

SUMMER 2018

IOWA OUTDOORS

THE DNR'S MAGAZINE OF CONSERVATION AND RECREATION

IN THIS ISSUE:

PARKS ON PARADE

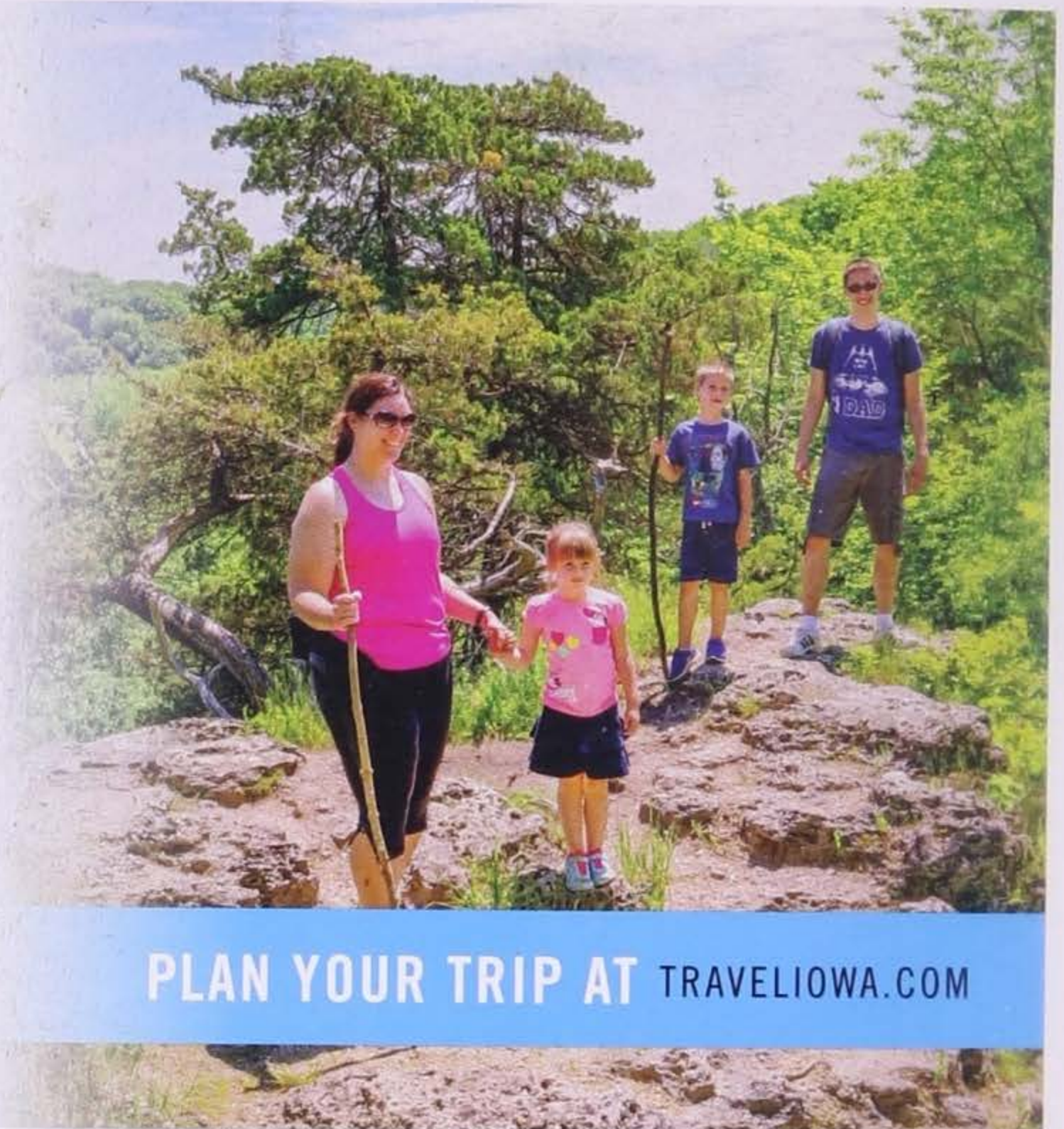
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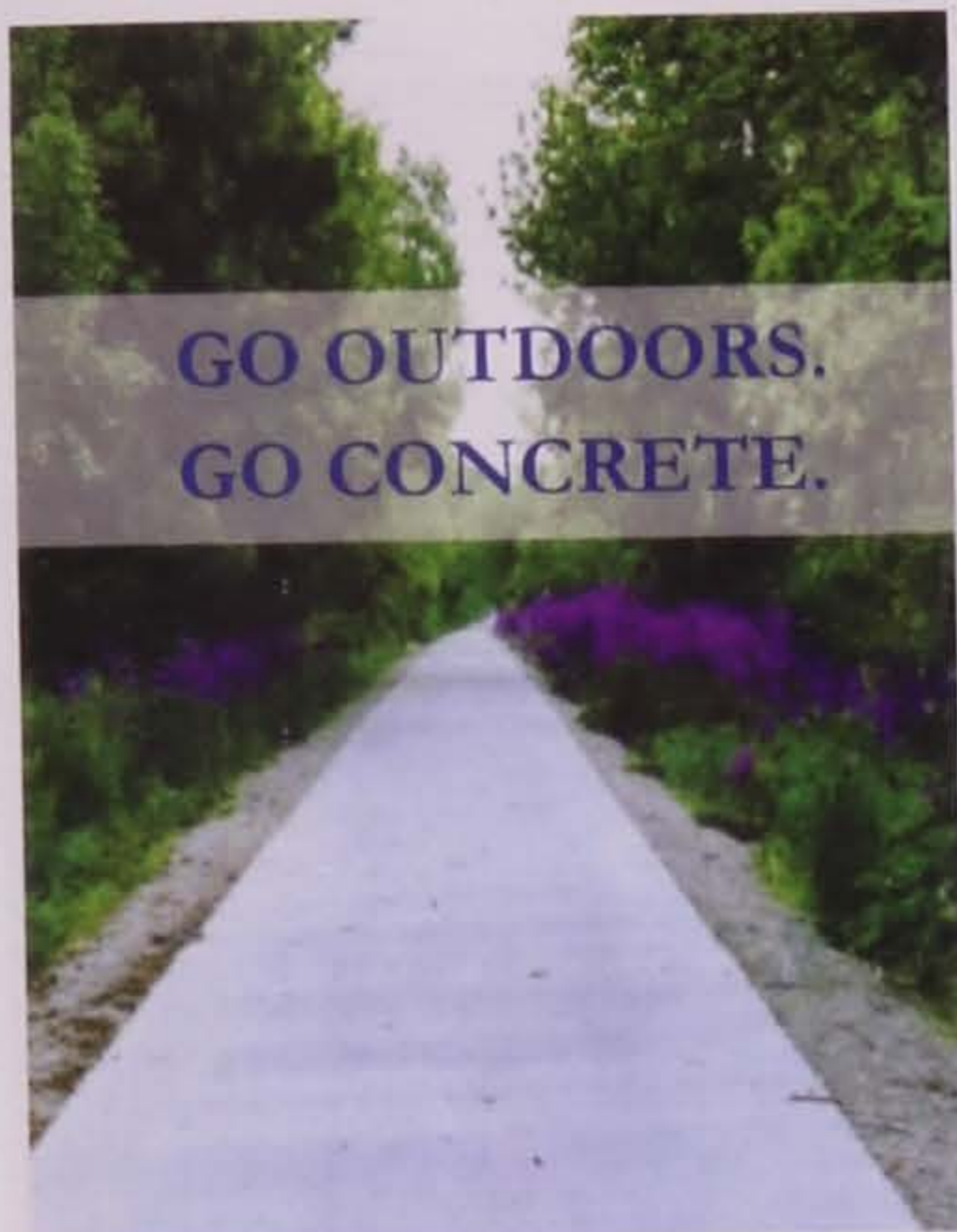


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Stand-up paddleboards are popular in the protected coves and bays of Rathbun Lake in southern Iowa's Appanoose County. From yoga classes on boards to solo getaways, Honey Creek Resort State Park provides complimentary SUPs to guests.

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ABOUT THE COVER

A long exposure taken from the bluffs of Pikes Peak State Park captures moving lights of a Mississippi River barge before predawn light washes out the Milky Way Galaxy above. "Landscape photography is where my true passion is at," says *National Geographic* award winning photographer Brandon Erdman.

PHOTO COURTESY BRANDON ERDMAN

ABOUT THIS PHOTO

The monarch butterfly, once an iconic and frequent sign of summer and fall, is on the decline and considered a species of concern. Population loss is prompting consideration for federal endangered species listing.

PHOTO COURTESY RON MAGGARD

Take a Side Trip from Honey Creek Resort to Tour the DNR's Rathbun Fish Hatchery

Ever wonder what it takes to raise more than 70 million fish every year?

Stop by the Rathbun Fish Hatchery for a free, self-guided tour of this intensive warm water fish hatchery. The fish propagated here grow best in water temperatures between 50 and 90 degrees Fahrenheit. Channel catfish and walleye are the primary species raised at the hatchery. Muskies are over wintered and other species may be raised based on stocking requests throughout the state.

Every year the Rathbun hatchery—one of eight in Iowa—produces 100,000 eight-inch catfish, 75,000 two-inch fingerling catfish, 70 million walleye fry, 225,000 two-inch walleye fingerlings and

175,000 9-inch walleye.

Brood stock walleye are annually collected in April from Rathbun Lake using gill nets. These fish are taken back to the hatchery where they are spawned before being returned to the lake. Fish produced here are stocked statewide in Iowa ponds, rivers and more than 250 lakes and reservoirs.

The Rathbun Hatchery is located just below the Lake Rathbun dam, about seven miles north of Centerville on road J5T, which runs on the dam. The hatchery is open year-round Monday through Friday, 7:45 a.m. to 3:45 p.m. Large groups must call ahead (641-647-2406) to make an appointment. Small groups are self-guided. 15053 Hatchery Place, Moravia, Ia 52571, 641-647-2406

See what it takes to create 70 million walleye a year. It starts when DNR staff gill net monster fish to obtain eggs, returning the fish back to the lake as soon as possible.



ABOVE: Walleye fry five months after hatching from eggs housed at the DNR Rathbun Hatchery.

IOWA OUTDOORS

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DNR MISSION

To conserve and enhance our natural resources in cooperation with individuals and organizations to improve the quality of life in Iowa and ensure a legacy for future generations.

EDITORIAL MISSION

We strive to open the door to the beauty and uniqueness of Iowa's natural resources, inspire people to get outside and experience Iowa and to motivate outdoor-minded citizens to understand and care for our natural resources.

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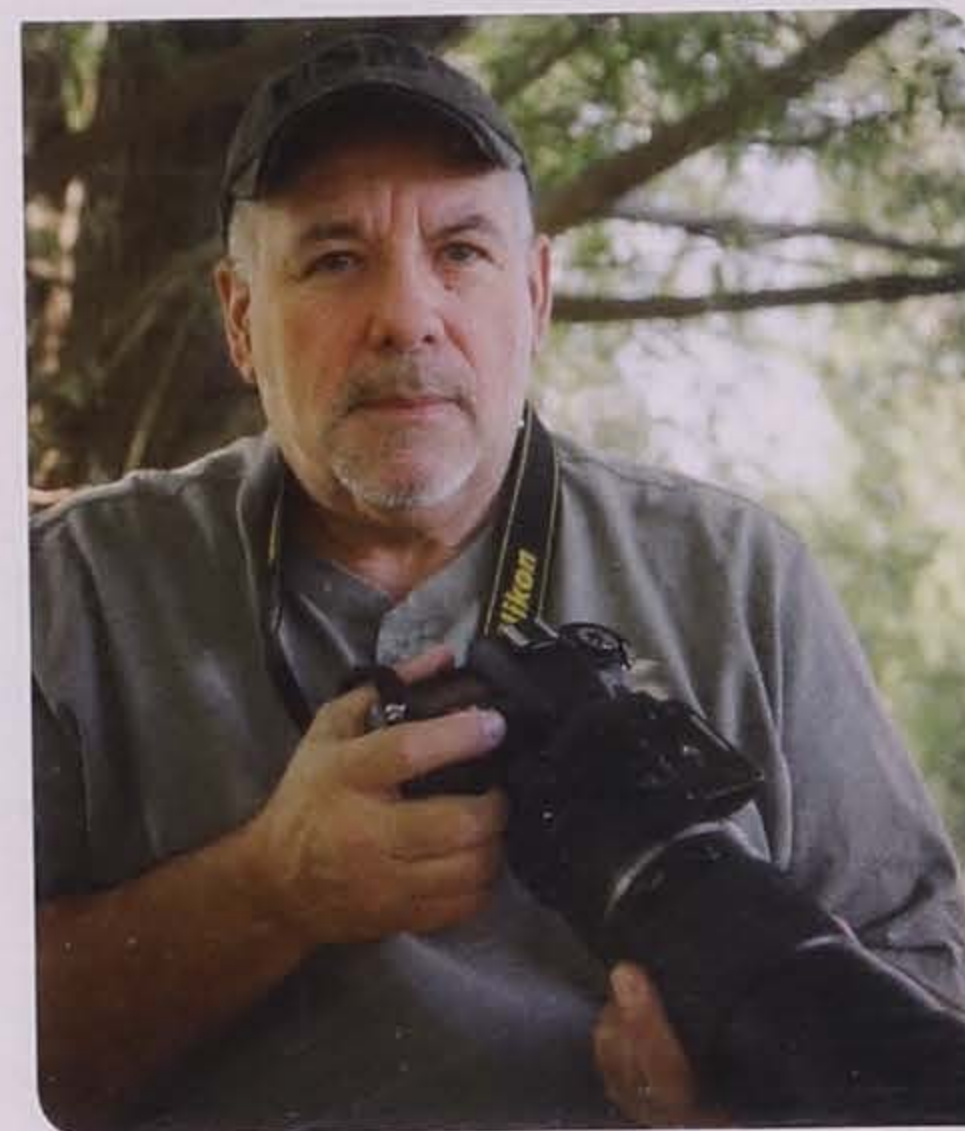
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Contributors



BRIAN GIBBS, a former Clayton County naturalist, has been addicted to wild places ever since his father first took him trout fishing in Yellow River State Forest. His passion for teaching others about enjoying and conserving natural beauty led him to work in such scenic places as Glacier National Park and Effigy Mounds National Monument. He is program director for the University of Wisconsin-Stevens Point Treehaven Field Station. briangibbs2671@gmail.com



RON MAGGARD of Jasper County lives on 45 acres and has a true love for nature. He started photographing deer and wildlife at 17 with his first 35mm camera, but life seemed to get in the way and he put the camera down for nearly 30 years. Two years ago, he purchased his first high-end camera and fell in love all over again. Now he feels he's doing what he was meant to—being behind the lens, capturing moments others may not see firsthand. See his works at: rmaggard-photography.smugmug.com

How does the DNR manage bass populations?



The DNR has managed black bass fisheries—largemouth, smallmouth and a small population of spotted bass—for decades to ensure Iowans across the state have access to the popular species. In different waters, management styles can differ greatly. One of the keys is managing habitat. In waters with poor water quality or absent of aquatic vegetation, sport fish struggle to thrive. In those cases, the DNR works with other conservation groups to enhance aquatic resources, or renovate the lake to remove carp and stimulate plant growth.

Managing black bass on Iowa's four flood control reservoirs—Rathbun, Saylorville, Coralville and Red Rock—can be a challenge. These lakes were designed to control flooding, and thus their water levels fluctuate widely. Nesting and nursery habitats are sometimes left without water, causing poor reproductive success. The black bass population is composed primarily of largemouth.

In the 16,000 acres of publicly-owned

impoundments and roughly 90,000 private ponds, bass and bluegill reign. Again, water quality is the key component to maintaining quality bass fishing. Largemouth bass are stocked on all new or renovated lakes to establish fisheries.

The larger, deeper natural lakes of northwest and north-central Iowa maintain stable largemouth and smallmouth bass fisheries. Moderate depth natural lakes, especially when they have good water quality and habitat, support good largemouth numbers. Shallow natural lakes often have poor water quality and lack aquatic vegetation, limiting bass numbers. Restoring these lakes and protecting the shore are crucial to black bass management.

Navigation features on the Upper Mississippi River—like wingdams, backwater lakes and side channels—and underwater rock structures, support good numbers of both largemouth and smallmouth bass. The biggest threat

here to black bass is siltation impacting backwaters and overwintering habitats. Smallmouth bass prefer swift flowing, less turbid interior rivers and small tributary streams.

Finally, harvest regulations limit the number and size of bass that can be harvested to protect the vulnerable, stronger producing bass. Most waters have a 12- to 15-inch length limit, but in some cases, a manager might impose a 16- or 18-inch length limit. Signs are posted at lakes for guidance. Some waterbodies employ slot limits to prevent harvest of fish in a chosen length range. It encourages the taking of smaller fish to improve growth. It is used most often when the number of fish added to the population annually is high but growth is slow. Catch-and-release-only might be ordered on waterbodies where fast-growing black bass face high angling or higher natural mortality rates.



Attention Anglers

Walleye in Big Creek and Brushy Creek have been tagged to evaluate survival, growth, and escapement.

Tag Location

Tags are 1 1/4" in length and cannot be observed unless the fish is filleted. Tags are located in the body cavity as shown below (green circle).



Please help by placing an envelope with your tag and completed survey in a drop box located at the fish cleaning station and park office. You can e-mail fishtags@iastate.edu for additional information.

Thank you for your assistance!

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TIPS, TRICKS AND MUST-KNOWS TO ENHANCE YOUR OUTDOOR FUN

UPCYCLED POCKET TACKLEBOX

When targeting a species, like panfish during spawn, a full-size tacklebox is more of a hassle than a help. Pack only what you need in a tiny, convenient pocket tackle box. Using an empty mint can, use hot glue or adhesive to affix cut Popsickle sticks, twigs or chopsticks to the sides and bottom to form compartments. Build a layer to the rim. For a removable tray, glue sticks to a spent gift card. Store hooks, splitshots, weights and swivels for an easy-to-carry tacklebox.



