SAGATAGAN Saint John's OUTDOOR UNIVERSITY

SEASONS

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Summer
2021

Summer Web Watching

LARRY WEBER

Most of us know that spiders are not insects; having eight legs when insects have six. Unlike insects, they do not have wings or antennae. Spiders are predators, feeding mostly on insects. To subdue this prey, they nearly all have venom connected to fangs. The venom is effective with insects, but rarely, despite some stories that we are told, is enough to harm humans. Most spiders have fangs too small to penetrate our skin.

To catch their prey, spiders either actively pursue; running or jumping, or use self-made snares to capture their food in a much more passive method. Those that actively hunt tend to have good eyesight, as seen with wolf spiders and jumping spiders; web-makers do not.

Whether from a story we've heard or a personal experience, we all have our own perceptions (or misperceptions) of spiders. Looking at them through their webs (even the word spider is derived from the word "spinder"), gives us another way to view their world.

Web-making spiders are of four types. Perhaps what we encounter most are cobwebs. They appear to be just a series of unorganized threads in the corners of rooms and windowsills. Despite their apparent disarray, these webs are quite organized, and spiders live there.

In shrubs and small trees we may find bowl-shaped sheet webs. Visible on a dew-covered summer morning, these bowl-shaped snares seem to be too big to have been built by the spiders that live in them. The web-owners hang inverted under the web.

Walking through lawns and along roadsides in summer, we may also see funnel webs. These webs may look like a cloth lying on the ground. A closer look reveals a hole in the center (why they are called funnel webs). It is in this hole that the web-maker sits in readiness to pounce and grab prey.

But for most of us, our first thoughts of spider webs are of the large, spoked circular ones made by orb-weavers. We see them in gardens, yards, roadsides, and fields during late summer. The

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The orb web of a Shamrock Spider (*Araneus trifolium*) as seen on a late summer morning. Note the dew cover, but also note not seeing the spider; it is in its retreat along the side of the web. LARRY WEBER.

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spiders that make these remarkable snares mostly survived winter as eggs and the young grew throughout summer. By late summer, many have grown big and form large webs.

This incredible construction of food catching needs a closer look. Typically, the orb webs are formed in the calm of the evening. They are made of several types of material from the spider's internal silk glands.

On the "tail end" of a spider are three pairs of organs known as spinnerets whose function are the spinning of webs. Silk used in their webs is produced in internal glands. Normally spiders will have about a half dozen types of these glands, producing as many kinds of silk, each with its own make-up and its own use.

Beginning the web construction, the spider lets out (pulls) a non-sticky strong thread from its spinnerets. Drifting in the breeze, it goes from the initial substrate and "gets caught" or attached to another site. Once in place, the spider crosses this thread, reinforcing it and securing it better. The spider will then drop down from the center of this thread to attach it below. From here, a frame is made complete with a hub in the center and threads that extend out to make a spoke-like arrangement. Walking on this non-sticky scaffold, the spider attaches spirals. Spirals on the web are sticky, made from three more kinds of silk. When complete it is these sticky threads that make up the spiral of the web where the prey are caught and subdued. If we touch the spoke threads, we will not get stuck, but we will when touching the spirals.

Orb webs are mostly constructed in a vertical plane to be better able to snatch flying prey. Once constructed, the spiders sit back and let food come to them. Orb-weaving spiders have poor eyesight and need to feel the presence of prey. Many will sit in an inverted pose in the hub during this time. Others go to a nearby retreat where they can also detect the presence of insect prey. A good night will garner several moths and by the morning, we can see their bodies; either consumed or wrapped for later consumption.

As the night proceeds, temperatures lower towards dawn and the moisture in the air will condense to form droplets on the threads of the web. The spider tolerates this for a while, but by dawn, most are gone. There are a few exceptions, but most spiders don't appear to like the moisture of a dew-draped web which is why wet webs often look like they are vacant.

Not everyone appreciates spiders; however, these dew-filled webs are quite photogenic and considered a marvel of beauty. Since the threads of webs are often very thin, it is the droplets adhering to them that allows us to see the webs clearly. Indeed, a dew-covered or foggy morning backlit by the rising sun can reveal huge numbers of these snares; far more that we might think are present.

