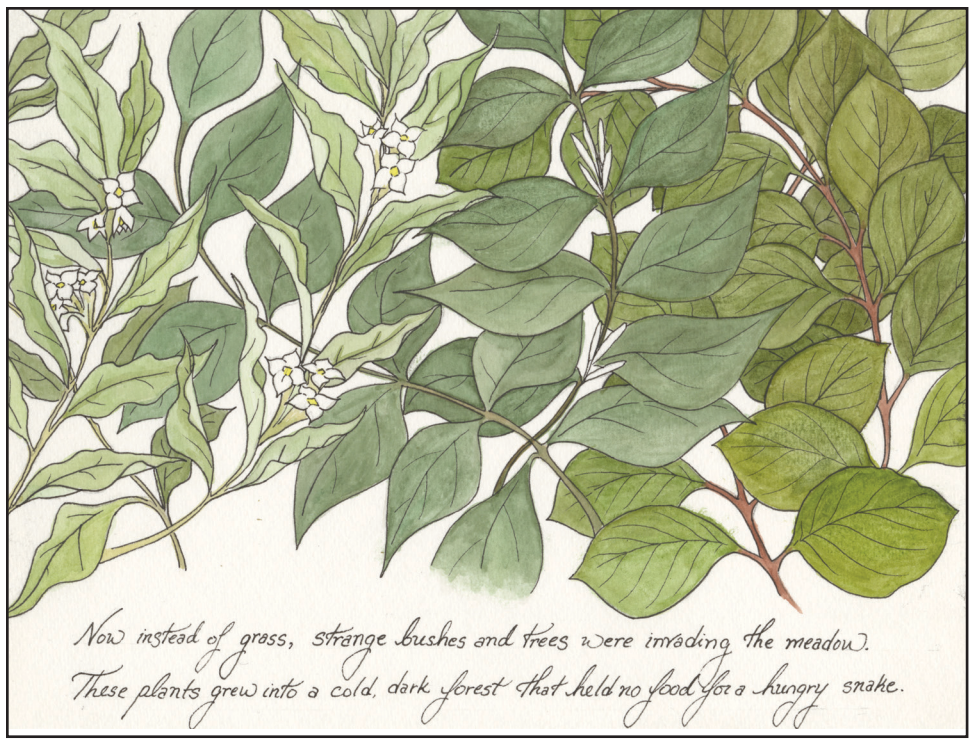
Eastern Massasauga rattlesnakes have seasonal differences in habitat needs. During the warm summer months, they inhabit open upland areas where they can forage and mate. When the weather cools, they move to low, open canopy wetlands where they seek out hibernacula—burrows just above the waterline which are often made by crayfish or other wetland species. They remain in their hibernacula throughout the dormant season until the weather warms sufficiently in the to allow them to return to their upland range.

Look for these species in fallen leaves:
White oak (*Quercus alba)*
American beech (*Fagus grandifolia*)
Smooth sumac (*Rhus glabra*)
Sassafras (*Sassafras albidum*)



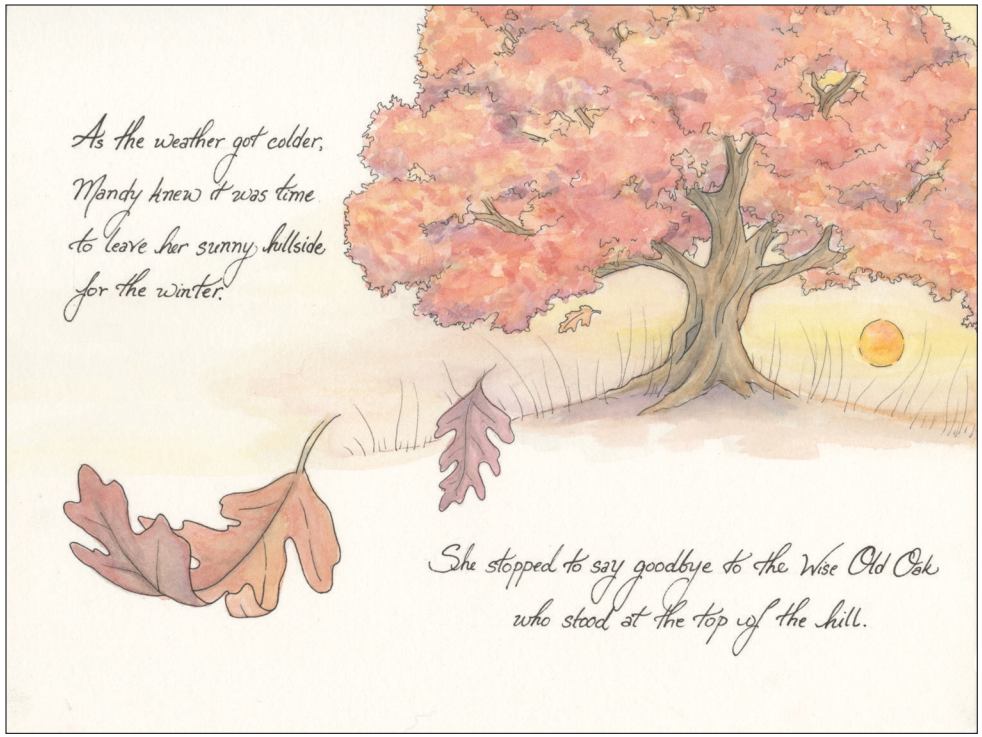
Historically, Massasauga Rattlesnakes have been known by many names such as the “Spotted Rattler” or “Swamp Rattler.” They have also been referred to as “Prairie Rattlesnakes,” a name that reflects their profound ties to the prairie ecosystem.