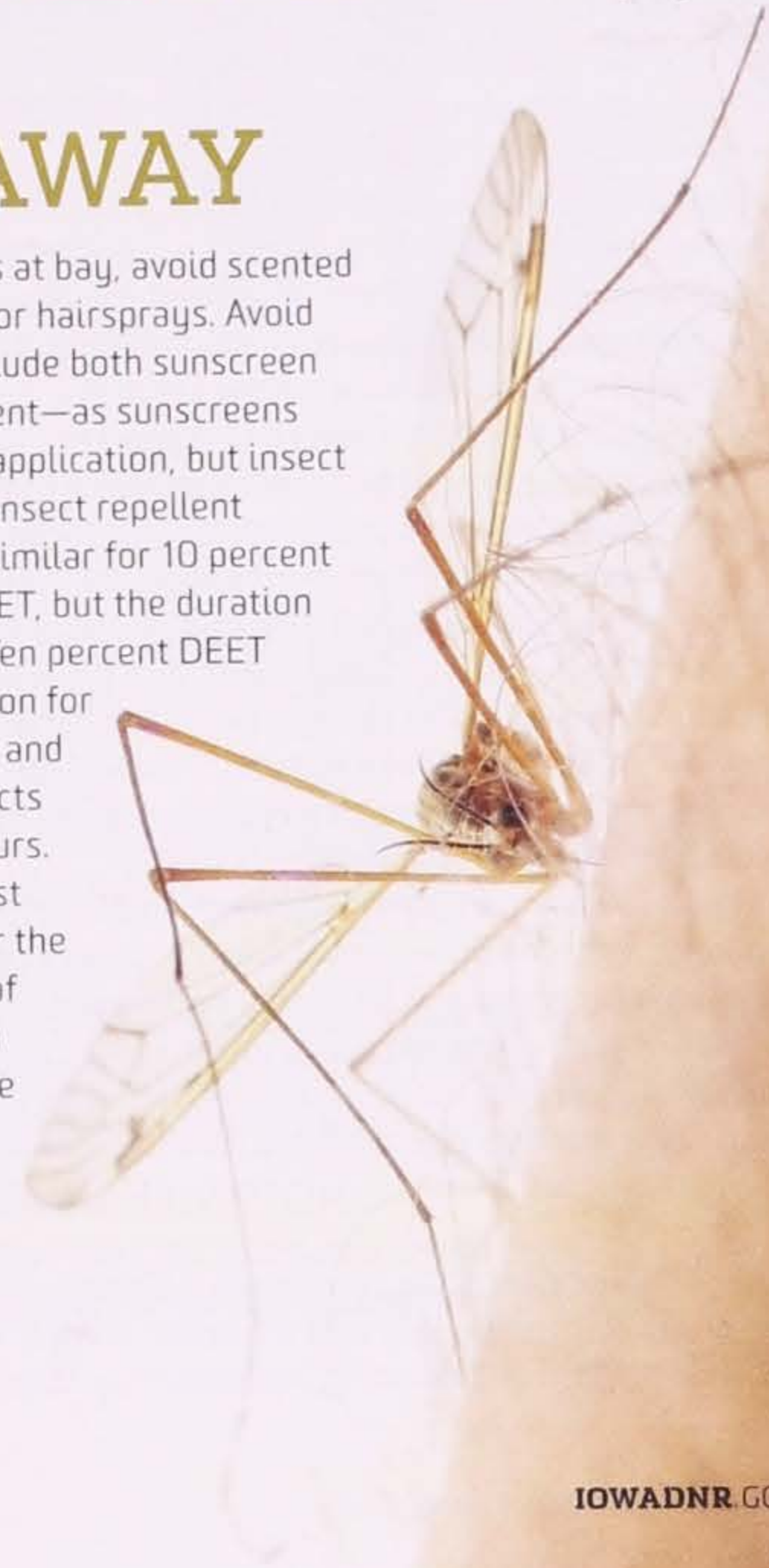
Pack a Better Cooler

Use these cool tips to get the most out of your cooler. Bring the cooler inside the night before you pack so it cools off. Save space for more ice by taking just the amount of food you need. Use solid ice or reusable ice packs on the bottom. Add raw meats sealed in plastic bags. Next, layer produce, dairy, eggs and perishable condiments. Top off the cooler with ice. Once packed and ready, stow in vehicle out of direct sunlight. Add a blanket or sleeping bag around it for extra insulation.



BUGAWAY

To help keep bugs at bay, avoid scented soaps, perfumes or hairsprays. Avoid products that include both sunscreen and insect repellent—as sunscreens need frequent reapplication, but insect repellents don't. Insect repellent effectiveness is similar for 10 percent to 30 percent DEET, but the duration of effect varies. Ten percent DEET provides protection for about two hours, and 30 percent protects for about five hours. Choose the lowest concentration for the required length of protection. Wash repellent off once returning inside.



ACTIVITIES, TIPS AND EVENTS FOR THE WHOLE FAMILY



NATURE IS A HEALING FORCE

Last Fall I made two bad decisions. The first was to not go to Iowa City for a football game. The second was to go to Iowa City for a football game. This contradiction can be explained—I missed the great upset victory over Ohio State and attended the disappointing loss to Purdue.

One of the game highlights was “the wave” after the first quarter to all the children dealing with life threatening illnesses in the University of Iowa Hospitals and Clinics Children’s Hospital which overlooks Kinnick Stadium. I was impressed that many Purdue players waved with enthusiasm during the entire break. The University of Iowa received lots of praise, first for the design of the new children’s facility that features amazing views of the field and for the effort to include the children.

About 1,939 miles due west on I-80, a facility on the campus of Stanford University unveiled an even newer building than Iowa’s that also served children and created not just a room, but a building with a view. The Lucile Packard Children’s Hospital Stanford opened last December with a 521,000-square-foot building that has a laser focus on patient care, technology and nature. The new state-of-the-art facility uses nature—and normalcy—to make kids feel more comfortable, which in turn helps them heal faster.

Lucile Packard was the wife of David, a co-founder of Hewlett-Packard. But more importantly, she was a great volunteer, supporter and visionary. In 1991 she was advocating for whole patient care and even treatment for the families of ailing children. For three decades she advocated for nature to be part of the solution.

With lots of scientific research to support her initial feelings, one of America’s most advanced facilities resembles a tree house...or at least part of it does. Other parts resemble various samples of California’s diverse ecosystem. One floor may look like the rocky shore of its coast, and the next a redwood forest. The lobby features the coastal theme, with a ceiling that is undulating waves, and 100 silver bird sculptures in various stages of flight hanging over—appropriately enough—flights of stairs. “At the heart of the building, a bank of elevators wrapped in reclaimed redwood resembles a massive sequoia trunk rising through the floors, like the world’s largest tree house.”

There are planter boxes for all rooms, spacious patios that allow outdoor opportunities and lots of wildlife. Or at least wildlife art that also helps patients and families navigate the hospital.

Nature as a healing force...imagine that. And while you are at it, imagine it as a preventative as well—so hike a park trail, paddle the rivers or sit in the woods and watch birds. It’s a tonic for health and wellness.

Wave on Iowa.

TIM LANE is a nationally-recognized authority on public health and physical activity. He is past president of the Iowa Association for Health, Physical Education, Recreation and Dance.

But Why?

Helping adults answer children’s nature questions

BRIDGETTE, 11, IN BOONE, ASKS:

Why is sun exposure considered both good and bad?



Obviously, overexposure to sunlight can create adverse medical issues. In addition to the painful feeling of a sunburn, too much exposure without sunscreen protection can lead to harmful medical conditions like skin cancers (some types are very dangerous).

However, too little exposure to sunlight is also detrimental. Reduced sunlight can cause a drop in serotonin that may trigger depression (serotonin is a brain chemical that affects mood). In Iowa, with reduced hours of light in winter, some people get a case of “the winter blues”—feeling sad and depressed.

Seasons with less hours of light can also disrupt the body’s level of melatonin, which plays a role in sleep patterns and mood. In most cases, these seasonal symptoms appear during late fall or early winter and go away during the sunnier days of spring and summer.

Your skin also produces vitamin D when it’s exposed to sunlight. Rickets is the softening and weakening of bones in children, usually because of an extreme and prolonged vitamin D deficiency. Vitamin D promotes the absorption of calcium and phosphorus from foods we eat.

Vitamin D, provided by sunlight exposure, may reduce mortality rates among the elderly, promote bone health, boost the immune system, lessen depression, increase cognition and support pregnant mothers.

So, balancing sunlight exposure is important. And being outdoors also provides other benefits from physical activity and happiness.

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HEAD TO THE RESORT FOR FREE, LAKESIDE FAMILY- FRIENDLY SUMMER CONCERTS

This summer kicks off a new attraction to Honey Creek Resort State Park—a free six-week summer concert series held every Thursday from June 28 to August 2.

The stage, located on the resort's Great Lawn, allows for scenic views of the lakeside resort and sprawling Rathbun Lake.

The concert is free for resort guests, visitors and locals. The lineup features local Iowa musical acts and boasts nationally-recognized artists in pop-rock, country, folk rock, blues and funk. All shows are family-friendly, with Honey Creek Resort's vast lawn providing ample space for children to play.

Food and drinks, including beer and bottled alcoholic drinks, are available for sale at each show, with sales helping support the concert series and future events.

Acts will begin at 6 p.m. and finish around 9 p.m. Attendees should bring a chair or blanket to sit on. Outside food and beverages, smoking and pets are prohibited.



OUTDOOR CONCERT SERIES LINEUP

JUNE 28 - B2WINS

B2Wins have a distinctive, signature sound that draws influence from a variety of genres. The music features power-pop melodies, a dynamite hip hop rhythm section, funky dynamic bass lines with some room for improvisation and crafty solos.

JULY 5 - THE BOYS

The Boys are a modern country cover band from southeastern Iowa, covering popular artists such as Chris Stapleton, Eric Church, John Pardi, Luke Bryan, Granger Smith and many more.

JULY 12 - DECOY

Decoy is a pop/rock band that creates its own unique sound from an eclectic mix of influences.

JULY 19 - FINAL MIX

Final Mix serves up the latest in R&B, jazz fusion, blues, hip hop, rock & roll and original material.

JULY 26 - THE NADAS

The Nadas are an alternative, Americana, country, folk, indie, rock, songwriter group from Des Moines with a dedicated local and national following.

AUG. 2 - STANDING HAMPTON

A premier export of the Des Moines music scene, Standing Hampton performs selections from the '70s, '80s and beyond.

Get Wet at Rathbun Lake

With 11,000 acres of gorgeous water and 150 miles of shoreline, Iowa's second largest lake has something for you—no matter what floats your boat.





Whether you want to cruise, paddle, ski or fish, you can find the perfect watercraft for enjoying Rathbun Lake. Bring your own watercraft and use the marina with a boat launch, fishing pier and 40 boat slips. Or, choose from a variety of watercraft rentals, including canoes, kayaks, jet skis, paddle boats, fishing and ski boats and pontoons.

Included in every overnight stay at Honey Creek is the

use of the water trampoline, stand-up paddle boards, kayaks, fishing equipment (licenses are sold at the hotel gift shop) and beach volleyball.

Many Honey Creek Resort guests opt for the pontoon boat rental that fits a dozen passengers comfortably—you get to be the skipper. Set out on the water, relax and take in the scenic surroundings. 🐾

Watercraft Reservations

To reserve a boat slip or learn more about renting or bringing your own watercraft, call **641-724-1450**. Watercraft rentals are available daily at Honey Creek Resort State Park from May 25 to Sept. 9. Rentals are weekend-only from Sept. 10 until Oct. 1. All rentals must be booked online at honeycreekresort.com. Rentals are weather-dependent.

Boat Description	Capacity	Half Day (8 a.m. to 1 p.m. or 2 p.m. to 7 p.m.)	All Day (8 a.m. to 7 p.m.)	Hourly Rate
20-foot pontoon	10	\$300	\$550	\$150
22-foot pontoon	12	\$325	\$600	\$150
24-foot pontoon	14	\$350	\$650	\$150
19-foot Four Winns Horizon Ski Boat	8	\$325	\$600	\$125
Seadoo Personal Watercraft	3	\$300	\$550	\$90

Leading You Outdoors for Another 62 Years

Polk County Conservation Board was created by voters in 1956 to provide quality outdoor recreation, conservation education and the long-term protection of Polk County's natural heritage. Iowans knew then the critical importance of protecting scarce natural areas for future generations. Fifty-six years later, on Nov. 6, 2012, the citizens spoke again when they overwhelmingly passed the Polk County Water and Land Legacy bond referendum designed to support \$50 million in land, water, habitat, park and trail projects in Polk County. Read on to see just a sample of how this bond funding has improved outdoor recreation, education and conservation for many generations to come.



Outdoor Experiences for all Audiences

Traditional camping, whether it be in a tent or an RV, isn't always desirable or practical for all audiences. However, the desire to experience an overnight stay in a park setting is still there. Four modern cabins were constructed at Jester Park in 2014 and four more will open at Yellow Banks Park in fall 2018. Affordable accommodations are available year-round with the comforts of home close at hand. These reservable cabins make the camping experience possible for all interests and abilities. Since opening, nearly 16,000 people have enjoyed a cabin stay and they have been occupied every weekend.



Four modern cabins provide year-round overnight accommodations at Jester Park, located on the west side of Saylorville Lake near Granger.

Lost In Iowa

Situated on the south side of Des Moines, Fort Des Moines Park immerses visitors in an outdoor classroom—even over the pond for a unique view.



The Power of Partnerships

Once a vibrant and active cavalry post in the early 1900s, Fort Des Moines Park on the south side had grown tired and lackluster. Breathing life back into the park was done collectively between the county, state, school district and the local neighborhood association. Dreams of a healthy pond with great public access, a connective trail system, new park shelters and an innovative outdoor classroom became reality in 2017 thanks to a network of dedicated partners. Park attendance increased 114 percent following the improvements.

Swiftness Results in S


Chickasaw Bottoms Greenbelt in northern Iowa has become one of the largest natural areas in the state. It is home to dozens of rare plants and animals. Known for its high quality restoration of wetlands, conservation staff became aware of a small 27-acre piece of land within the larger Chickasaw that was intended to be a bridge. The concern was a stream that bisected the site.



Swiftness Results in Success

Chichaqua Bottoms Greenbelt in northeastern Polk County has become one of the largest natural areas in the state. It is home to dozens of rare plants and animals and is known for its high quality restoration of grasslands and wetlands. Conservation staff became aware of the sale of a small 27-acre piece of land within the larger footprint of Chichaqua that was intended to be a beef feedlot. Of concern was a stream that bisected the sandy erodible

land and supplied water to a major wetland complex downstream. The potential for serious water quality and wildlife habitat impacts existed. Water and Land Legacy bond monies allowed staff to move quickly and decisively to acquire the land, recommend more suitable locations for a feedlot and protect the public investment at this signature park—a win-win for conservation and animal agriculture.



Chichaqua Bottoms Greenbelt, found in eastern Polk County, consists of 10 square miles of beautiful prairie, woodlands and wetlands along the Skunk River.

Lost In Iowa



Special events, such as the Pedaler's Jamboree Iowa, now use the Chichaqua Valley Trail to bring thousands of visitors to the various trail communities between Baxter and Berwick.

Connecting Communities

A trip along the scenic Chichaqua Valley Trail (CVT) is as rich in history and potential as it is in natural beauty. Nowhere else in Iowa do trail users have access to such extensive natural areas, as the CVT crosses through open farmland, rolling meadows, forested river valleys and along Chichaqua Bottoms Greenbelt. Following a critical trail extension in 2015, the CVT traverses 26 miles stretching from Berwick to Baxter. This recreational route was built on the converted bed of an abandoned railway corridor

in 1987, and now serves as a significant connection to several surrounding trails and communities just as the railroad did so many years ago. The extension has sparked numerous businesses associated with trail users, as well as the formation of a friends group that has financed trail amenities such as benches, signage and bike fix-it stations. Readily available funds provided by this bond has in turn granted the public with tangible, functional results such as trail-to-community connections like the CVT.



Easter Lake is the centerpiece of this beautiful 464-acre park on the south side of Des Moines. Once renovations are complete, this park will attract more than 1 million visitors annually.

Leveraging Dollars Accomplishes Big Results

Many years of planning and partnerships will result in significant improvements to Easter Lake Park by the end of 2018. The area is undergoing a \$25 million renovation that includes a 10-kilometer trail around the lake and substantial water quality improvements to the 178-acre lake and 6,380-acre watershed. Since the lake's creation in 1967, it has lost nearly 30 percent of its volume as a result of siltation. Sediment washing in

from the watershed has filled the lake. Knowing that this one project alone could use one-half of allocated bond funding, staff was focused on working with project partners to incorporate multiple public and private funding sources. As a result, more than \$16 million was leveraged independent of the bond allowing for more money to be spent on other land, water, trail and park projects in the county.



Lost In Iowa

Every Drop of Water Matters

Water quality management was a critical component of the bond referendum. Nearly 28 percent of the funding was earmarked for land and water enhancements. To date, improvements have been made to ponds and lakes in five Polk County parks, as well as creek, wetland and greenbelt enhancements in dozens of areas. The Polk County Conservation Board is a leader in water management authority planning and implementation. Bond funding has allowed the board to start a water monitoring program to assess the water quality of watersheds in Polk County. Currently, 64 sites are monitored bi-weekly at creeks, streams and drainage ditches by trained staff to conduct basic chemical, physical and biological measurements of water. Gathering data allows staff to detect changes in water quality and better assess the health of the watersheds. We can then share this information with watershed and governmental partners to aid in future efforts.



Polk County Conservation Board Naturalists Heidi Anderson and Joe Boyles collect water samples in one of the 64 sites that is part of the water quality monitoring program.

The Jester Park Nature Center near Granger will be situated on the west side of the park and will open to the public Sunday, Aug. 5.



Jester Park Nature Center—Your Gateway to the Outdoors!

Quality of life opportunities and experiences are so plentiful in parks, trails and wild areas. Businesses benefit from having quality parks, trails and outdoor recreation available for their employees. Potential employees and entrepreneurs make job choices based on outdoor opportunities. Developing facilities that launch people outdoors to achieve long-term environmental health for our region aligns with missions and goals of the

Metropolitan Planning Organization, The Tomorrow Plan and Capital Crossroads. One such facility that is opening on Aug. 5 is the Jester Park Nature Center. This center will be a significant tourist attraction and environmental education hub, portal to Polk County's family of parks and Jester Park's new front porch. Tremendous private support, coupled with public and bond funding, has made this dream a reality for our current and future generations. 🐾



travel
IOWA

STEP BACK IN TIME AT HAYDEN PRAIRIE STATE PRESERVE

STORY AND PHOTOS BY *BRIAN GIBBS*

The drive to Hayden Prairie State Preserve from my home in northeast Iowa is filled with a mixture of bluffs, trees, farms and warm camaraderie.