Late summer is the time that we are likely to get dew-covered mornings and the webs, along with nearby plants drip with dew drops. Those braving the cool temperatures of early mornings and willing to get wet with dew, may get plenty of photos. As the day warms and winds pick up, the webs will be knocked down. Many spiders will also take down their own webs by consuming the threads. Made largely of protein, these threads are digested and "recycled" to form new webs later.

Returning to the same sites later in the day will reveal almost no webs. It may look like they never were here, but by dusk, the cycle begins again. It is only the frosts of September that will stop the early morning show of delightful webs of late summer. Take advantage of the season to view this spectacular show.

LARRY WEBER *is an award winning naturalist, educator, and author whose books include* Spiders of the North Woods, Butterflies of the North Woods, *and* Minnesota Phenology. *Larry was recently granted the 2020 Lifetime Achievement Award from the Minnesota Association for Environmental Education.*

Hiking on a late summer morning reveals many orb webs in the dew. LARRY WEBER.

A Lichen Orbweaver (*Araneus bicentenarius*) in its large web (up to three feet) that is free of dew. LARRY WEBER.

Minnesota Earthworms

Ryan Hueffmeier

Did you know that the earthworms we grew up with are not native to Minnesota? Even if we had native earthworms prior to the glaciers, they would have been eradicated through the actions of the large ice sheets (1-2 miles thick) and cold climate at the time. Earthworms we see today were introduced to North America over 200 years ago, both intentionally and unintentionally through farming, horticulture, and shipping practices of settlers from Europe.

What happened after glaciers receded? The environment went through primary succession, a process that started from the ice-scraped bare bedrock to eventually create the forest and prairie landscapes we see today. During that 10,000—18,000-year transition, fungus and bacteria became the primary decomposers of organic matter. Our ecosystems developed a thick duff layer (the organic matter including leaves, plants and animals, that build up on the forest floor above the mineral soil) over time. Decomposition by fungus and bacteria happened slowly and the plants and animals that developed during this process had strong connections to that thick duff layer.

European earthworms (*Lumbricus terrestris*), through the assistance of humans, have been moved efficiently throughout our state. Not many areas are European earthworm free; we even find them in remote areas such as the Boundary Waters Canoe Area. These introduced European species do their job and do it *really* well.

What is their job? The worms break down organic matter and create castings (poop), which are nutrient packets, containing nitrogen and phosphorus and more. They break down organic matter much faster than the traditional fungus and bacteria with which our ecosystems are adapted.

Earthworms consume the duff layer so fast that they grabbed attention of researchers in Minnesota over 20 years ago. Forest researchers saw large areas of mineral soil completely devoid of duff. This quick removal of the duff layer by European earthworms has documented negative impacts on native forests and prairies. Researchers continue to track their impacts and try to better understand how they are changing our future forests.

But earthworms are good for gardens, right? Research does show that European earthworms have positive impacts in agricultural systems, through their feeding and burrowing behaviors. But not all earthworms are the same. And not all ecosystems are the same.

Our understanding of earthworm ecology in Minnesota has clearly established that European earthworms are generally bad for our *natural* ecosystems (forests and prairies) even as they've been generally beneficial for our *created* ecosystems (gardens, farm fields, landscaped yards). But there is a new species of earthworm in Minnesota that is getting the attention of gardeners and landscapers who are surprised that the benevolent earthworm can cause negative impacts on these systems.

Jumping worms (*Amynthas sp.*) are a subtropical species that originate from Asia. The jumping worm to date has only been recorded in the southeast section of Minnesota and throughout the metro area. Unlike European earthworms, jumping worms primarily impact our created ecosystems.

The jumping worm has had the earthworm research

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Invasive jumping worms tend to be darker in color than their European counterparts. The clitellum (ring) around the worm is closer to the head and wraps entirely around the worm. Setae (tiny hairs) around the earthwoom body help it move. The jumping worm has as many as five times the number of setae as the European worms. This helps them move more quickly, sporadically, and very "un-worm-like." Beth Solie.

Become a Worm Ranger!

Join this citizen-science project to help learn where jumping worms are across Minnesota. Every September–October there is a bioblitz where the public helps to map the spread of these species across the landscape.

Learn more and watch a video of jumping worm movement:

jwp.cfans.umn.edu/jumping-worms-project

Science Glows with Expanding Perspectives

Jennifer Y Lamb, Ph.D.

Amphibians and reptiles are often thought of as simple creatures with uncomplicated lives. Crawl (or hop or slither), eat, reproduce, repeat. But even species that we consider common have secrets that we are just starting to unravel. For example, *they glow*. More specifically, they biofluoresce.