Open prairies and savannas are increasingly rare in Michigan, reduced to fragments of their historical extent that represent only 0.1% of the 2.23 million acres estimated to exist prior to European settlement (Chapman and Brewer 2008).



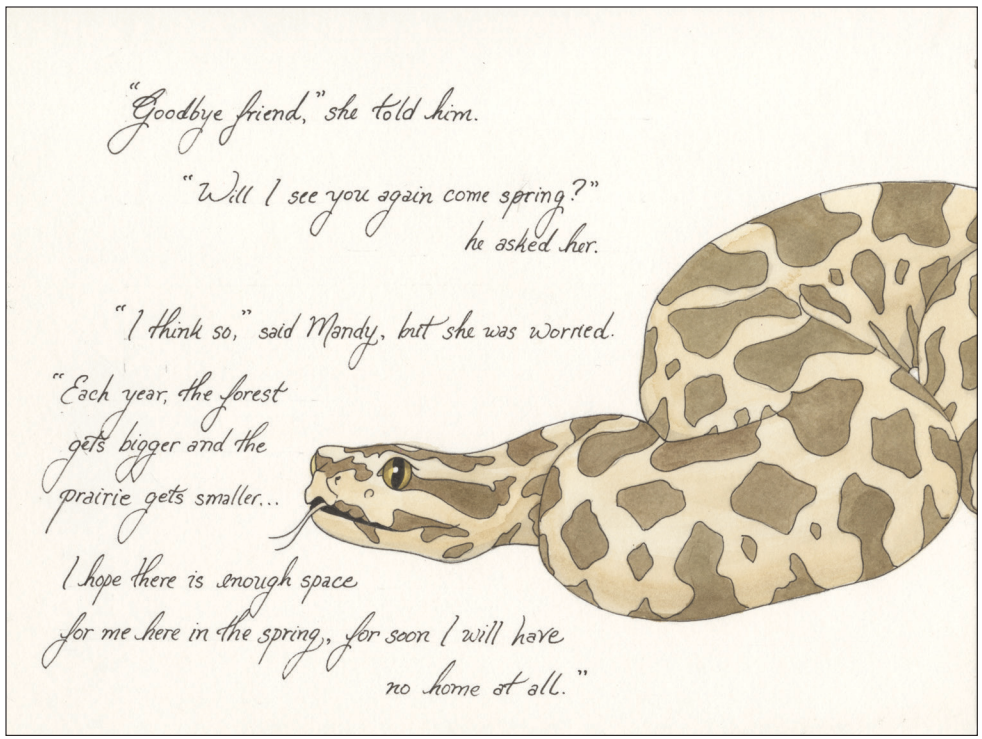
Invasive species are a growing concern for land managers in Michigan. The bushes in the story are Autumn-olive, Honeysuckle, and Buckthorn, all of which are common invasive woody plants which grow quickly under a wide variety of conditions. Left unchecked, these invasive plants can reduce local biodiversity by outcompeting native species in both prairie and forest understory communities. They can also impact habitat quality of many other species reliant on native vegetation composition such as Eastern Massasauga rattlesnakes.