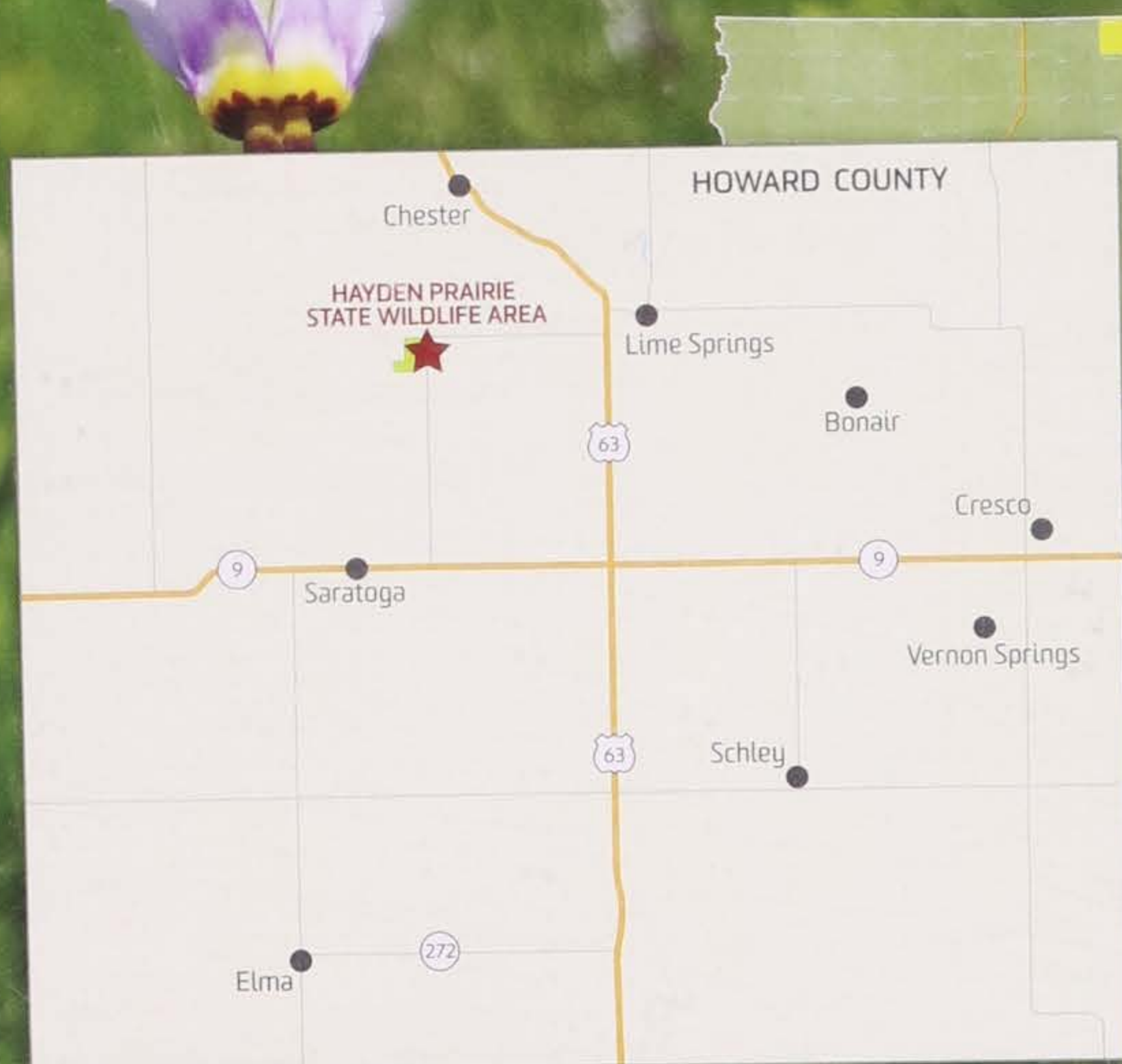
I'm making the 90-minute trip with two fellow natural resource friends, Bruce and Gary. Bruce loves trees, Gary loves rivers and I love wildflowers. No matter our nature differences, we've decided a trip to witness the famous shooting star display at Hayden Prairie would be a great way to pass a warm, sunny May day.


At first, I have trouble trying to imagine what one of Iowa's largest relict prairies may look like. The rolling hills and limestone outcrops of northeast Iowa's driftless area make this difficult to do. However, just west of Decorah, the landscape changes. Farm fields replace woodlands. Except for a few gentle hills, the land is flatter. A closer look out the car window reveals the Iowan surface landform, a landscape that today is dominated by rich loamy soils, rows of farm fields and rarely draws attention to itself.

Upon arriving at the preserve, we are greeted to a riot of color. Pinks, purples, lavenders and whites stretch as far as the eye can see. A smile comes across my face. We are in luck—shooting stars are on full display. We gallivant into the prairie where golden alexanders and the white flowers of wild indigo shine. I'm several hundred yards out before an off-putting smell forces me to take a 360-degree look around and notice that Hayden Prairie is an island surrounded by a sea of agriculture. Despite being in such a warm, beautiful native landscape, a strong paradox chills my spine. I find myself owing a debt to the preserve's first champion: Dr. Ada Hayden (1884-1950).

According to *The Guide to Iowa's State Preserves*, the prairie was investigated by Dr. Hayden in 1945. Not only

Throughout the summer, Hayden Prairie State Preserve in Howard County is awash in activity, starting first with a spectacular display of shooting stars at the end of May and early June.





Hayden Prairie supports tremendous biodiversity, including a population of smooth green snakes. These harmless insectivores are listed as a species of special concern in Iowa due to declining populations and sensitivity to pesticides. **OPPOSITE:** In late spring and early summer, be on the lookout for blooming prairie smoke.

was Hayden a skilled botanist who curated the Iowa State Herbarium, she was the first woman to graduate from Iowa State University with a doctorate degree (1918). During 1944-1945, she had become director of the prairie project and worked diligently to identify prairie relicts that could be preserved. One of those places was a large grassland in northern Howard County. Shortly after investigating the prairie, Hayden lobbied the Iowa Conservation Commission to purchase and protect the site. Within a few months, the prairie was bought by the state. In 1950, in honor of her contributions, chiefly being the first promoter of prairie preservation, the site was named Hayden Prairie. Today, Hayden Prairie holds the distinction of being Iowa's first dedicated preserve and is also an accredited national natural landmark.

The 240-acre black soil prairie is divided into two parcels by a north/south gravel road. The larger 200-acre section of prairie was hayed at one time but never plowed. This part of the prairie contains many common upland prairie species, but also features a small sedge meadow on its south boundary. The southwest 40-acre unit across the gravel road was never grazed or plowed. This parcel is packed with flowers and is where my friends and I choose to spend the most time in May.

The vibrancy of the prairie brings us to our knees. Bruce is busy trying to take video of the shooting stars blowing in the wind. I'm trying to capture the "beard hairs" coming out from the red prairie smoke, but the wind won't cooperate. Gary is plopped down in a field of white shooting stars and orange hoary puccoons.

"Isn't this amazing?" he says with two handfuls of soil, "To touch and smell soils that have never been plowed. It's incredible. Think about the millions of microbes in a teaspoon of this dirt."

In the moment, it was difficult to visualize exactly what Gary was talking about, but we all felt alive and healthy in the relict prairie.

Later that afternoon, we were nearly back to the car when something bright green caught my eye. At first, I thought it was just a piece of prairie grass, but upon closer look saw the object slip through the soil. "SNAKE!" I yelled to my friends. Within seconds, Gary is down on the ground trying to catch the bright reptile.

The smooth, green snake slithers harmlessly through Gary's dirt black hands. I've never seen this bright shade of green in an Iowa animal; it's almost as if the emerald snake was a transport from the Amazon. Smooth green snakes are a native, insect-eating reptile whose populations have been on a significant decline over the past several decades due to habitat loss and pesticide use.

So far, these brilliant, emerald-colored reptiles have recently been observed in 53 counties. Due to fragile populations, smooth green snakes are listed as a species of special concern in Iowa. After a few photos, the snake is released and we both go our separate ways. Driving by the



prairie one last time, I promised myself I would be back in the summer to search for orchids.

I returned to Hayden Prairie on a sweltering day in early July. The humidity was oppressive, and from the moment I stepped outside my car, I was sweating. I immediately regretted wearing pants, but didn't want to get any poison ivy or nettles. I had a rough idea of where the orchids were, but truly doubted my ability to keep composure in the July heat.

Shortly after stepping into the prairie, a buzzy, insect-like song distracts me from my floral search. I trod through thigh-high grasses with hopes of finding the small critter. My feet feel clumsy amidst the undulating ground. A large clump of prairie sod catches my foot and down I go. Laying face down in the prairie, the sound gently runs away from me. After a few seconds, my mind put an image to the song. It is a grasshopper sparrow. This shy grassland-loving bird preys on insects, and the parents frequently feed grasshoppers to their nestling birds.

I laid motionless in the airy kingdom of grasshoppers and birds. White stratus clouds drifted above. The earthy smell of black soil rolled across the land. Wind whispered to the grasses and the grasses laughed back. A bird wearing a tuxedo hovered over me. His bubbling, rambling song awoke me from my rest. It's a bobolink, one of the fastest declining grassland bird species in North America.

From its winter home in South America to its breeding grasslands in North America, bobolinks make a roundtrip migration of nearly 12,000 miles every year. How many stars have guided this traveler, how many trips around the world has this bird made, I ask myself.

I'm nearly to the end of my exploration when I notice a large, blooming flower standing tall in the prairie. Its spotted, bright orange flowers curl upward, and its elongated, prominent stamen hang noticeably down. It looks like a brightly colored alien spaceship, or better yet, a jellyfish. But the Michigan lily is nothing to fear. In fact, it's a favorite of hummingbirds and larger day-flying insects. Sphinx moths, hummingbird moths and great spangled fritillaries are attracted to the brilliant flower, and monarchs have also been known to dine on the nectar.

I notice a monarch fluttering between milkweeds. With monarch populations possibly headed toward listing as a threatened species in the near future, how critical is managing a place like Hayden Prairie for insects and biotic diversity?





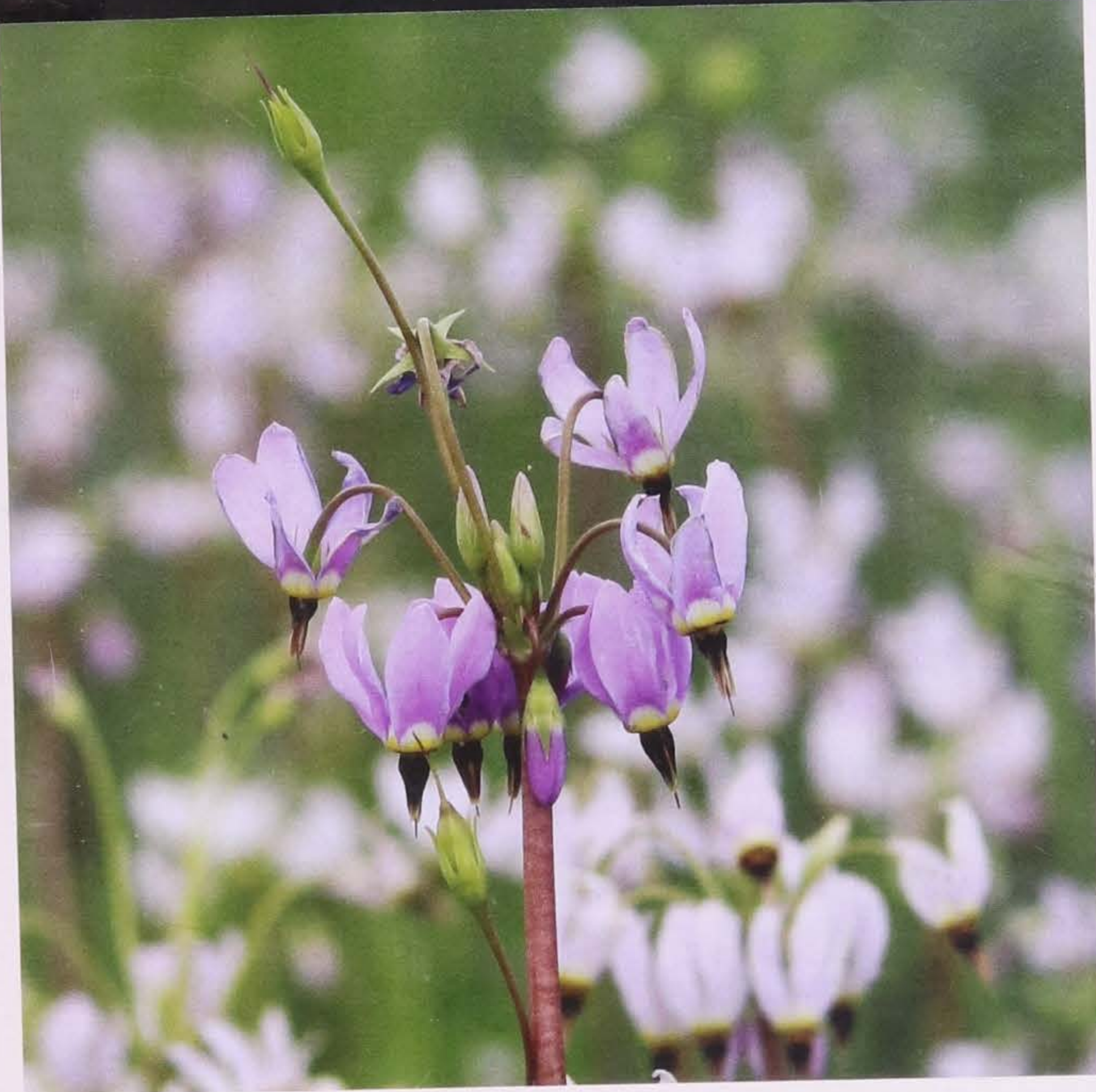
Local biologists refer to the 242-acre Hayden Prairie as "Iowa's rainforest" due to the fact more than 200 different plant species, 46 native grassland birds and 20 butterfly species are documented here. To help them remain for centuries to come, state preserves prohibit removal or damage to plants, animals and other materials.



A 2004-2005 butterfly and skipper study completed at Hayden Prairie identified 31 species. Two threatened species, the Poweshiek skipperling and silverly blue, were found in the prairie in very low numbers. Researchers believe the insects are in danger, not only because of lack of connected grasslands in Iowa, but also due to frequent prescribed burns. While the positive effects of prescribed burning for certain prairie species has been well documented, the hot flames can also eliminate both the caterpillars and their food sources (prairie grasses and veiny pea) in the spring.

Striving to maintain the biodiversity at the preserve, DNR staff manage Hayden Prairie in accordance with a rotational prescribed burning schedule with nine units. This schedule is designed to leave unburned refuges and different plant compositions to maximize biotic diversity of plants, birds, fire-sensitive insects and mammals at the preserve. The rotational fire schedule, alongside brush and exotic special removal the past 25 years, has ensured that Hayden Prairie remains much the same as it did centuries ago. A recent conservation assessment of Hayden Prairie praised the ongoing management of the preserve stating, "This natural area has retained its lofty status as the best prairie on arable land in the Midwest." Somewhere, Dr. Hayden has to be smiling at such lofty prairie praise in the Tall Corn State. 🐞





OPPOSITE: A viceroy gathers nectar from a rattlesnake master. Shooting star is one of the many flowers that dot the Hayden Prairie ecosystem. Bobolinks also thrive in diverse grasslands. DNR fisheries biologist Gary Siegwarth (opposite page, left) and author Brian Gibbs bask in the glory of the untilled prairie.






Exploring the Lore
of the Upper Mississippi at

Paint Rock

STORY AND PHOTOS BY *BRIAN GIBBS*



Paint Rock is good medicine.
The timeless view presents a
physically challenging hike to
reconnect with nature and history
at this section of Yellow River
State Forest in Allamakee County
between Effigy Mounds and
Harpers Ferry.



Watch for signs to guide you along your journey to Paint Rock campsites and overlooks.

Take a weekend escape along the bluff tops of the Upper Mississippi River, load the car with backpacking essentials and hike to camp at one of Iowa's most revered places: Paint Rock.

Historically, the Paint Rock area was a sacred Ho-Chunk (Winnebago) village and gathering site. The site was also a landmark marker for European voyagers coming up the Mississippi. In 1805, explorer Zebulon Pike wrote, "Passed Paint Rock on the right of the river, nine miles above Prairie du Chien. It has obtained its name from having numerous hieroglyphics painted on it, painted by the Indians." Furthering the cultural and spiritual significance of this site to the Ho-Chunk is an 1849 sketch of these bluffs by William Williams. Williams depicted the site as having a large rock that was "smooth faced and has a great many animals with picture writing on it." As more European settlement increased in the area, more archeological studies of the site would soon follow.

Iowa archeologist Ellison Orr first surveyed the area in 1911 and quickly became inspired by the immenseness of the landscape from atop the bluffs.

"From this high point, one looks out on the miles and miles of jumbled bluff, river and island, wonderful in the ethereal beauty of their spring verdure; majestic in summer sunshine and storms; and stern as winter snowstorms sweep over them in their frozen whiteness," he says.

During his work, Orr surveyed several Native American mounds and found numerous "red smears and red petroglyphs that give to the cliff the name painted rock." Though the petroglyphs are weathered, a journey up to Paint Rock is sure to give you a better appreciation for the magic and history of the upper Mississippi at Paint Rock.

To begin your adventure, turn onto Paint Rock Road, just north of Waukon Junction, and continue until you see the "Yellow River State Forest/Paint Rock Unit" sign. Follow the access road about one-third mile to the Paint Rock Trailhead parking lot where a three-mile round-trip backpacking expedition awaits.

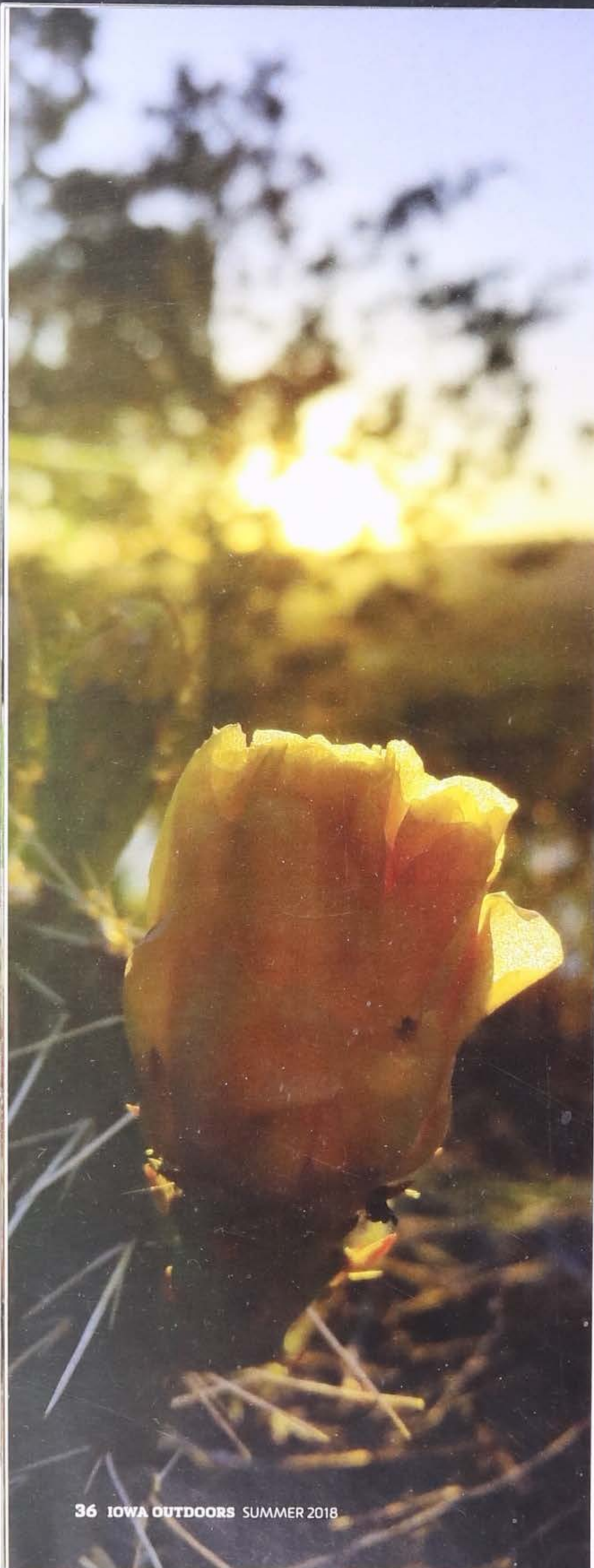
From the Paint Rock parking lot, it's a three-quarter-mile, 250-foot hike up to a spectacular walk-in campsite called Camp Hennessy. The trail begins by following an old access road and promises to jumpstart your heart as you wind around the base of the towering hillside. During the spring or summer, take a break on your ascent to listen for cerulean warblers and red-shouldered hawks, two state-threatened birds that nest in this densely wooded area. After summiting the bluff, the trail veers south next to a white pine tree planting and follows a level trail through a mixed hardwood forest until reaching the Mississippi loop trailhead sign.

Under a canopy of tall oak trees, trek the well-marked Mississippi Loop Trail until you reach Camp Hennessy. After setting up camp, wander down the trail to a spectacular wooden bench that overlooks the Mississippi River.



Timber rattlesnakes are a protected species in 14 Iowa counties. These beautiful creatures are sometimes spotted while sunning themselves on rocky outcroppings in northeast Iowa. While venomous, the last fatality from a bite in Iowa was in the 1800s! These snakes are not overly aggressive. TOP: The translucent bloom of a prickly pear can be observed during sunny days. BELOW: Morning fog drifts from the Paint Creek Valley, revealing a mesmerizing display of fall color.





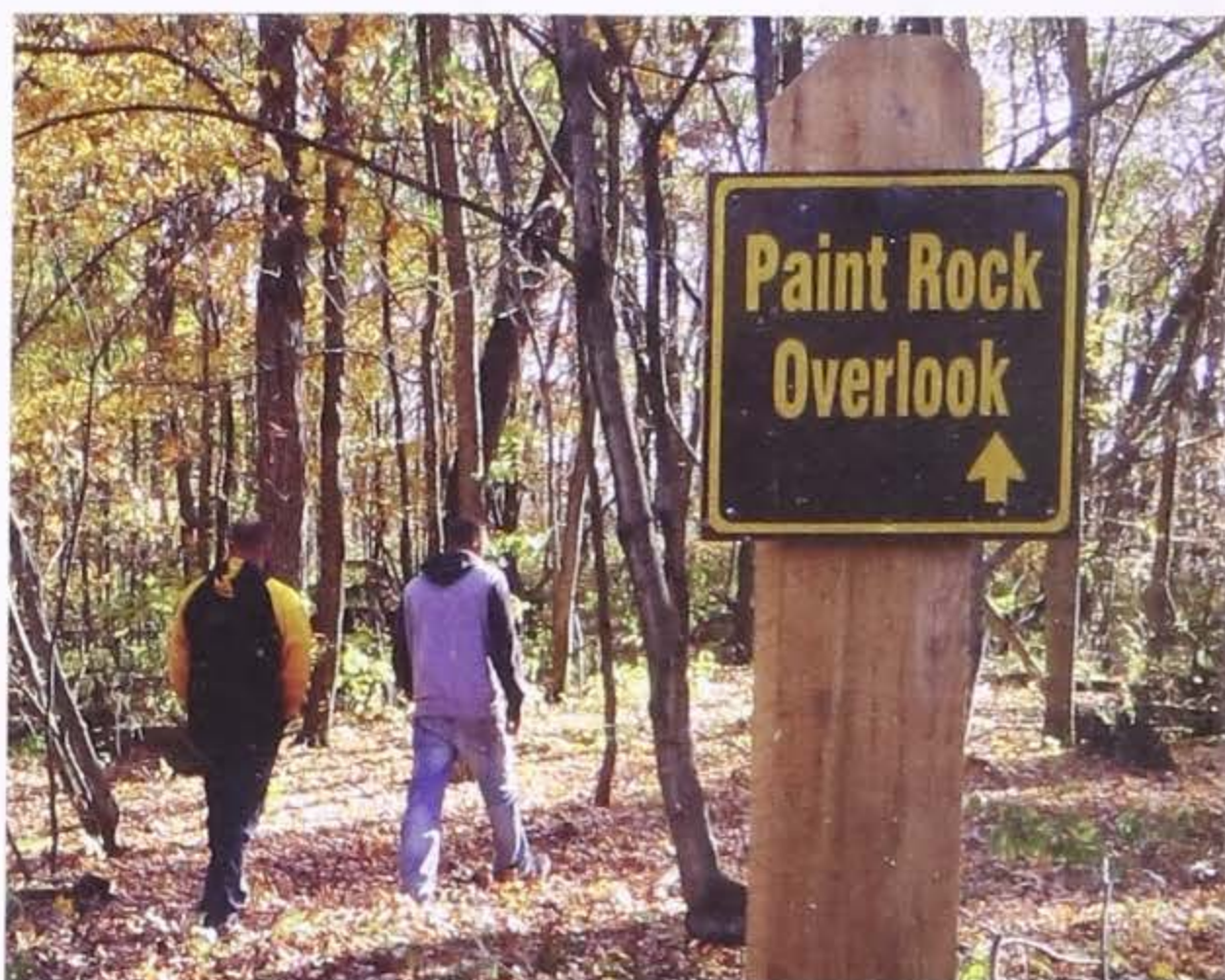
Prairie grass carpets the ground and cedar trees serve as the perfect frame on this picturesque view of the upper Mississippi. Continue ambling down the trail, intermittently catching views of the river's two-mile-wide floodplain along the way. At the junction for the Paint Rock Overlook trail, take a left to visit one of the most inspiring views of the Mississippi found in the Upper Midwest.

Before arriving at the overlook, walk beside several large Native American mounds that were constructed for ceremonial and burial purposes. Built during the Middle-Late Woodland period, these 1,000-year-old formations are some of the area's oldest human structural designs. Mound building was a communal event that often involved the laborious task of transporting soil in baskets 200 feet up from the Mississippi River to build the giant mounds. Sadly, these mounds represent only a tiny fraction of the nearly 10,000 mounds that historically marked this celebrated landscape. Today, most of the mounds have been lost to plows, looters and even pioneer cemeteries.

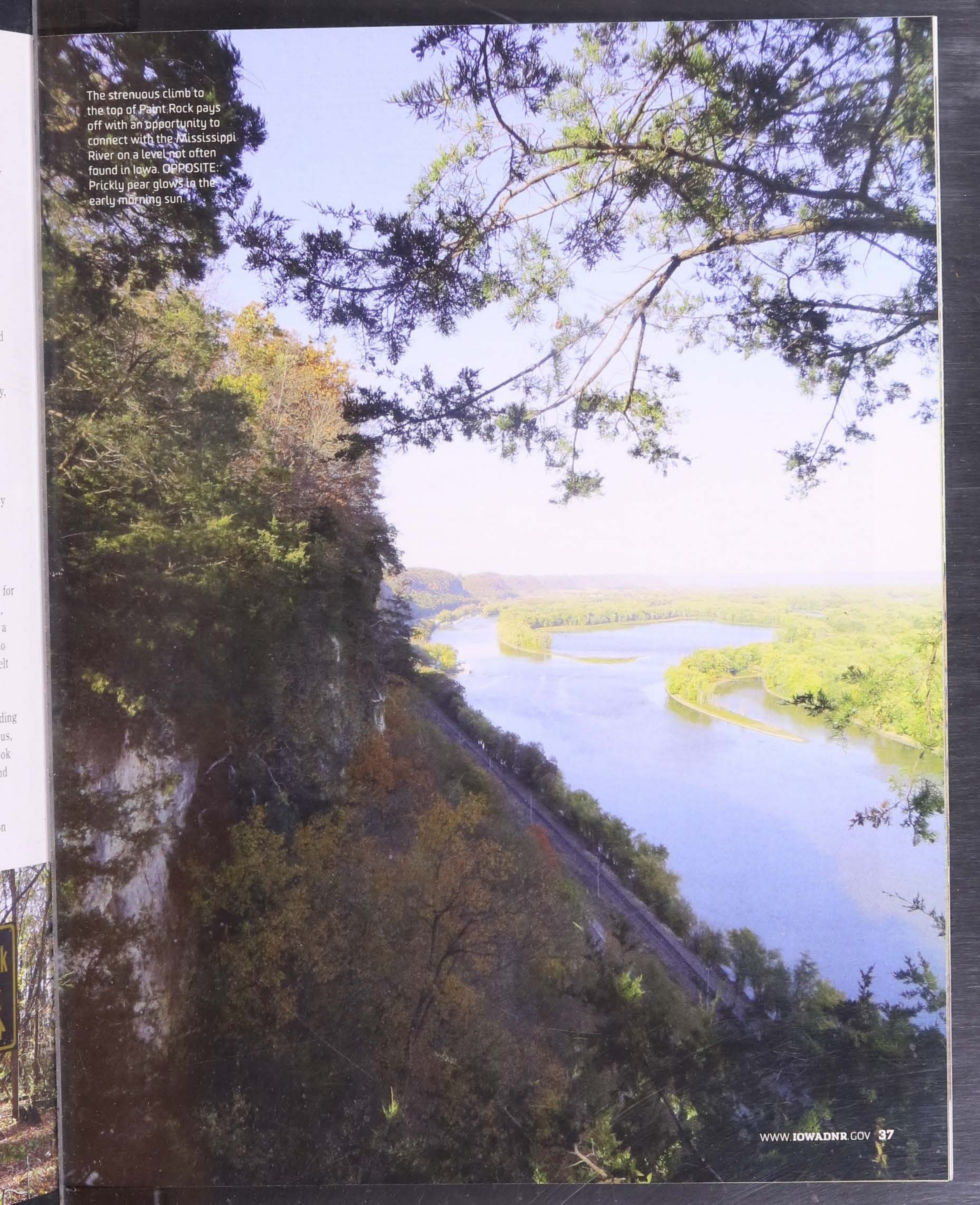
Standing next to these ancient mounds is powerful medicine for the modern soul. These marvels tell the story of this landscape's once incredibly rich biodiversity found in its abundant forests, prairies and rivers. Historically, a wide array of plants and animals including elk, mountain lions, wolves, bison, black bears and prairie chickens interconnected here and allowed native people to flourish for thousands of years. This diverse scene is almost mythical, for the Iowa we know today is dramatically different. Yet, a hike out to the timeless Paint Rock Overlook allows one to re-trace their footsteps and re-visit what Iowa may have felt like 1,000 years ago.

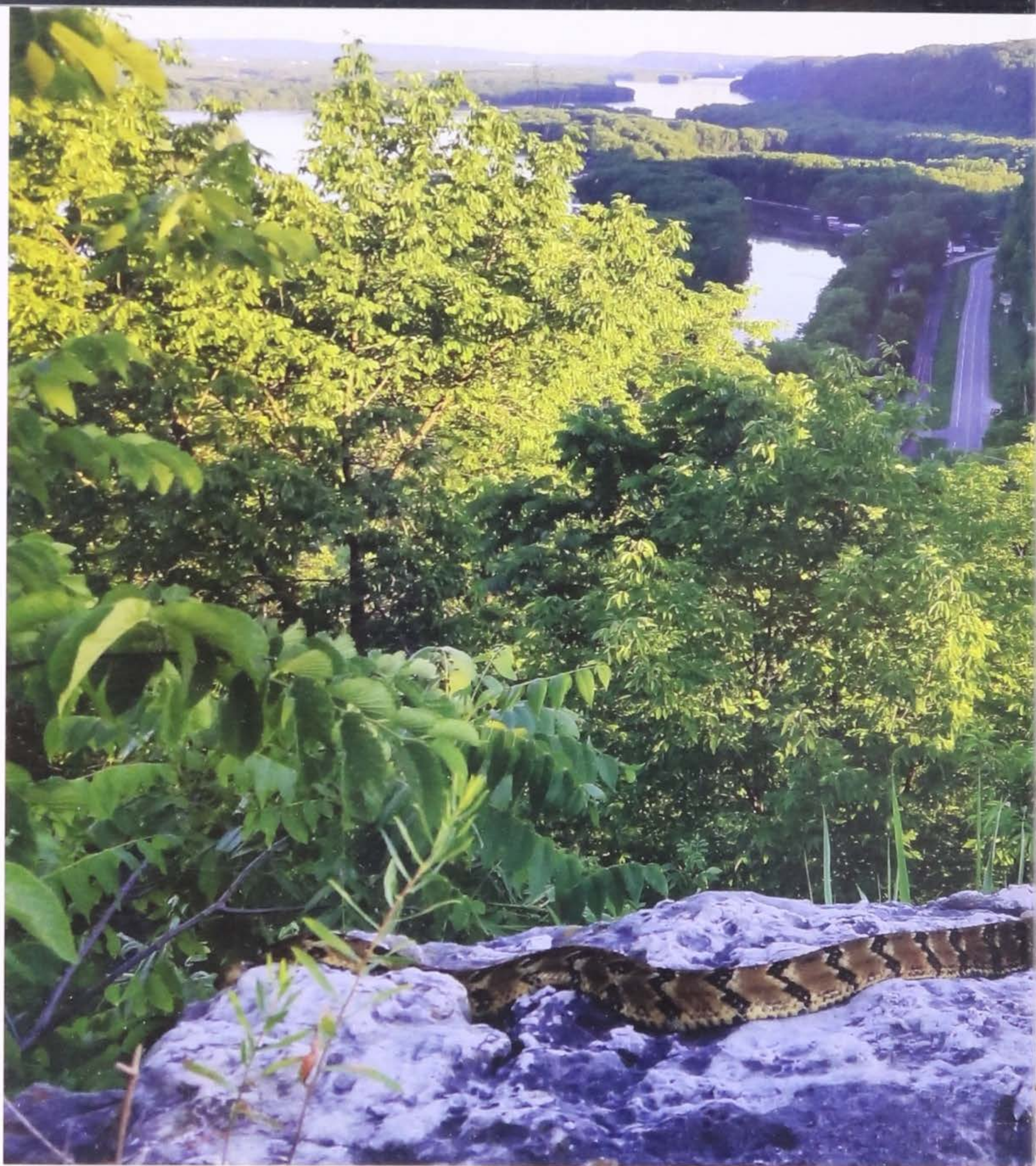
The panoramic scene is best captured in the early morning or late evening when the sun turns the surrounding bluffs into a gilded paradise. If you are feeling adventurous, depart from Camp Hennessey and head out to the overlook during the night to take in the fantastic view of a thousand twinkling stars over the Mississippi.

In spring, wander the ridge to find pasque flowers in bloom, or be amazed to find prickly pear cacti growing on



The strenuous climb to the top of Paint Rock pays off with an opportunity to connect with the Mississippi River on a level not often found in Iowa. **OPPOSITE:** Prickly pear glows in the early morning sun.





the dry rock outcrops. Following your search for these floral beauties, kick back and soak up the sun on the ridge top in a sea of prairie grass. Keep your eyes focused on the big blue skies for the fastest bird on earth, the peregrine falcon.

Along the upper Mississippi bluffs, peregrines—or “long-wings” as they are called—participate in remarkable aerial flights and courtship calls. After courtship, the bird will use steep rock outcrops along the Mississippi to nest

on. Interestingly in falcons, the male is one-third smaller than the female. Because of this, a male bird is aptly called a “tierce.” In their affinity for peregrines, Woodland cultures built bird effigy mounds by historical peregrine eyrie sites.

Two effigy mounds north of paint rock closely resemble a pair of raptors side by side with one of the birds having a wingspan of 227 feet, while the other is only 141 feet. Just as the mounds provide an essential story about Iowa’s history,



Author Brian Gibbs wasn't sure if the snake was soaking up heat from a warm rock or taking in the incredible view looking south to the Great River Road in Allamakee County.

so too does the peregrine falcon.

In the 1960s, due to the use of DDT, peregrine populations were extirpated from the Mississippi River valley. On the brink of extinction, the bird was listed on the federal Endangered Species Act until 1999. It wasn't until 2000 that wild peregrines began reproducing along the valley, the first time in over three decades. The banning of DDT and re-introduction of these revered birds along the

river bluffs are two critical components of why there are now 21 known nesting pairs in Iowa, with 17 of them occurring on the Mississippi River.