Spot these invasive species in the illustration:
Autumn-olive (*Eleagnus umbellata*)
Maack's Honeysuckle (*Lonicera maackii*)
Glossy Buckthorn (*Frangula alnus*)

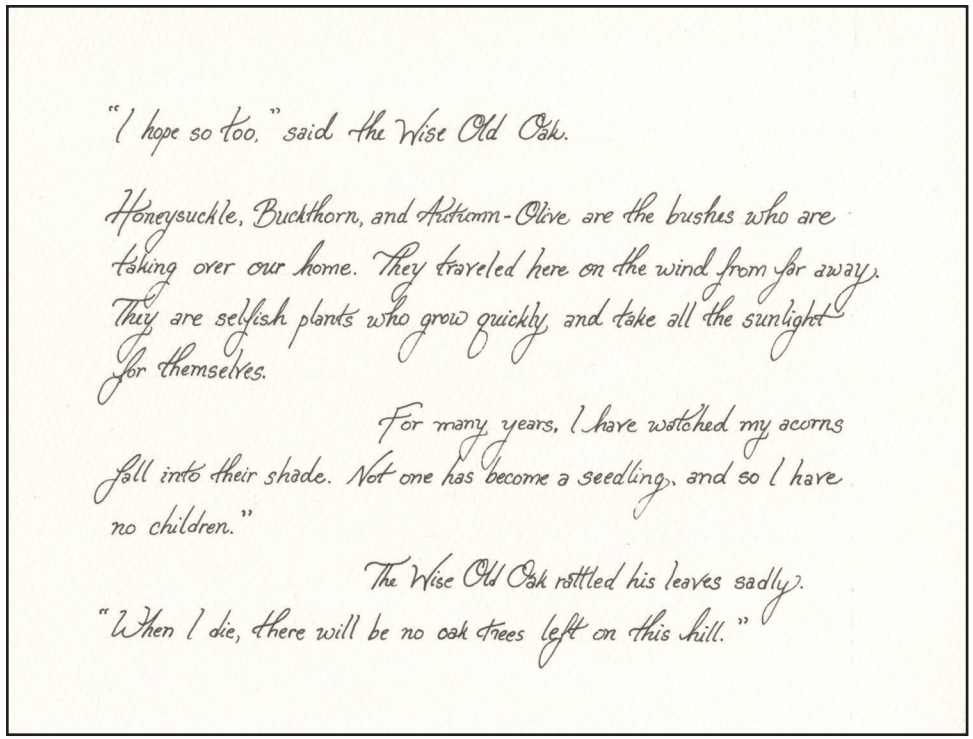


The Wise Old Oak in this story is a white oak (Quercus alba). White oaks and other oaks in the white oak family can often be identified by their distinctive leaves with rounded lobes and deep sinuses as depicted in the illustration. They grow on well-drained upland slopes like that of Mandy's prairie and exhibit a wide-spreading crown when grown in the open, with wide horizontal branches that become gnarled with age.

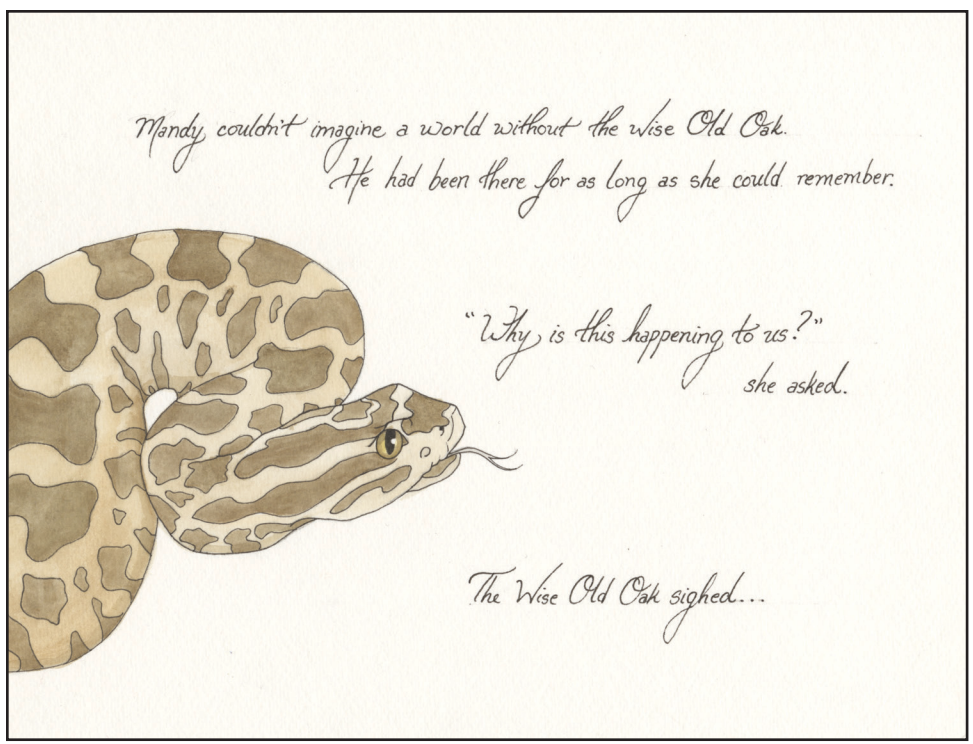
Check out the characteristics of this species in the illustration:
White oak (*Quercus alba)*