No matter if you are from the flatlands or hill-country, this backpack trip can be a physical and emotional challenge. Yet, falling asleep fireside under a blanket of stars, then greeting the sunrise on a rocky summit overlooking the Mighty Miss offers willing adventurers infinite youth and promise. 🐍

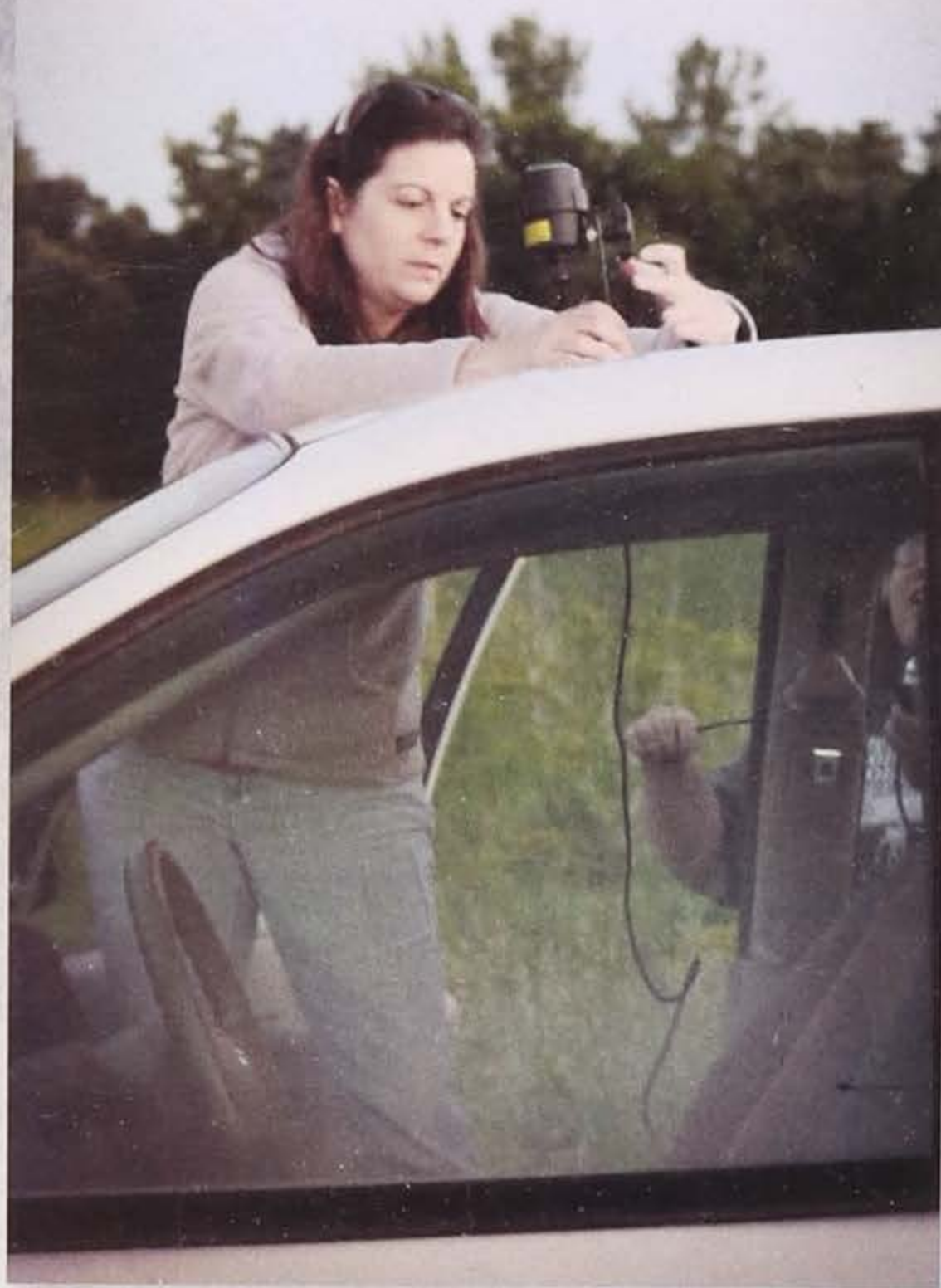


Designated Batters

STORY AND PHOTOS BY MARIAH GRIFFITH

Bat populations across the nation are being decimated by white-nose syndrome, making it vital to find and document remaining populations to protect them. To identify populations, citizen scientists are helping find these aerial acrobats on the go.





With a suction cup, DNR wildlife diversity biologist Karen Kinkead stations a microphone atop a vehicle to record ultrasonic sounds of local bats. Researchers and volunteers slowly drive nighttime routes to collect bat sounds. The recordings, analyzed at Iowa State University, identify individual bat species and calls. The data helps researchers determine what types of bats are present and their population levels. Over time, that data can help monitor changes in bat populations.

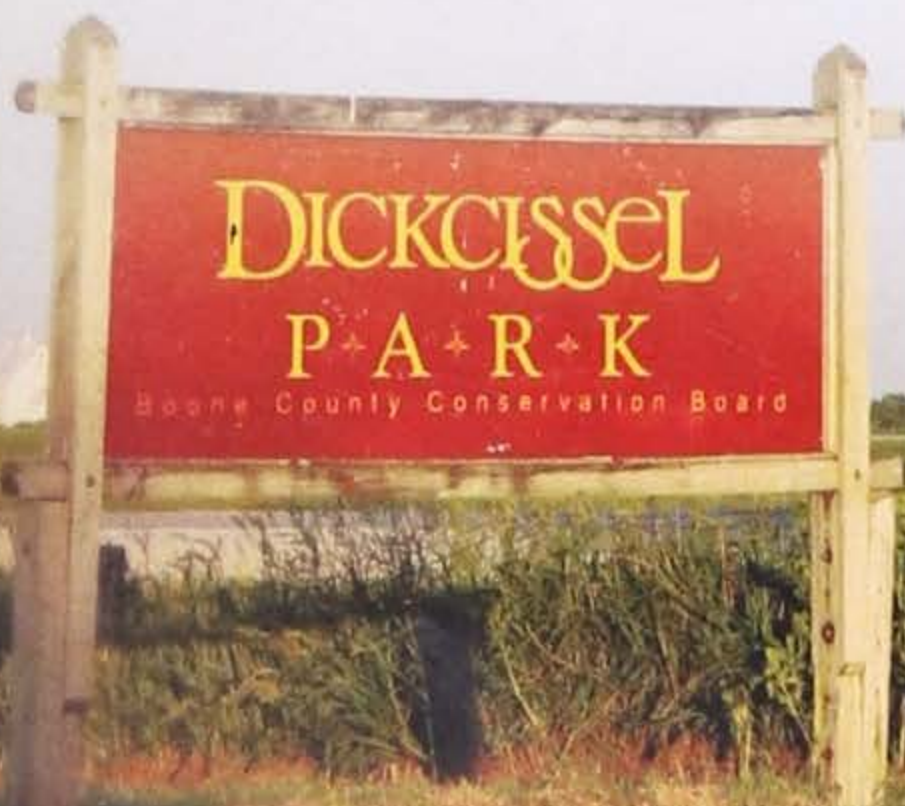
Just off of Highway 30, there's a small gravel parking lot at Boone County's Dickcissel Park. I pull in at about 8:17 p.m. and see a small pond surrounded by 5-foot-tall wild parsnip, where a dedicated fisherman is standing in brown chest waders. Since I've got a few minutes to spare, I stretch my legs and yawn one more time from an afternoon nap. It's early enough that there won't be any bats out for a while. Shuffling my feet through the dust and rocks disturbs a handful of nearby red-winged blackbirds. They fly over to scold me.

They don't have to worry—I won't stay long. Tonight, I'm riding with one of 25 pairs of dedicated volunteers collecting data for a bat survey led by the DNR and Iowa State University. The survey helps identify bat species and population sizes with audio recordings, collected while driving country roads around various counties.

In the background, the sun is slowly falling in a blaze of pinks and oranges, unbothered by clouds. The blackbirds continue to flit through trees and towering wild parsnip stems, fluffing and fanning their feathers in what I'm sure is a manly display. Flies, like gobs of dirty engine oil, putter around the yellow platforms of parsnip blooms and daisies. There are only three cars in the lot—one red, one yellow, one white—and their colors match the scrolled sign lettering.

A dusty white minivan with a DNR decal pulls into the lot, and out pops biologist Stephanie Shepherd. Her cheeks are bing-cherry-red from sun, and she laughs that today was her first of the field season. Shortly after, we're joined by biologist Karen Kinkead, and the three of us pack into the minivan to head to the survey route. On the seat next to me is a black plastic case about the size of an early-2000s computer tower, covered with strips of bright green duct tape bearing directions.

"It doesn't look like a lot of equipment, but that's part of the reason this study is accessible to the public," says Shepherd. She says she likes citizen science projects because they foster public participation, even if volunteers don't have a science background. The recordings they collect are analyzed at Iowa State University, and run through extensive software to identify the calls of different bat species and individuals.



At a deserted gravel corner we pull over and Kinkead flicks on the flashing hazard lights. Shepherd hops out and pops the heavy latches on the black case to reveal a microphone, wiring and a few other gadgets nestled in wavy gray foam.

"You're getting the real volunteer experience today," calls Kinkead, standing in the passenger doorway so she can wipe a spot on the roof clean with her shirtsleeve. "Not too glamorous, but that's never slowed us down before."

Shepherd passes her the microphone and a magnetic GPS tracker to stick on the roof.

"We're going to be going pretty slow, don't you think?" Shepherd smiles. She says the routes aren't terribly long, but they take a while to drive because the recordings are taken at 20 mph. Kinkead flips the microphone straight up and gives it one last jiggle to make sure it's stuck to the roof.

It's about 8:50 p.m. when we get settled, and Shepherd is in the passenger seat holding a boxy yellow recorder, complete with blinking red lights and thick wires running out the minivan window. Occasionally she calls out turns on the route to Kinkead. Although we can't hear bat calls directly (they're ultrasonic), the yellow box, called an Anabat, plays static sounding clicking sounds as the roof microphone picks up various sounds overhead.

"See, the bats sound more chip-chip—not squishy like the hawk moths from earlier," says Kinkead, driving slowly down the gravel road, "and the pace picks up when they're closing in on something."

Based on the clicking (or lack thereof), there haven't

been many bats out tonight, but the slow drive yields other wildlife sights and sounds. Shepherd tallied five toad and frog species' calls by 9:45 p.m. A while later, a stretch of road has an abundance of hummingbird-sized hawkmoths and milkweed, which leads Shepherd and Kinkead to chat about another population survey they're working on for butterflies. Kinkead laments that her elementary-age daughter used to not be scared of insects, but developed a temporary fear of butterflies. But now, she out-catches her field-experienced biologist mom.

Kinkead and Shepherd have been working together on various DNR projects for more than a decade, but they started driving this survey route in 2015—the first year survey administrators called for volunteers.

"I got into this because I coordinate the volunteer citizen science programs for the DNR, and I'm also used to doing night frog and toad studies," Shepherd says. "So I'm pretty used to skulking around in the dark. Karen is pretty awesome and experienced too, so I twisted her arm a little and got her to join me."

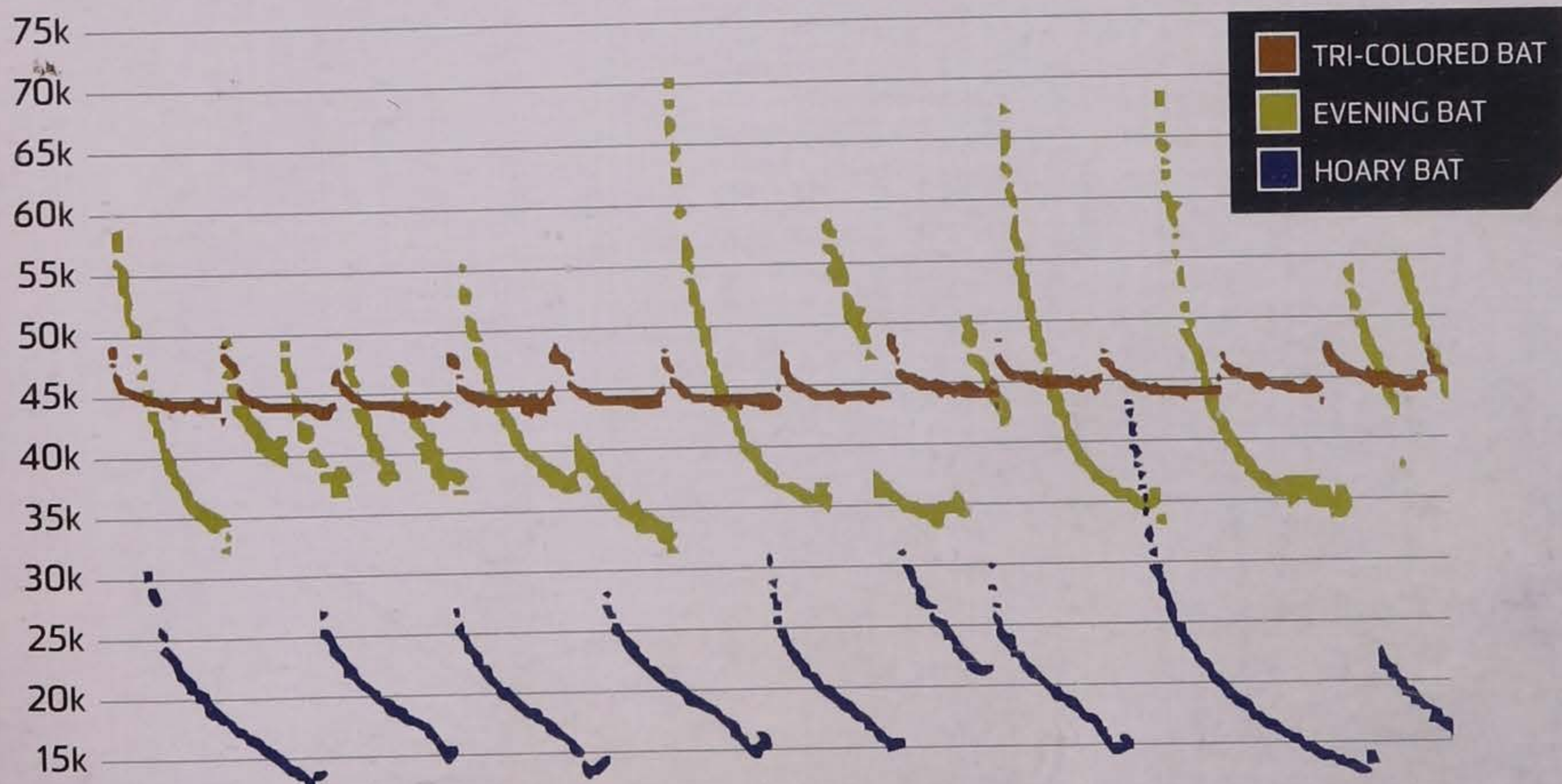
"Oh, you didn't have to twist that hard, now did you?" Kinkead smiles.

As we drive toward a stand of trees, Kinkead tells me that we're in the Des Moines River Valley. A young opossum lumbers stiff-legged along the shoulder, looking a little groggy and confused by the vehicle.

"We've got a better chance of hearing bats here," Kinkead says. "When you have a river valley or a road going through trees, the bats get funneled into those corridors beneath the canopy."

Echolocation Call Sequences

A series of short click sounds depicted below by their unique frequencies and sequences are used by wildlife biologists to identify three species of bats. The Anabat unit converts audio collected by the volunteers into these digital data files below.



Sure enough, a burst of clicking and flashing starts coming from the Anabat. Glancing across the nearby farm fields, I wonder aloud what a volunteer driver is supposed to do about deer.

"Well, I suppose you'd just keep going—they should be able to outrun us at this slow pace," Shepherd says. "But I have to admit, I hadn't really thought about it."

As if on cue, a tawny doe pops out of a field down the road and we all burst out laughing. Two minutes later, another deer's rump is visible in the headlights, poking out of tall grass.

"You're fine right there, just stay put," Kinkead says quietly as we creep along, but the deer doesn't listen. Instead, she whips around to face the vehicle with a look of terror and clumsily bounds off into the grass on the other side of the road. "I said stay put, silly," Kinkead chuckles.

"You must have brought the deer curse with you," Shepherd says to me. "I don't think I'd ever seen them on this route until tonight."

A Late Night Cruise Around Story County

The next week I'm out late again. This time the route covers Story County, and I'm riding with two friends from the Ames area.

Tyler Harms and Michael Meetz have also been driving their route since 2015, but met a few years earlier through teaching hunter education courses. Meetz is recently retired but still spends a lot of time working with a variety of conservation organizations. As we pull up to the start of the route, he jokes that he doesn't step back quick enough when they ask for volunteers.

Harms doesn't sit around either—at the time he was executive director of Iowa Young Birders, which introduces young people to birding through field trips and educational sessions. But tonight, he's another volunteer fussing with misbehaving bat study equipment. (He has since become a DNR wildlife researcher.)

"Hey, one of these days I'll make you drive while I hold the box, just to shake things up," Meetz jokes, his luxurious

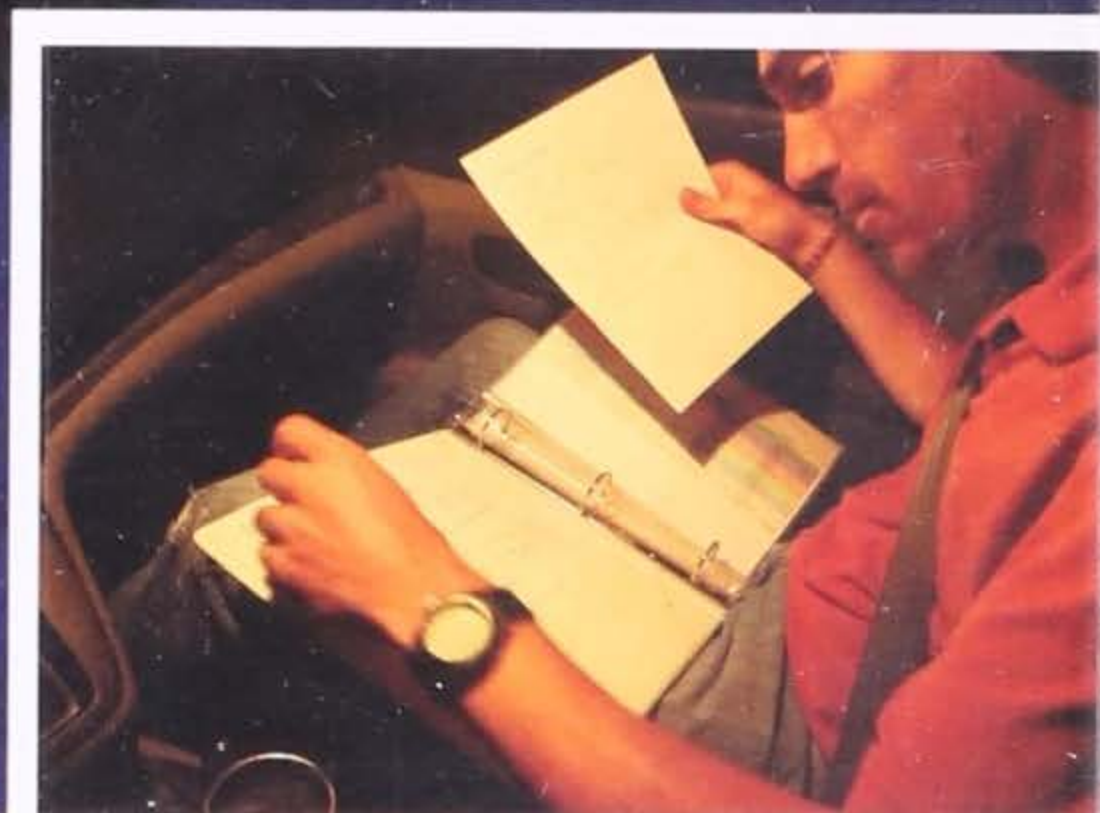




BELOW: The DNR's Tyler Harms checks the Anabat device prior to driving the nightly bat survey route. As many as 25 volunteer teams collect data for a joint survey by the DNR and Iowa State University. The volunteers routinely drive dusty county roads at a slow speed and record bat vocalizations to track bat species and their population densities.



Volunteer citizen scientists track bat populations to see which species are in peril and which ones are strong. The data allows DNR biologists to make future management decisions based on the findings. It also is a component of tracking the deadly white-nose syndrome that has decimated some bat populations. **BELOW:** Tyler Harms double-checks the night's driving route directions. **LEFT:** A northern long-eared bat. Bats should not be handled without wearing leather gloves to guard against bites.



mustache jiggling as he chuckles at Harms. Harms grins, but keeps fiddling with the Anabat. The sky is full of rosy clouds and we're parked at the start of the route, with the occasional truck leaving us coated in gravel dust. Harms already has everything running, but he's nervous about the amount of static coming through.