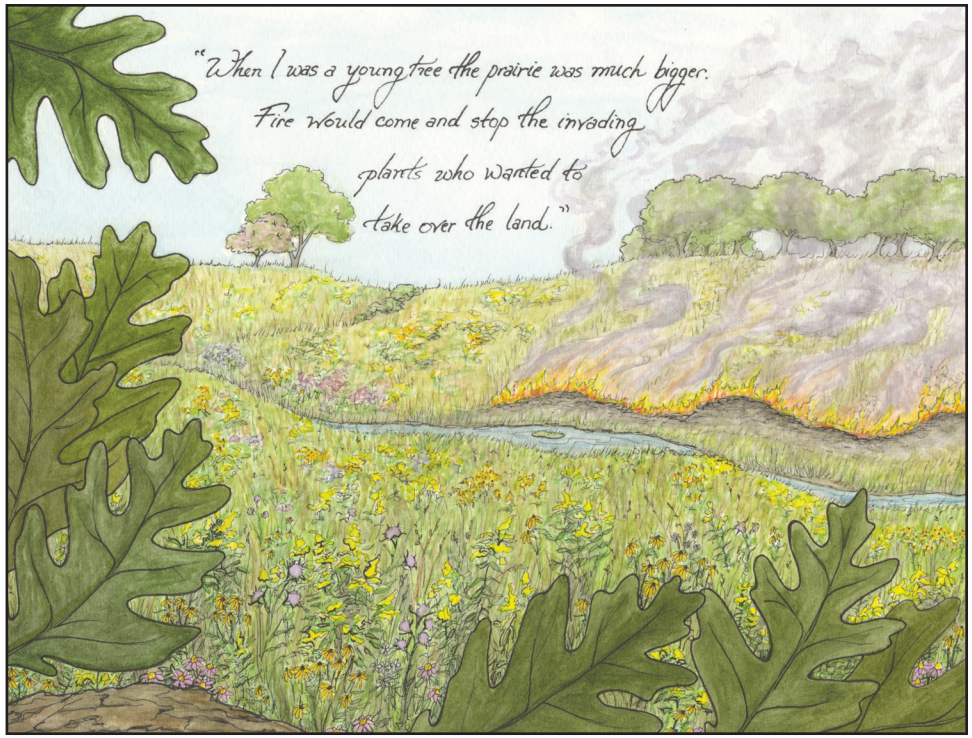
Without regular disturbance such as fire, prairies and other open systems like savannas will experience encroachment by woody plants that grow from the forested edges towards the center of the prairie. Prairie grasses and forbs are adapted to thrive following disturbance by fire but cannot tolerate an excess of shade. In contrast, the woody plants that replace them grow well without fire and can perpetuate in shaded conditions. The preservation of prairie ecosystems depends on the dynamic return of disturbances that favor the evolutionary strategies of fire-dependent species.

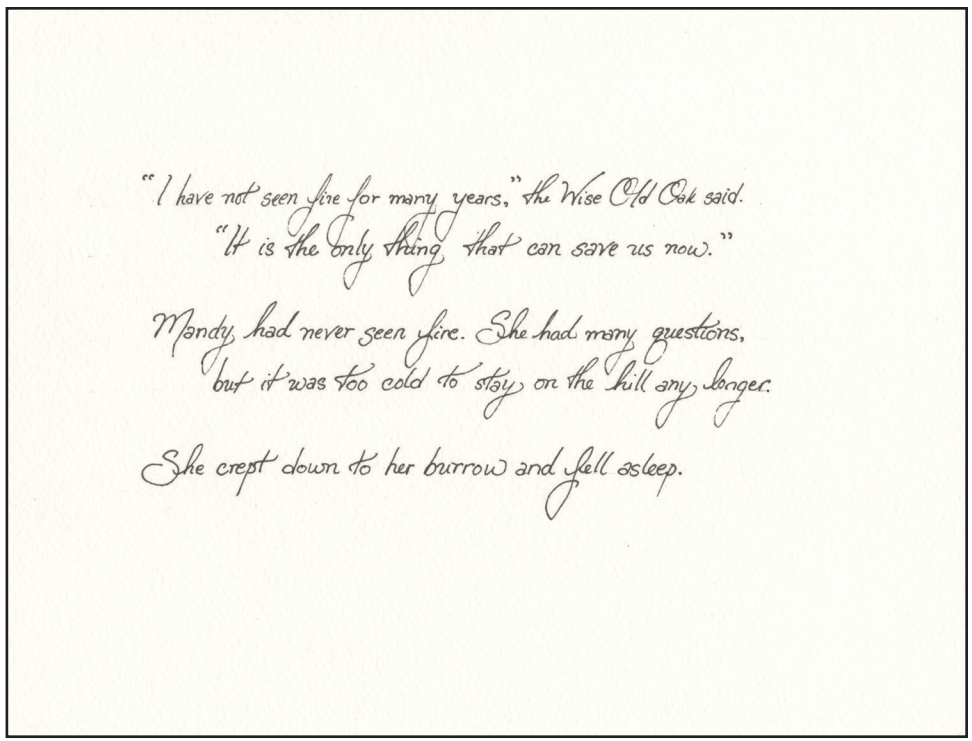


Oaks of all species are in decline across much of their range, but white oaks are especially rare when compared to pre-settlement distributions (Abrams 2003). Although oaks were dominant in Eastern deciduous forests prior to European settlement, a combination of extensive land-clearing, fire suppression, increased deer browsing, and the introduction of new pests, diseases, and invasive species has profoundly altered the character of forests in the region, restricting oak recruitment. A common result is the widespread replacement of oak with shade-tolerant native species such as red maple (Acer rubrum), and invasive species such as those identified in the story.



White oak trees are long-lived and individuals have been dated at over 400 years old. The oldest known member of the species is the Mingo Oak in West Virginia, which was estimated by the Smithsonian to have seeded in the 1350s and survived until 1938. To put it in perspective, the Mingo Oak came into existence around the dawn of the Renaissance and had been dropping acorns long before the apple tree that dropped the famous apple on Isaac Newton's head inspired his theory of gravity in 1687.





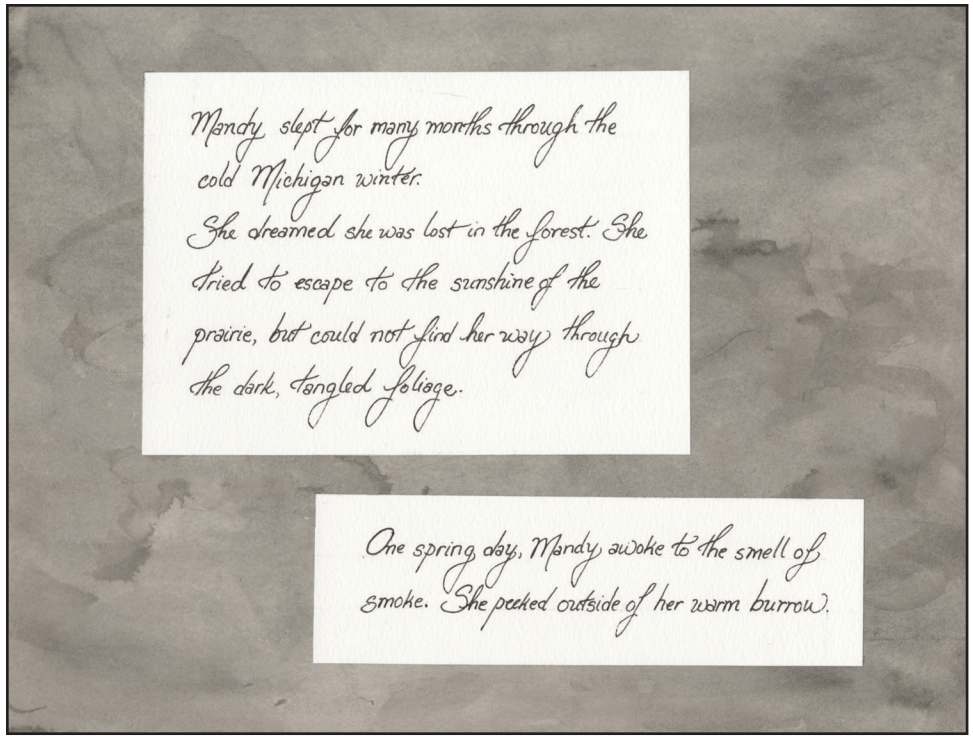
Fire could have been ignited by lightning but much more commonly would have been lit by native peoples who used it to modify the landscape to encourage foraging and hunting opportunities. The dominant cultural group in Michigan was the Anishinaabe, a collective of the Ojibwe, Odawa, and the Potawotomi peoples who collectively form the "Keepers of the Three Fires" or the "Three Fires Confederacy." Their cultural attitudes around fire and traditional practices of burning sustained the oak savanna and prairie ecosystems of Lower Michigan for thousands of years.

Note in this illustration that the leaves are on the trees and the prairie flowers are in bloom. Although burns are more commonly conducted in the early spring and late fall, summer burns, also referred to as "growing season burns" can also provide ecological benefits by favoring different plant species and modifying fire behavior. The low, creeping intensity of the fire behavior and the wispiness of the smoke portrayed in the illustration partly illustrate these dynamics. A diversity of fire contributes to a diversity of landscapes!