"Two more minutes and you'll be late!" Meetz calls, popping up on his toes. With his hands tucked in his pockets and a mischievous grin on his face, it's obvious he doesn't really mind—the study routes just start as close to a half-hour after sunset as volunteers can manage. Harms runs his fingertips over the microphone one more time, causing the Anabat to spit out sharp sounds like a DJ scratching records.

"That's what I like to hear," he says, and we're off. As the minivan—gray this time—crawls down the gravel road, Harms says he hopes to see some bats since I'm along—on assignment for the magazine.

"You can see them all you want, but the only bat I can tell from sight is a Louisville Slugger," says Meetz. Harms groans at the joke.

But in all honesty, the data they're collecting is important.

Most of Iowa's bat species are migratory, and because of the cost of statewide studies, there isn't much current data on species abundance, population sizes or colonies' travel habits. The volunteer monitoring helped establish baselines about bat activity before a deadly fungal infection, white-nose syndrome (WNS), appeared in Iowa. Hopefully in the future, researchers can find a cost-effective treatment. In the meantime, the data helps figure out where various bats and populations are and track these populations over time to see if WNS is reducing populations in Iowa. This fungus colonizes on exposed skin on bats, and seems to have killed more than a million bats in the U.S. indirectly by eating holes through their wings, blinding them and using up their energy reserves in winter.

The last of these scenarios is particularly problematic as it can lead to the demise of many uninfected bats. Bats roost together and hibernate in colonies, some including many thousands. When emerging from hibernation, the bats shiver to raise their body temperature before flying out to find food and water. When one bat starts shivering too early because its fat reserves have been consumed in fighting the fungus, the motion and warmth can disturb the

bat's neighbors, who then start shivering and waking up too. When this happens, all the bats may leave their roost together only to discover it's still winter, and the colony promptly dies from the cold and lack of food.

These mass die-offs have implications for humans too. Julie Blanchong, the Iowa State University associate professor leading this study, says bats play a crucial role in controlling populations of pest insects—particularly mosquitoes. With a string of mild winters and a northward trend of the populations carrying the Zika virus, bats are one of our best defenses against such new diseases.

Back in the minivan, it's about 9:55 p.m. when we spot a large raptor gliding over a corn field. It's too dark for pictures, but Harms says it's probably an owl, based on its flying posture. A moment later a dark shape scurries across the road ahead of us, leading Harms and Meetz to quibble over whether the animal was a raccoon or an opossum. Bats are eating a swarm of bugs overhead, and the Anabat picks up a flurry of cheeping that sounds like baby birds.

"I'm glad to hear those guys," says Meetz. He explains most groups don't have the funding to do statewide bat studies (each Anabat costs about \$3,000), so the recordings that volunteers collect may give us the most complete picture of Iowa bat demographics to date. Of course, it will take a few years before there's enough data for that.

"With just a couple years having passed so far, we're still establishing a baseline," Meetz says. "The plan is to collect data as long as possible and look at the trends over time, as well as year to year."

If increasing numbers of bats are recorded, he explains, that indicates land use changes and management strategies are promoting bats and can be applied to greater areas. Conversely, falling numbers can help identify areas where management is unsuccessful, and strategies can be modified or phased out accordingly.

"This whole area here used to be open field with some stands of trees," Meetz says, nodding his head toward a

development of white cookie cutter houses. "Even a year ago none of this was here, so it will be interesting to see how the local bat population responds. Most likely it will fall, but we have to look at the data for a few years before we can be sure."

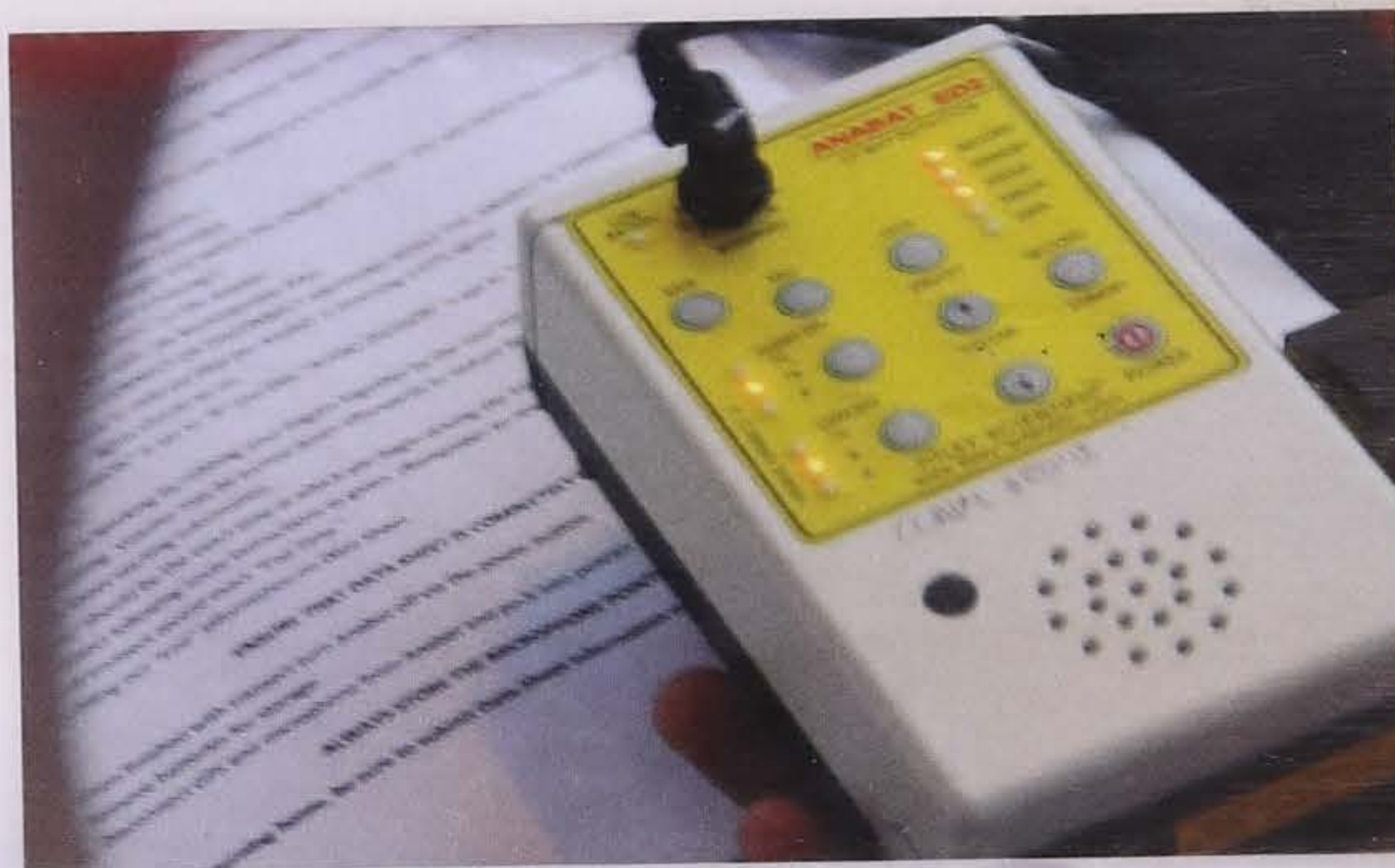
We drive a little further as Harms and Meetz chat about the future of the bat study.

"It's entirely sustained by average people with a dedication to conservation, and that's part of what makes these projects valuable—people care, and care enough to learn about the issues we're facing," says Meetz.

Harms says caring can be a hurdle in the Midwest because researchers here have to compete for funding with other projects involving obviously charismatic subjects.

"When I first came to Iowa I knew nothing about prairies, but it's hard for anyone to know nothing about obvious habitats like mountains," Shepherd says. "Now I know that Iowa has gorgeous places and wildlife too—you just have to look a little harder for them."

The Anabat in her lap chirrup happily in agreement. 🦇



ABOVE: The Anabat unit is used to record bat calls and convert the audio into digital files for analysis.

GET INVOLVED

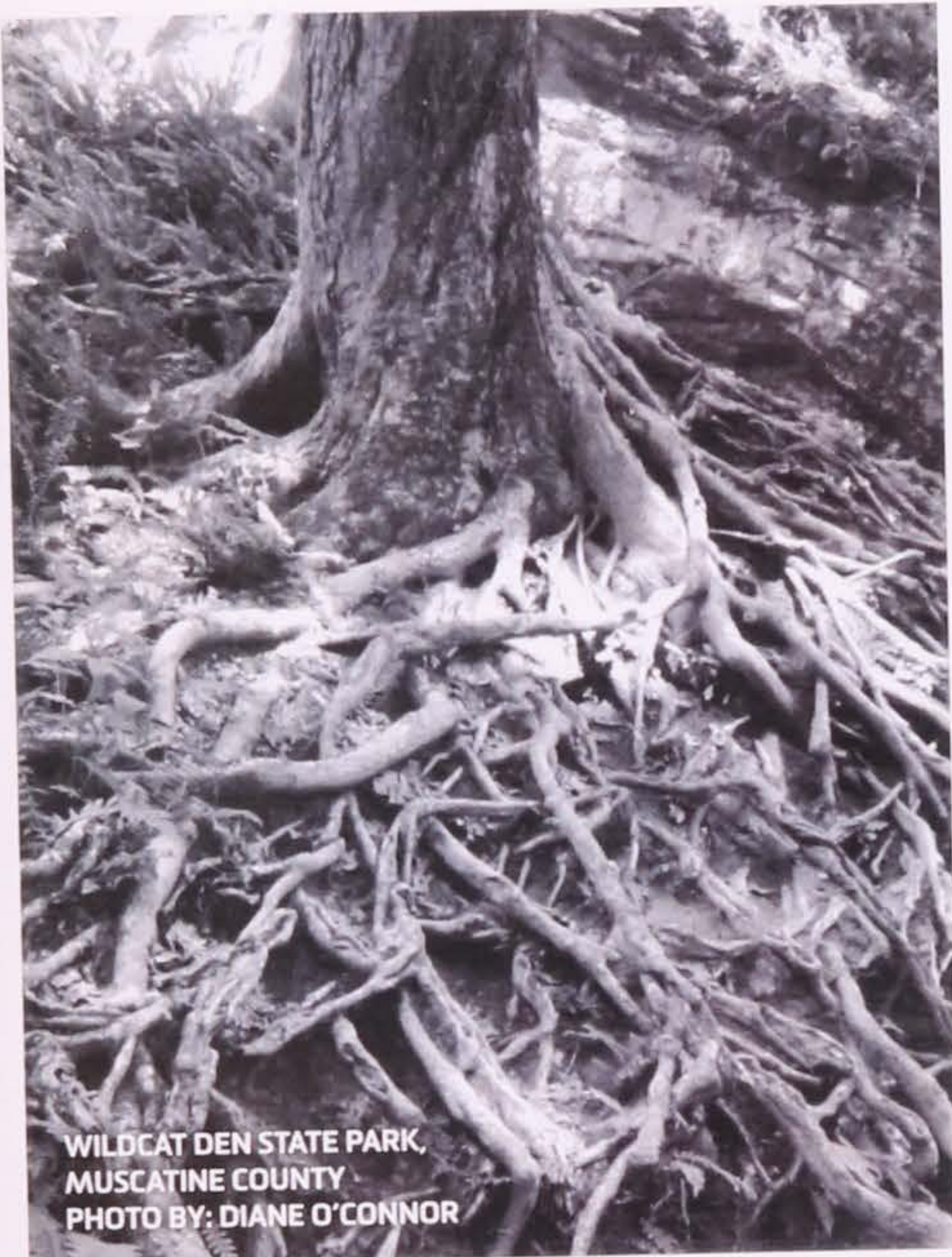
Interested in volunteering? Visit iowadnr.gov/vwmp and choose "Acoustic Monitoring for Bats" for more information and a volunteer interest form.



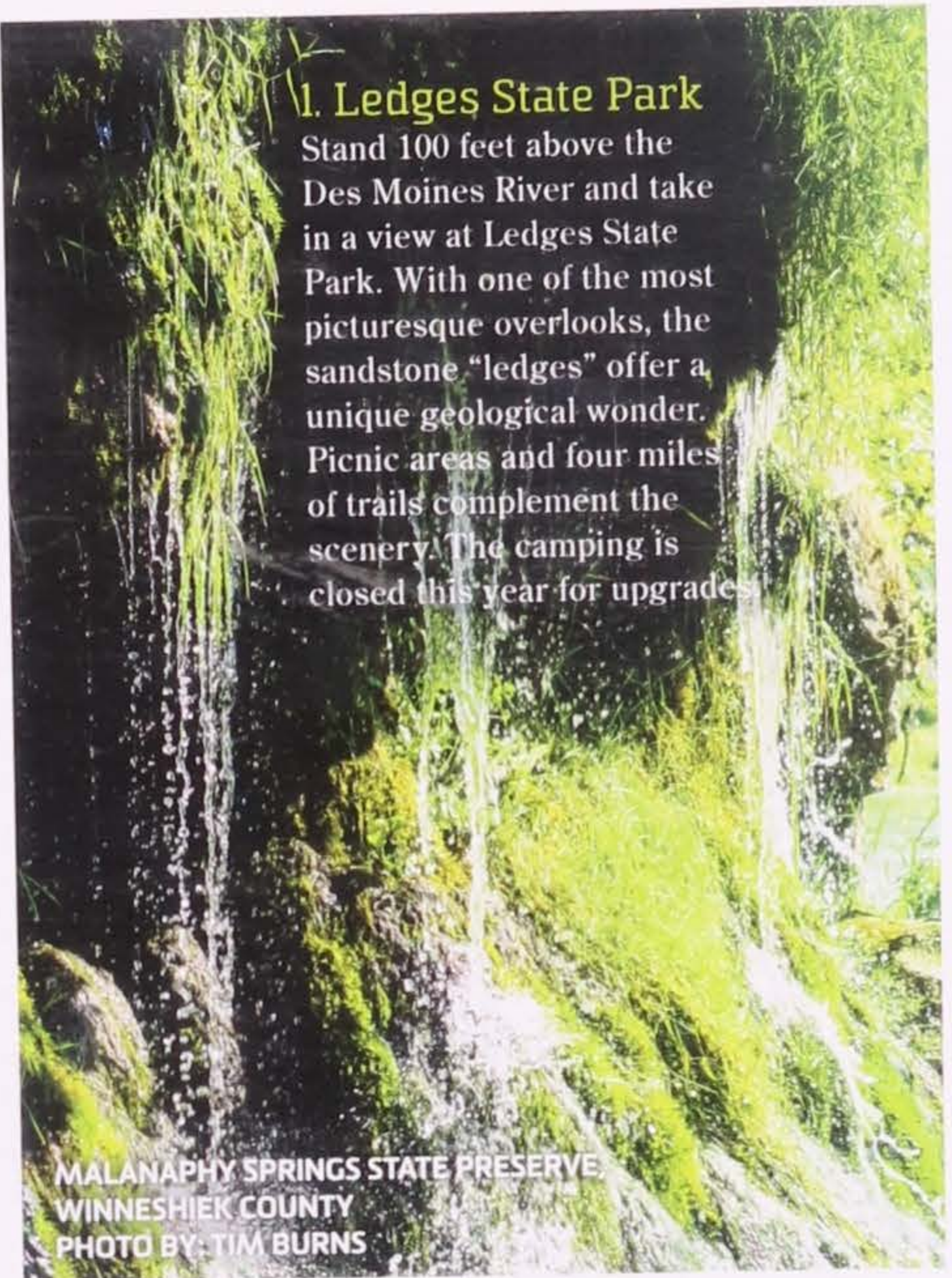
TOP INSTAGRAMMED STATE PARKS IN IOWA

Step outside for a weekend and enjoy Iowa's state parks. Along the way, don't forget to snap some pictures and share them on Instagram. Explore parks all over the state by hiking, biking, relaxing lake side and experiencing extraordinary views. Tag @iowadnr and use #IowaStateParks for a chance to be featured on our Instagram page.

PIKES PEAK STATE PARK
CLAYTON COUNTY
PHOTO BY: TIM BURNS



WILDCAT DEN STATE PARK,
MUSCATINE COUNTY
PHOTO BY: DIANE O'CONNOR



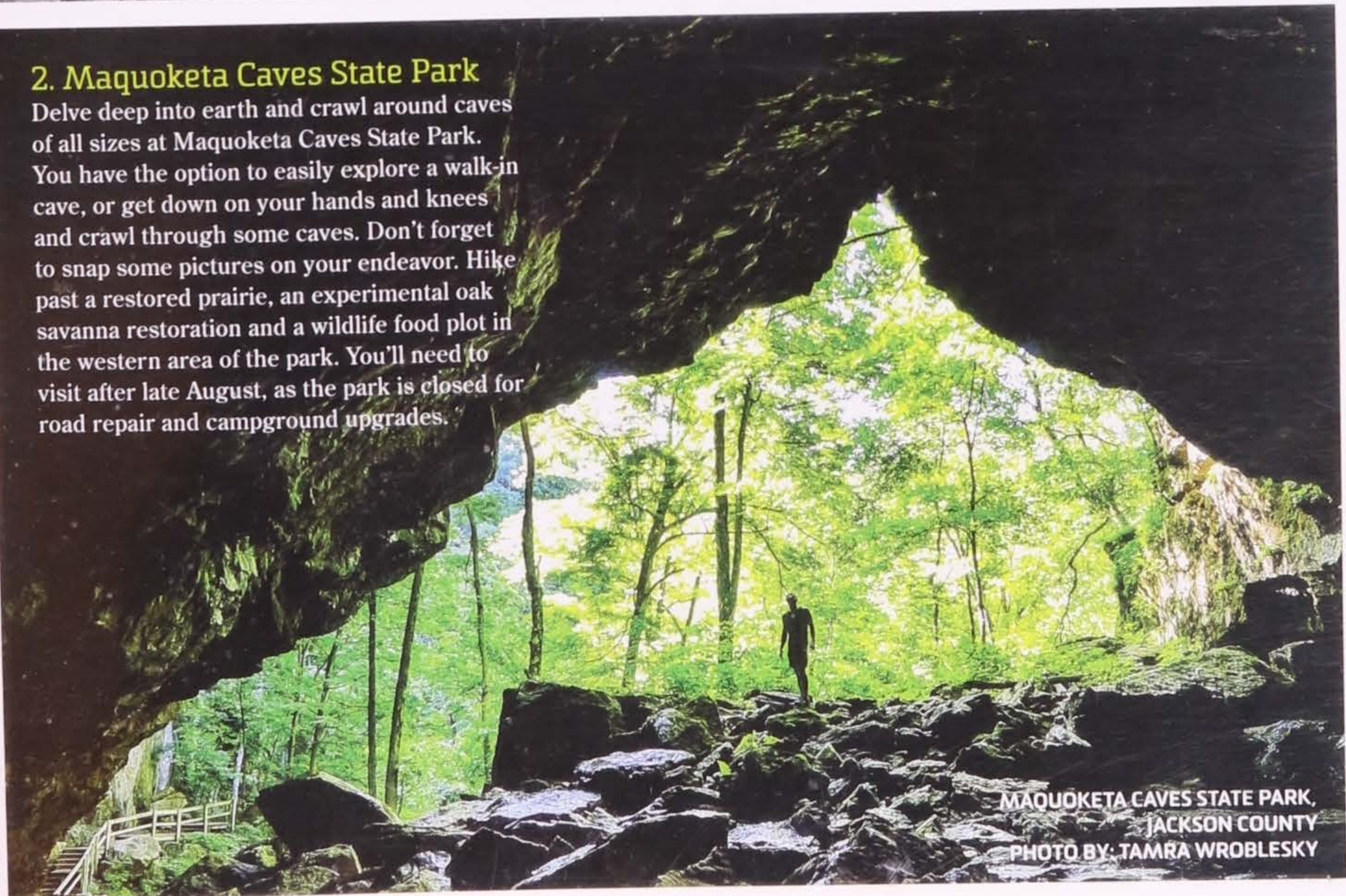
1. Ledges State Park

Stand 100 feet above the Des Moines River and take in a view at Ledges State Park. With one of the most picturesque overlooks, the sandstone "ledges" offer a unique geological wonder. Picnic areas and four miles of trails complement the scenery. The camping is closed this year for upgrades.