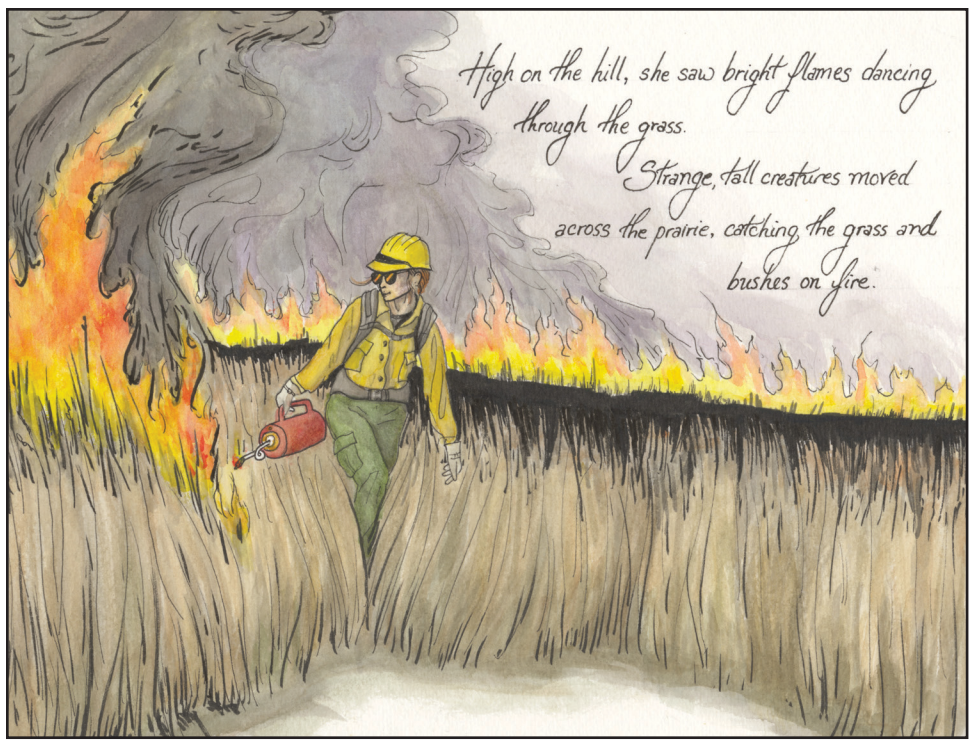
Look for these species in the illustrated prairie landscape:
Tall goldenrod (*Solidago altissima*)
Purple coneflower (*Echinacea purpurea*)
Black-eyed Susan (*Rudbeckia hirta*)
Hill's thistle (*Cirsium hilii*)
White oak (bark and leaves) (*Quercus alba*)

Following European settlement, a widespread practice of fire suppression all but erased fire from the Southern Michigan landscape. Given the relatively short lifespans of Eastern Massasauga Rattlesnakes, Mandy almost certainly would not have seen fire in her lifetime.

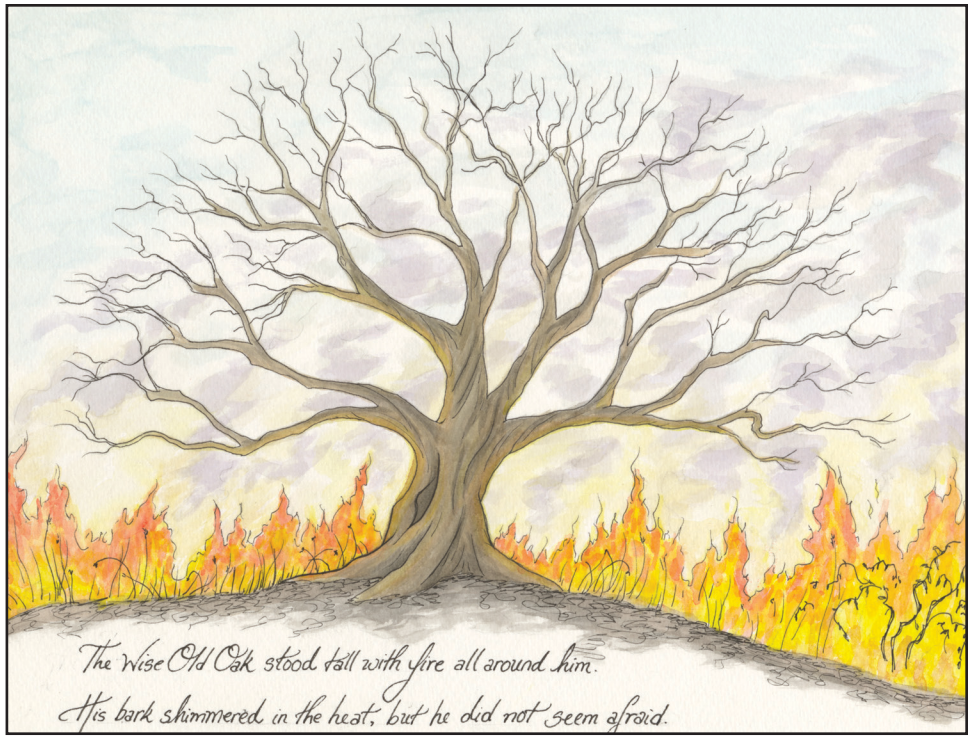
Eastern Massasauga Rattlesnakes rely on the adjacency of their upland and lowland habitats. Snake mortality commonly occurs during this transition between summer and winter sites as they are often exposed to road crossing and other human-created barriers. Mandy is lucky to have a home that, at least for a time, satisfies all three of the following conditions: upland prairie or savanna, open-canopy wetland, and adjacency of the two habitats.



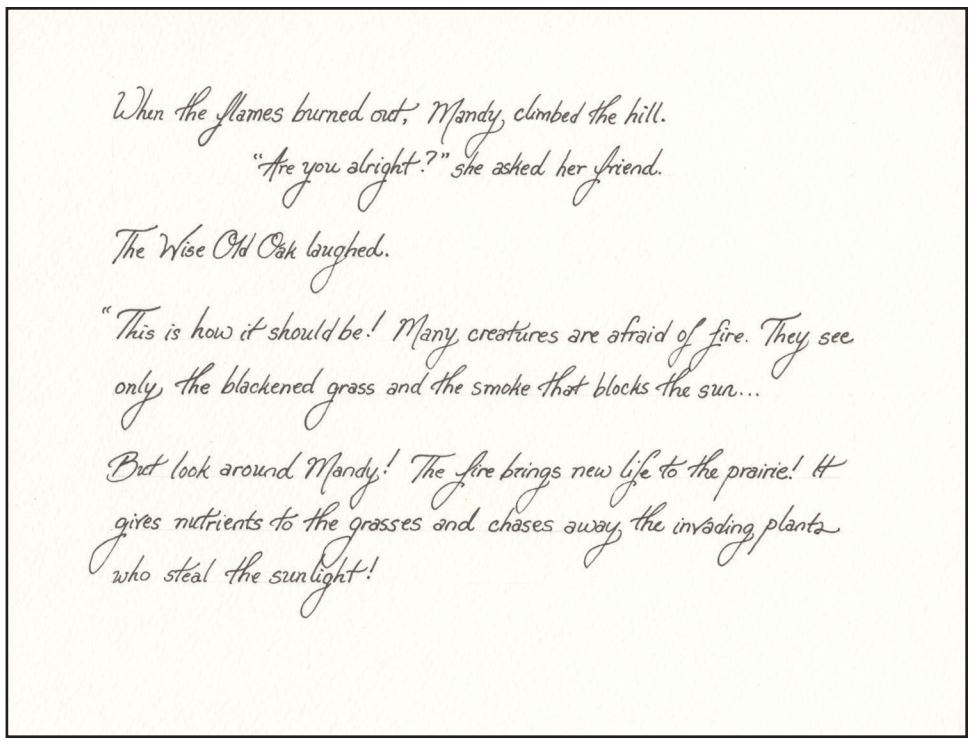
Mandy smells smoke in the early spring while she is still in her hibernaculum. Land managers seeking to improve Eastern Massasauga Rattlesnake habitat often conduct their burns in the early spring or late fall when the snakes are in their lowland habitats. This practice ensures that snakes are not harmed by prescribed burning.



Prescribed fires are often conducted using drip torches as depicted in the illustration. Professionals and trained volunteers carry fire across the burn unit which has been carefully planned and prepared to ensure that fire remains inside the desired area.



Oaks have evolved thick, heat resistant bark which shields them from the radiant heat of low-intensity ground fires. Because oaks are early- to mid-successional species, they rely on fire to provide the disturbance conditions under which they thrive. They can re-sprout readily after fire and their leaf litter is much more flammable than that of late-successional species whose leaves have evolved to act as fire arrestors. As such, oaks perpetuate a delicate equilibrium in which fire plays a critical role: rather than "fearing" fire, they embrace it.



Studies have demonstrated that repeated low-severity fire can increase both soil nutrient availability and herbaceous plant diversity—both benefits referenced by the Wise Old Oak (Scharenbroch et al. 2012).

Smoke is a common concern for prescribed fire practitioners. There are strategies that are used to manage smoke and keep it from posing adverse risks to communities. Managers wait for the perfect window of temperature, humidity, time of year, and wind conditions to conduct a burn.

Mandy knew he was right.

Everywhere she looked, there were little stalks of new grass poking through the blackened ground.