MALANAPHY SPRINGS STATE PRESERVE,
WINNESHIEK COUNTY
PHOTO BY: TIM BURNS

2. Maquoketa Caves State Park

Delve deep into earth and crawl around caves of all sizes at Maquoketa Caves State Park. You have the option to easily explore a walk-in cave, or get down on your hands and knees and crawl through some caves. Don't forget to snap some pictures on your endeavor. Hike past a restored prairie, an experimental oak savanna restoration and a wildlife food plot in the western area of the park. You'll need to visit after late August, as the park is closed for road repair and campground upgrades.



MAQUOKETA CAVES STATE PARK,
JACKSON COUNTY
PHOTO BY: TAMRA WROBLESKY

STATE PARK,
TON COUNTY
Y: TIM BURNS



DID YOU KNOW

Pikes Peak State Park is named after explorer Zebulon Pike, the same namesake of Pikes Peak in Colorado!

MAQUOKETA CAVES STATE PARK
JACKSON COUNTY
PHOTO BY: RICH EATON

3. Backbone State Park

Iowa's first state park boasts 21 miles of hiking and multi-use trails. One of the most well-known features is the Devil's Backbone, one of the highest points in northeast Iowa, and is accessible by trails. Backbone Lake also offers swimming, boating and fishing. One unique feature in the park is the opportunity to climb and rappel the cliffs throughout the park, one of the few Iowa State Parks to allow climbing.



WAUBONSIE STATE PARK
FREMONT COUNTY
PHOTO BY: LANCE BRISBOIS

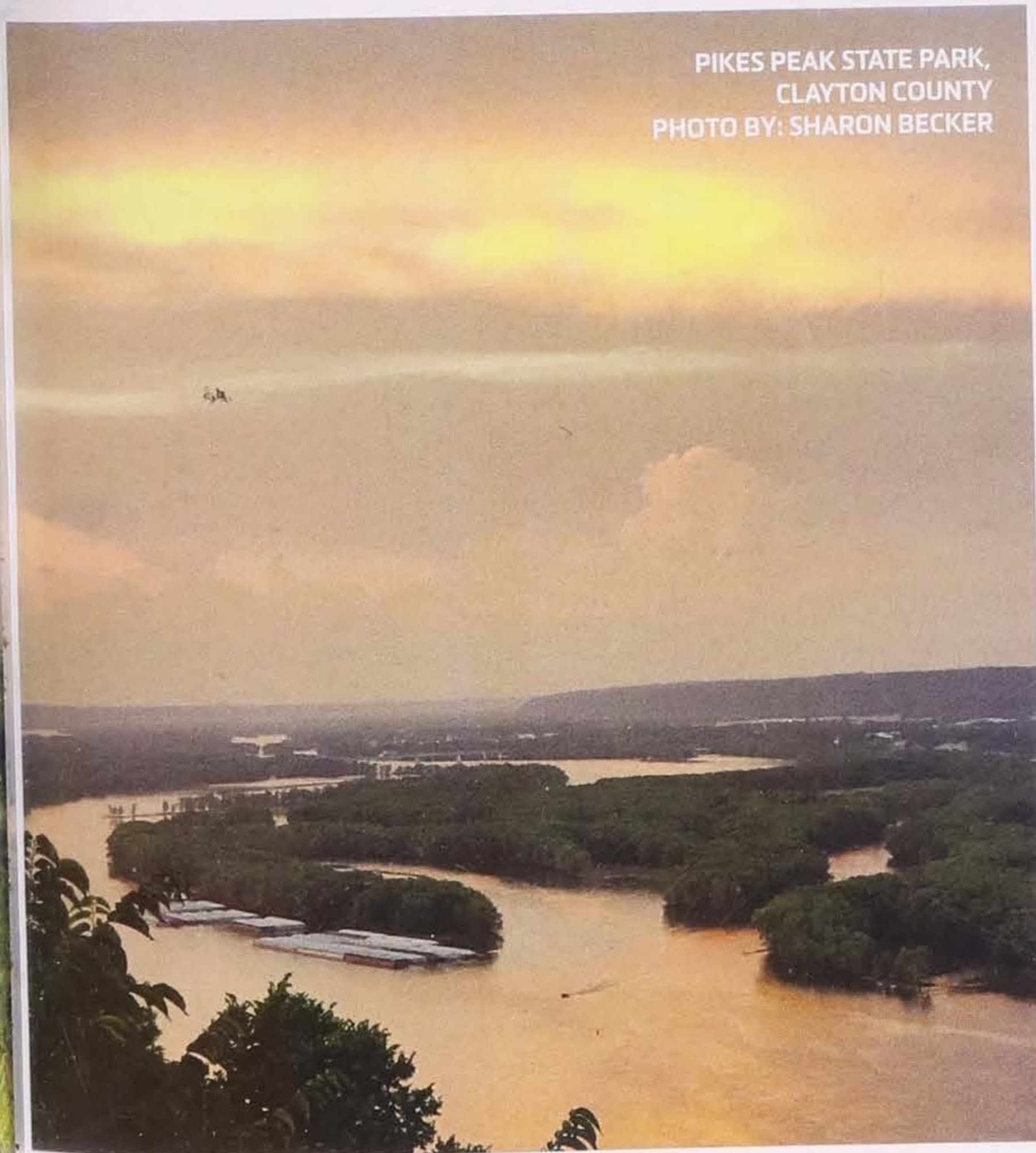
4. Lewis and Clark State Park

Relax beachside at Lewis and Clark State Park. The 250-acre lake is the perfect background for sunset pictures after a day at the beach. Go for a cruise around the lake with easy access, provided by the boat ramp. The park was named after the famous duo that explored the region in 1804. Dive into history by checking out the full size reproduction of Lewis and Clark's keelboat, "Best Friend." Check online or call 712-423-2829 to make sure it is open before planning to visit.

BELLEVUE STATE PARK,
JACKSON COUNTY
PHOTO BY: ERIN KILBURG



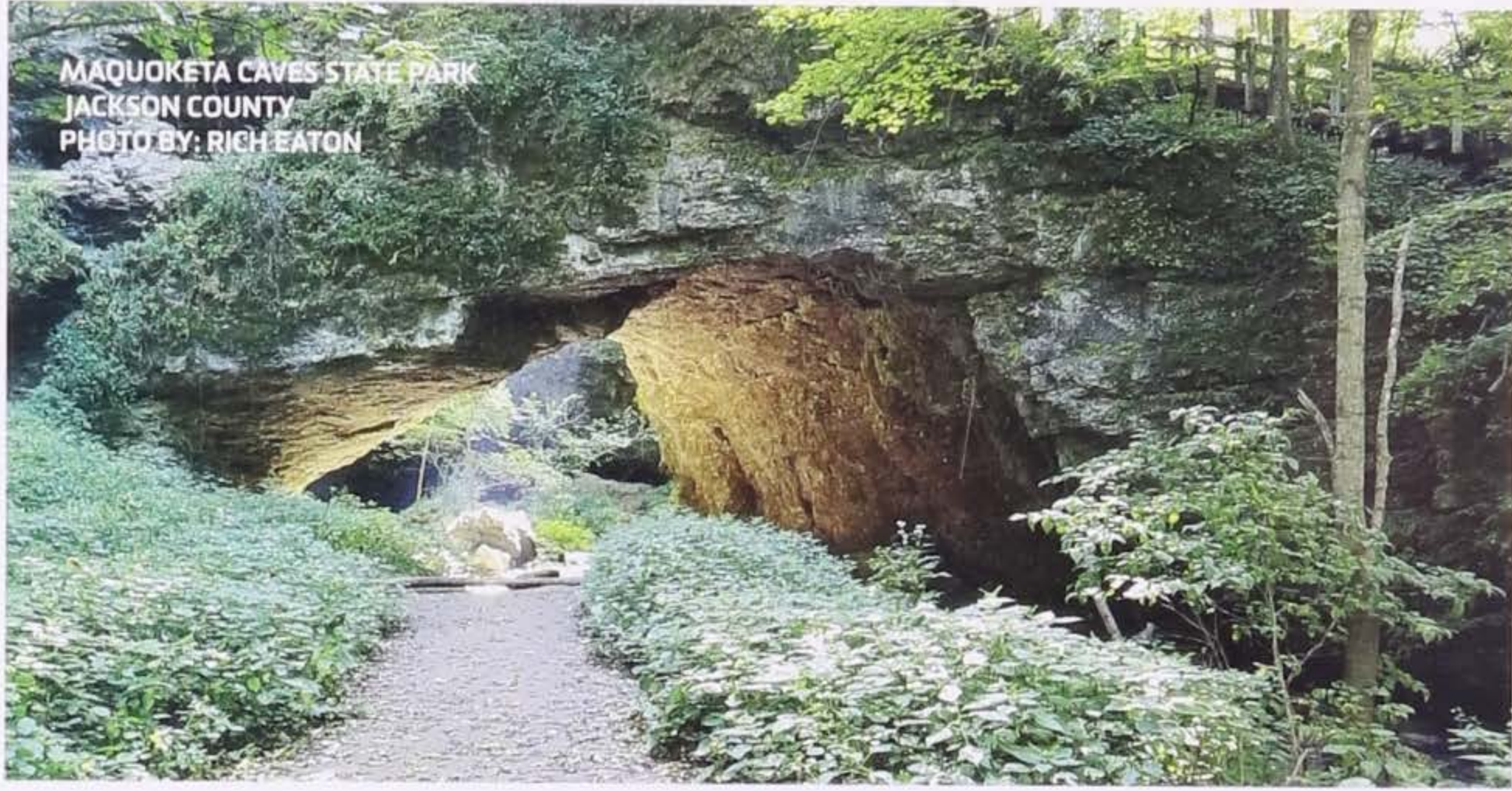
PIKES PEAK STATE PARK,
CLAYTON COUNTY
PHOTO BY: SHARON BECKER



5. George Wyth State Park

On a summer day, George Wyth State Park's lakes are crowded with beachgoers snapping pictures and soaking in the sun. Each of the four lakes offer an array of activities, from wind surfing to power boating. The park, is a popular picnic area and provides 5.5 miles of paved multi-purpose trails for a leisurely stroll or bike ride.

MAQUOKETA CAVES STATE PARK
JACKSON COUNTY
PHOTO BY: RICH EATON



6. Black Hawk State Park

A popular gathering spot for group activities, Black Hawk State Park in Sac County has picnic areas, informal cookout areas and fishing, which bring in many people to enjoy the beauty of the lake and time together. A disc golf course is available nearby. There are 128 camping units on site with a volleyball court and a large playground facility for kids of all ages.



LAKE GEODE STATE PARK,
HENRY COUNTY
PHOTO BY: STEPHANIE JOHNSON PHOTOGRAPHY



A photograph of a person fishing in a stream. The person is wearing a red shirt, blue pants, and a white hat, and is standing on a rock in the middle of the stream. The stream is surrounded by dense green forest, and the water is calm, reflecting the surrounding trees and the person. The scene is peaceful and scenic.


BACKBONE STATE PARK,
DELAWARE COUNTY
PHOTO BY: MATT GRIMM

7. Wildcat Den State Park

Located near Muscatine, Wildcat Den State Park provides stunning backgrounds for all your pictures, no filter needed. The system of trails throughout the park lead the visitor to layered and rough 75-foot cliffs. Pine Creek winds through the park with historical structures, like the Pine Creek Grist Mill, lining the waters.

8. Clear Lake State Park

Whether it's jumping off the the docks into the water or fishing off them, Clear Lake State Park is all about the water. The park is located on the southeast shore of Clear Lake. Fish for walleye, northern pike, catfish, yellow bass, crappies and other panfish. Don't forget that #IowaFishing hashtag.

A photograph of a swan swimming in a lake at sunset. The swan is in the foreground, facing right, with its reflection clearly visible in the calm water. The background shows a wide expanse of water reflecting the golden light of the setting sun, with a dark silhouette of a forest or shoreline in the distance. The sky is a mix of bright yellow and orange, with some dark clouds on the left side.

9. Pikes Peak State Park

Pikes Peak State Park won't take you to the mountains, but it will give you a breathtaking view of the Mississippi River. Look out across the vast Mississippi, dotted with islands from atop the 500-foot bluff. The park has 11.5 miles of trails where hikers can view a waterfall and many more geological wonders.

10. Lake Ahquabi State Park

Enjoy a day fishing or kayaking at Lake Ahquabi State Park. Boats, canoes, kayaks and paddleboats are available to rent through the concessionaire. Trails run 6.5 miles throughout the park, including four miles of trail that runs along the shoreline.



LEARN MORE ONLINE

Find park amenities, maps and locations, make reservations and see alerts and closures at iowadnr.gov/parks.

LAKE KEOMAH STATE PARK,
MAHASKA COUNTY
PHOTO BY: MATT GRIMM

The Art of Hand-Rearing Monarchs

STORY BY CELESTE WELSHHONS PHOTOS BY RON MAGGARD

Families raise butterflies from eggs, upping survival rates for release back into the wild.

After the passing of their grandmother, Mindy DeKoning and her sister, Heather Maki, began raising monarchs with their families. Their grandma started the 20-year-plus family tradition of hand-raising monarchs. DeKoning has raised monarchs the last 10 years.

"I encourage any parent to try this. I had a young child and it was just such a neat thing for the two of us to do together," says DeKoning. "It's time spent outdoors and a great activity for kids."

All you need is a container (something as simple as a pickle jar will work), access to lots of milkweed and a spray bottle for misting larva and milkweed leaves. Using milkweed stem cuttings instead of single leaves helps keep the larva's food fresh longer.

Look on the milkweed leaves, usually the underside, for tiny white eggs. Monarchs lay eggs one at a time, so it could take a lot of looking before you're satisfied with how

many eggs you find. While looking, keep an eye out for tiny caterpillars, too. They are only around 2 millimeters long after hatching. Always look before cutting milkweed to ensure no existing eggs or larva will be harmed.

Don't assume you have enough milkweed for many caterpillars; each larva can eat 20 large leaves or more. Monarchs can go 24 hours at most without eating, but anything beyond that will likely result in unsuccessful pupation and adult emergence. Finding good food sources is especially hard late summer and fall.

Larva "only eat milkweed, and in the late summer the milkweed has become diseased," says DeKoning. "The plants aren't as good from lack of water."

From the egg hatching to adult butterfly, the monarch life cycle only takes about a month to complete. The warmer it is, the more quickly they grow. In nature, 10 percent or less of monarch eggs will reach adulthood, but the survival rate climbs to 80 or 90 percent when handraised from an egg in captivity.

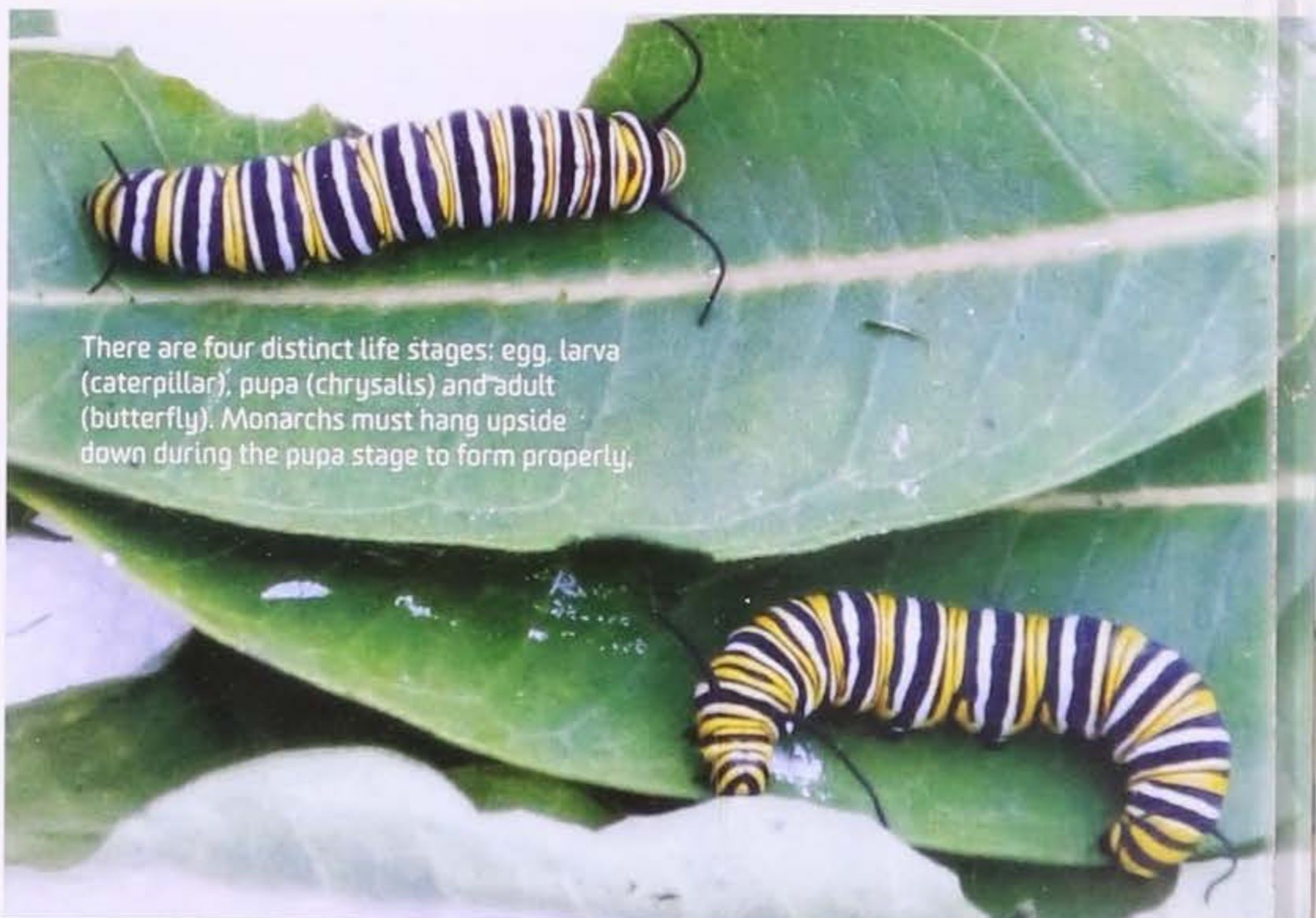


Jane Cruchelow hand raises monarchs at her acreage in Mingo. She converted 3.5 of her 21 acres into monarch habitat and is an active member of the Jasper County Monarch Enthusiasts Facebook page. She has released over 800 hand-reared monarchs back into the wild.