The Honeysuckle, Buckthorn, and Autumn-Olive bushes drooped with withered leaves.

They could no longer invade the prairie.

Vegetation returns quickly to a prairie after a low severity fire. While small woody plants can be successfully managed by burning, larger bushes and trees may need to be manually removed with hand tools or power equipment prior to the application of fire. If woody vegetation is sufficiently established, the cost of restoration may increase significantly. It is therefore much more effective to act quickly to preserve the prairies and savannas that remain rather than waiting until they require more substantial intervention to be restored.

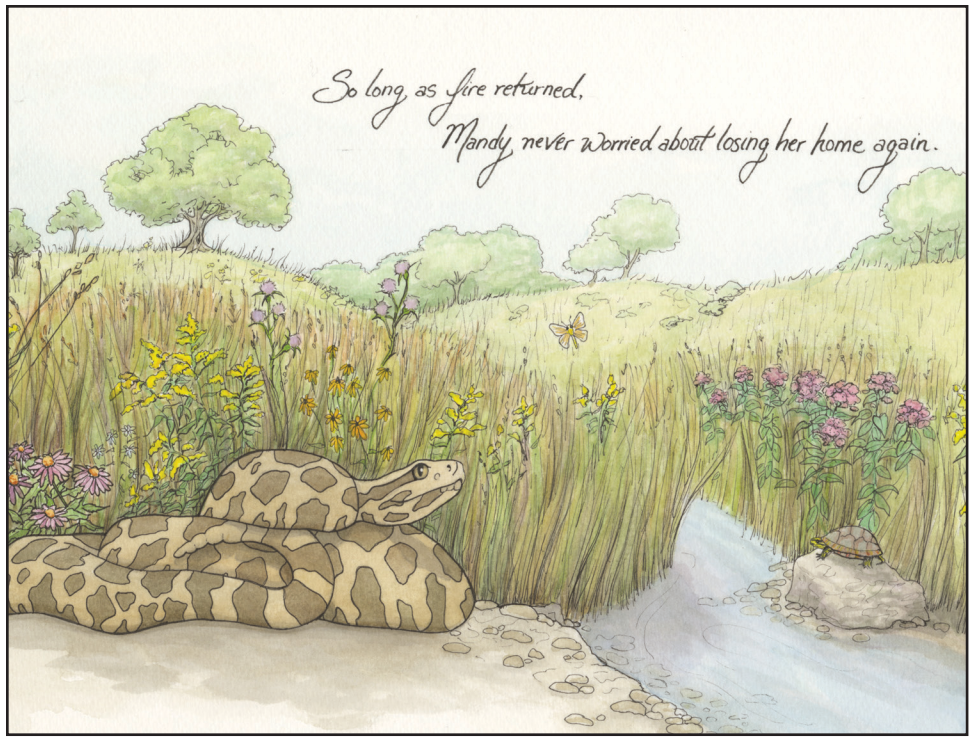
As seasons came and went, fire returned to the prairie many times.

The Wise Old Oak swayed joyfully in the breeze as his acorns grew into seedlings.

In time, Mandy brought her own children to visit them, and the whole prairie bustled with new life.

Female Eastern Massasauga Rattlesnakes reach maturity during the summers of their second to sixth years depending on their location within their range. They give birth to live young, and their brood size can vary widely from roughly 3 to 11 young in Michigan populations.

Newborn snakes, known as neonates, carry the same spotted markings as their parents but are paler with yellow tails and “buttons” instead of the fully formed rattles exhibited by the adults of their species. The young snake in this illustration exhibits a button characteristic of a snake in between its first and second shedding if its skin.



Look for these species in the illustration:
Tall goldenrod (*Solidago altissima*)
Purple coneflower (*Echinacea purpurea*)
Black-eyed Susan (*Rudbeckia hirta*)
Hill's thistle (*Cirsium hilii*)
Joe Pye Weed (*Eutrochium purpureum*)
Indian grass (*Sorghastrum nutans*)
White oak (*Quercus alba*)
Poweshiek skipperling butterfly (Oarisma poweshiek)
Painted turtle (Chrysemys picta)

Works Referenced

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Chapman, Kim Alan, Richard Brewer (2008). Prairie and savanna in southern lower Michigan: history, classification, ecology. The Michigan Botanist, 47, 1-48.

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About the Author

Gillian Moore is a Masters student in Conservation Ecology at the University of Michigan School for Environment and Sustainability. Committed to the use of fire to restore ecosystems, Gillian has worked as a wildland firefigher throughout the Western United states for four fire seasons, and has participated in many prescribed burns across the West and Midwest. As an artist, she combines her ecological knowledge with drawing, painting, and writing to make lessons about the natural world available to public audiences.