To properly tag a butterfly, start by gently pinching their wings together while they hang onto something like a stick. Make sure they are unable to move. If they move, or you move your fingers across their wings, scales are removed, potentially resulting in damage. Put the tiny tag on your finger tip and then gently press it into place on the underside of their hindwing on the mitten shaped (discal) cell.



"I agree that there are certain things that we should let nature just do its thing. However, we as humans have done lots of bad things for nature. We're trying to reverse that."—Mindy DeKoning



There are four distinct life stages: egg, larva (caterpillar), pupa (chrysalis) and adult (butterfly). Monarchs must hang upside down during the pupa stage to form properly.



Success rates increase when raising larva by hand too, but they can become infected before harvesting by parasites such as the tachinid fly. Tachinid fly larva eat the monarch larva from the inside out, but it is impossible to tell anything is amiss until the tachinid fly larva emerge. This usually takes place right before the monarch larva pupates or during the pupa stage.

Tachinid flies exist in Iowa, but are more prevalent in southern states. Losing a caterpillar can be discouraging, says DeKoning, but being able to watch butterflies take their first flight and knowing you are directly helping the population is a great reward.

Katie Cantu, naturalist for the Jasper County Conservation Board, has seen fewer and fewer monarchs in recent years. They used to be easy to find, especially in the pine trees of Maytag Park, but for the past few years, she needed to hand-raise caterpillars in order to have something to show during school presentations. Previously, Cantu was offered the use of Maki's monarchs and had to take her up on the offer because of such low numbers. Almost all kindergarteners in Jasper County get to see and interact with the butterflies.

"It really sticks in their minds, and then they see me later and I'm 'the butterfly lady' because that's what they remember," says Cantu.

There are typically four, sometimes five, generations of monarchs every year, with the last generation being the hardiest. They live eight to nine months, as opposed to the two to six weeks of other generations. Their bodies are tougher and wings longer for overwintering. In Jasper County and other parts of central Iowa, most eggs laid after July 20 will grow into the overwintering generation of monarchs, says Cantu.

It is this generation that leaves Iowa to migrate to Mexico in late August. A typical peak in monarch numbers in central Iowa occurs around early to mid-September, Cantu says (a little earlier in northern Iowa and later in southern counties). Monarch tagging also begins at the end of August since all monarchs then are part of the migrating generation.

Anybody can purchase monarch tags from Monarch Watch (monarchwatch.org) in Kansas for between \$.21 and \$.60 per tag, depending on quantity. If the butterfly is recovered in Mexico, information about the date, time and location of the recovery will be published on the Monarch Watch website. Check the list in late spring to see if any butterflies you tagged last year were recovered. There are numerous public tagging events across the state, including

at Maytag Park in Jasper County every fall.

Try not to handle monarchs past the larva stage unless necessary, and release butterflies immediately after tagging. Make sure butterflies have access to proper nectar-bearing flowers if you plan to keep them more than a couple hours after hatching (when not tagging).

You don't need to be a naturalist or conservationist to help monarchs, says Cantu. One of the biggest ways to help is plant milkweed and other pollinator-friendly native plant species. Discontinue mowing ditches and using pesticides.

The Jasper County Monarch Enthusiasts Facebook page is a great resource for those interested in raising monarchs. There are many active members ready to provide advice and even materials or last minute milkweed ([facebook.com/groups/359749304216803/](https://www.facebook.com/groups/359749304216803/)).

The Neal Smith National Wildlife Refuge near Prairie City in Jasper County offers People for Pollinators, a program to help people plant

pollinator gardens. They provide free site planning assistance, seeds or plant plugs, tools and educational material. There is

"I think having people like Mindy in our county is just great. She's doing so much and reaching people through their Facebook page."



also a DIY Prairie Series once a month through July that helps participants through every stage of creating prairie on their own land (fws.gov/refuge/Neal_Smith/Events.html).

When selecting pollinator-friendly species, look to native species first—they tend to develop deeper root systems for less watering and drought resistance. Don't use pesticides on anything you intend to be a pollinator food source. Butterflies need food from spring through fall, so make sure to plant a variety of species so something is always blooming or available.

Milkweed is a perennial, so it can feed numerous monarch generations over many years. Visit the Reiman Gardens website for ideas on native pollinator-friendly plant species and tips for attracting butterflies. Overripe fruit and rocks for basking in the sun are a good place to start. (search "pollinator garden" at Reimangardens.com).

Blank Park Zoo in Des Moines offers the Plant.Grow.Fly program that designates pollinator habitat and encourages creating new habitats. Every fall they hold a monarch festival.

To have your land designated pollinator habitat through Plant.Grow.Fly, one host plant and one nectar plant must be planted together. That's it. It can be something so small it fits in one flower pot or so large it takes up acres. Then, register your garden at blankparkzoo.org and order a sign to place in the pollinator habitat. You can register habitat as a monarch waystation through Monarch Watch, for a fee, as well (monarchwatch.org/waystations/). There are additional requirements for Monarch Watch waystations compared with Plant.Grow.Fly habitat. 🐛



After emerging, butterflies need 30 minutes to let their wings unfold and at least two hours for their wings to dry.



Learn more

If you have questions, you can contact Katie Cantu: (641) 792-9780 kcantu@co.jasper.ia.us; The Neal Smith National Wildlife Refuge: (515) 994-3400 nealsmith@fws.gov; Plant.Grow.Fly: (515) 285-4722 plantgrowfly@blankparkzoo.org; Reiman Gardens: (515) 294-2710 reimangardens@iastate.edu; Monarch Watch: (785) 864-4441 monarch@ku.edu; or Mindy DeKoning: msg0924@gmail.com

Notes From the Field

BY JESSICA MONTANA



MYSTERY OF THE SMOKING PONTOON

To encompass all bureaus within the DNR, an executive decision is revamping Warden's Diary. "Notes From the Field" has replaced Warden's Diary to highlight experiences from various DNR staff while afield fulfilling the DNR mission and serving Iowans. Erika Billerbeck, who commonly wrote Warden's Diary, still serves as a conservation officer in eastern Iowa. Jessica Montana supervises the DNR's environmental field office in Atlantic.

In May 2017, a county Emergency Communication Center contacted the DNR's environmental field office to report a pontoon on fire near the Valley truck stop, an area off I-80 north of Atlantic. The sheriff's office and fire department were on-scene requesting assistance with an engulfed pontoon. The boat was on a flatbed semi sitting abandoned in a gravel lot. And it appeared to be leaking a black liquid.

"Leaking? What is leaking?" DNR Environmental Specialist Wendy Wittrock asked.

"Well, I'm not sure; it's black and looks like some kind of oil. And, the pontoon is still smoking." Even with the smoke, fire officials resisted adding water to the fire, which could have caused a larger spill of the unknown black liquid, until DNR staff arrived.

Wendy and I went to investigate. Upon approach, the pontoon was indeed smoking and leaking a black oily substance. The semi-trailer was not connected to a vehicle and had no plates. We noticed tire tracks from what seemed to be the vehicle that secretly hauled it to this remote spot. Several small streams of black liquid were seeping out of the tanks onto the gravel lot. Pooling was evident. Truck stop staff assisted fire officials to contain some dripping liquid by placing five gallon buckets under the flow.

The pontoon was in rough shape. You could immediately see—and smell—it had seen better days. Baffles running the length of the craft were pitted, rusted and charred. We spotted jagged, worn and rusty holes on both sides.

The trailer was covered in the black, greasy liquid. Finding the least grimy spot to hold onto, Wendy and I climbed on the

pontoon to get a view from above. We were perplexed as to what we saw. Through large square holes cut on the top side of the normally empty baffles, we spied black liquid, loose straw, blankets and what looked to be flannel shirts—mixed together in a sloppy mystery stew.

Getting a bit of the black tar on my fingers, I smelled it expecting a fuel or waste oil smell. It was almost odorless, felt greasy, like oil, but not consistent with waste oil. As we climbed down, we were greeted by the truck stop staff with more details. He had added a chain on the hitch, so whoever came back for it "couldn't take it without talking to us first." He thought it was originally parked behind an abandoned building across the highway, where a puddle of black liquid was mixed with old bed mattresses.

We definitely had a mystery on our hands. DNR staff are often tasked with identifying who's responsible for manure releases or fish kills. Typically, however, there are more clues than what we had today. Instead we had an old, abandoned, pitted, rusty pontoon on fire, filled with straw and black liquid, flannel shirts and two sealed but dented 55-gallon drums on a semi-trailer. And no one to claim it.

As we stood taking it all in, a man and his son pulled up asking what we were going to do, how dangerous it was and who was responsible. We had the same questions, but our first goal was to stop the leaking. DNR staff are equipped with environmental cleanup materials, like absorbent booms or socks. We also had absorbent sand, or powder, that once applied can be swept up or shoveled.

Wendy and I went to work, attempting to plug holes in the

tanks with a tape and putty combination. That didn't work. Without being able to get into the baffle from the top due to all of the liquid and straw and the structure already being wet, the putty wouldn't stick. Plus, we didn't want to widen the rusty holes by messing with them too much. We had a small stream to contend with and didn't want a greater mess if the holes ruptured further. We put more buckets under the holes to capture fluid and planned to properly dispose of its contents when full; then, as the tank emptied, let the straw from within serve as a natural plug.

With the liquid contained, we spoke with an Iowa DOT enforcement officer, who had identified the trailer owner as a Nebraskan—we will call him "Mr. Doe"—who claimed the black liquid was not waste oil or hazardous, but a vegetable oil used to coat a pontoon to avoid rust. He said he was under contract with a federal agency to move more than 70 retired pontoons from Michigan to Nebraska, making Iowa a pass-through state. This last haul was a culmination of all the vegetable oil-like substance from the other 69 crafts combined into this last one. All was well, said Mr. Doe, until a tire blew. In the wee hours, he parked on the side of the highway to soak up the leaking liquid with bed mattresses, which he was also hauling on the semi-trailer. When the mattresses failed to work, he drove to the other side of the highway, tucking the trailer behind some trees. He assumed the fire ignited from the heat from his blown tire. He had hoped to return the next day to make repairs and hit the road for Nebraska.

However, we informed him that he can't take the trailer and pontoon in its current state back on the road. There was a high likelihood those holes would get bigger as he

traveled—and bigger holes meant more black liquid spilled on the highway. He stated again that "vegetable oil is not hazardous." It might not be hazardous to humans, but it is hazardous to aquatic life. The stuff was also *slippery*, posing traffic hazards. He agreed and promised to find a company to pump and empty the tanks. We suspected the tanks had leaked for miles based on their condition.

Even after we asked the fire department to place temporary containment around the pooled areas, we advised Mr. Doe he is responsible for cleaning up the rest of the material and emptying the pontoon contents before heading back to Nebraska. Unfortunately, upon checking his progress the next day, we learned he had other plans.

We arrived that morning to tire tracks filled with more black liquid, spent booms, empty buckets and no trailer. Despite being warned of the dangers and the hitch being locked with a chain, he decided to re-dump the full buckets back into the baffles, cut the lock and chain, risk a major highway spill and disappear into the night.

Thankfully, no waters of the state were impacted, clean-up was relatively easy and quick and the dirty bed mattresses and absorbent booms were properly disposed of.

Although I was an extra set of hands to assist with clean-up, solving the fiery pontoon mystery would not have been successful without the perseverance of Wittrock. She worked with local police and fire departments, DOT officials and a local businessman to help solve the puzzle.

And for Mr. Doe? He received a Notice of Violation as did his place of business—a scrap facility. We also notified our colleagues on the Nebraska side of his activity in Iowa, just in case he decides to ever again haul more pontoons. 🚚



Wild Cuisine

STORY BY ALAN FOSTER

Berry Up to Easy Homemade Pancake Syrup

Few Iowans made it through childhood without picking handfuls of mulberries straight from the tree and showcasing the fruit of their labor in purple-stained hands and clothes.

When the fruit is in season, mulberry trees are laden with thousands of the raspberry-like berries. While many drop to the ground and go to waste, or are eaten by birds, there are still plenty to go around. And although not as flavorful as other berries, they still work well in many sweet concoctions. They are great in pies and cobbblers or a refreshing summer drink or smoothie. Toss some in your oatmeal, fold them into your pancake batter or muffin mix, or make homemade mulberry ice cream. And if you are lucky enough to have a tree on your property, or know someone that does, they are free.

For a breakfast treat, turn that bountiful harvest into bottles of a berrylicious topping for pancakes and waffles. Maple syrup may be the mainstay, but homemade mulberry syrup may just change your mind.

MULBERRY SYRUP
4 cups mulberries, rinsed
4 cups water
2 to 3 cups sugar

Add berries and enough water to cover the berries in a sauce pan. Don't worry about removing the tiny stems. All you are after is the juice. Bring to a boil, then shut off heat. Mash with spoon, spatula or potato masher. Let cool several minutes. Extracting the juice can be done several ways. Juicing machines work well, or pour mixture in a cheesecloth-lined

colander placed over a large bowl. Or buy a commercial jelly bag and hang over a bowl. Let drain a couple hours or overnight. Mash occasionally to extract as much juice as possible. Discard mulberry skins in your compost pile. Start with about four cups of strained juice in a sauce pan. Add two to three cups of sugar, or to taste. Gently boil mixture until syrup has reached desired thickness. Let cool, pour into sterile jars and store in refrigerator.

HARVEST TIPS

Picking a mother lode of mulberries, albeit a fun family activity, can be an arduous task. However, there is an easier and quicker way. Place a clean tarp or mattress sheet around the base of the tree. Gently shake tree branches to release their bounty.





BLAME THE REDCOATS FOR DEMISE OF IOWA'S NATIVE MULBERRY TREE

Red mulberry is the only mulberry tree native to Iowa, but it is harder to find and less common now than the non-native white mulberry tree. It was the British who brought Asian white mulberry to the American colonies to create a silk production industry. (Silkworms eat one thing—mulberry leaves.)

According to the U.S. Forest Service, in 1624 the Virginia Legislature required every man to plant at least four white mulberry trees to aid the fledgling silk industry. By the 1830s, the potential for a silk industry prompted “mulberry mania” in the east. By decade’s end, cold winters destroyed white mulberry farms in the Northeast, while those in the South died of disease.

While those dreams never came to fruition, birds took off with the fruits of white mulberry, spreading seeds across the nation. Today it has outcompeted and hybridized native red mulberry in many areas.

White mulberry is noted for rapid plant movement used in pollen release. The stamens act as catapults that release in just 25 microseconds, which is 4,000 times faster than an eye blink. That energy shoots pollen at about 350 miles per hour—over half the speed of sound—making it the fastest known movement in the plant kingdom.

The two trees are often misidentified, as they can’t be identified based on fruit color (the berries of both start off white). Ripe fruit of white mulberry ranges from white to purple-black, but they are mostly dark.

White mulberry leaves have glossy surfaces—red mulberry do not, among other leaf shape differences. While mulberries are known for their sweet fruit, the wood has a mild, sweet aroma and is good for smoking meat, fish and game.

WHERE TO FIND BIG TREES

The biggest native red mulberry trees on public land are at Waubonsie State Park (48 miles south of Council Bluffs), which has the tallest in Iowa at 71 feet, and Woodland Mounds State Preserve (26 miles southeast of Des Moines in Warren County) and at Kilbourne City Park in Keokuk. The largest tree for trunk girth, however, is on a private residence in the Des Moines metropolitan area. It has a circumference of 12 feet 8 inches and a height of 60 feet.

Rusty Patched Bumblebee

(*Bombus Affinis*)

The rusty patched bumblebee is the first bee to be placed on the endangered species list in the continental United States. This native bee's original range included 28 states, primarily in the East and Midwest, and two provinces in Canada. Now, it can only be found in 13 states and one Canadian province. The U.S. Fish and Wildlife Service estimates populations have declined in 90 percent of its original range.

BUZZ POLLINATION

This bee has a significantly shorter tongue than other bees. Even though a long tongue is necessary for most bees to gather pollen and nectar from flowers, the rusty patched found another way—buzz pollination, also known as sonication. During buzz pollination, the bee grabs the pollen producing structure of the flower and vibrates their wing muscles at a frequency to dislodge pollen that would normally stay trapped within the anthers. Only about 8 percent of crops require buzz pollination, but that includes some important foods—tomatoes, peppers, potatoes, blueberries and cranberries.

COLD TEMPERATURES AND HIGH ALTITUDES

Bumblebees in general can fly in colder temperatures, lower light levels and higher altitudes than other bees, but the rusty patched bumblebee can withstand more than average. They can fly at altitudes as high as 5,000 feet and in temperatures that would kill other bees. It is one of the first to emerge in the spring and last to hibernate in the winter.

BREEDING CYCLE

Queens emerge early spring after hibernating all winter. Solitary queens are the only ones that can initiate a new colony, so the number of colonies for the next year depends on how many potential queens were created and hibernating during the previous fall and winter. The number of potential queens produced relies heavily on the amount of pollen and nectar gathered from late summer until hibernation, so an early cold spell could heavily impact food availability and the number of queens for the next year.

LIVING ARRANGEMENT

Unlike the typical beehive, this bee makes its home 16 to 18 inches underground often in old rodent burrows in grasslands, wetlands, ditches, fields and tallgrass prairies which are now almost non-existent in the upper Midwest. Nests are made of soft soil, and some have been found above ground in chunks of grass or soil due to unavailability of open grassland. Typically there are between 50 and 400 bees in a colony in the wild, but colonies in captivity can have up to 2,100 members. The rusty patched may be more susceptible to insecticides and other chemicals than other bees because they live underground.

THREATS

There is an array of possible causes for their population decline. Most likely is a strain of *Nosema bombi*, a single cell parasite that affects bumblebees. The disease was likely brought over from Europe by the common eastern bumblebee, *Bombus impatiens*. Urban and agricultural sprawl, tendency for commercially-raised bees to carry disease, climate change and persistent and long-lasting use of insecticides and pesticides, are also contributing factors to the decline in all bee numbers.





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