Biofluorescence occurs when an organism absorbs and then emits light in different colors. Scientists first thought that biofluorescence only occurred in invertebrates, like scorpions and spiders, or jellies and corals. However, in the last few decades we've learned that many vertebrates fluoresce, including bony fishes, sharks, reptiles, mammals, and recently, amphibians.

In 2020 Matthew Davis, my colleague at St. Cloud State University, and I discovered that many amphibians fluoresce under ultraviolet and blue light. Matt and I may seem like an odd pairing. He is an evolutionary biologist who primarily studies marine fishes. I am a herpetologist who usually focuses on the ecology and behavior of amphibians. But Matt's prior experience with biofluorescence in fishes, paired with my understanding of amphibian biology, makes us a good team.

When people come together from multiple disciplines or perspectives, we can get rapid expansions in science. The specific training and scientific background of each member of the team influences the direction of research. Biologists who first described biofluorescence in scorpions learned about the phenomenon from geologists who were using ultraviolet light to survey for fluorescing minerals in the desert. Biochemists use fluorescence to identify specific pigments extracted from animal skins, whereas a herpetologist like me might be more curious about whether that fluorescence could be used at the organismal level for communication.

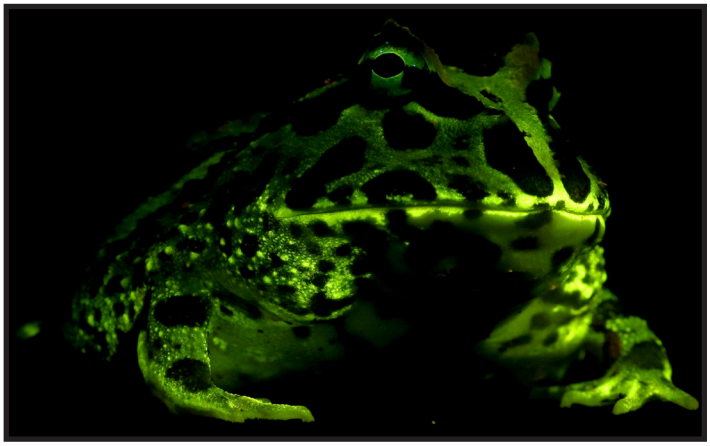
Salamanders and frogs glow in blues, greens, oranges, yellows, and reds, depending on the species and light source. Some that are brightly patterned under white light, like Tiger salamanders (*Ambystoma tigrinum*), fluoresce an intense green. Others, like the Boreal chorus frogs (*Pseudacris maculata*) that we hear trilling in the spring in Minnesota, are muted. My research team was not the first to find biofluorescence in a living amphibian, but we were the first to show how widespread and variable it is. Each year there are new accounts of glowing amphibians and reptiles, with innumerable questions to ask and answer.

My research team at St. Cloud State includes a team of undergraduate and graduate students tackling the ecology and natural history of amphibians and reptiles. The core of our research is what differences do we see and why?

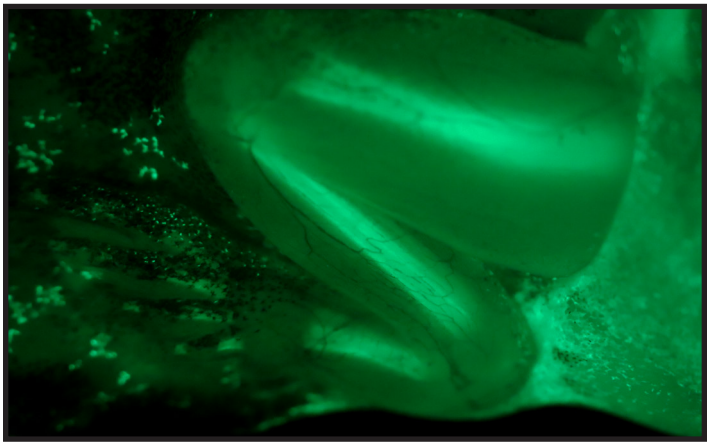
This summer, we are working in the Abbey Arboretum. One of the species we're working with is the Painted turtle (*Chrysemys picta*). Painted turtles can be brilliantly colored with yellows and reds.

When males are courting females, they will face them and then use their long foreclaws to tap, scratch, and tickle the female's face. Exploring whether males are more colorful than females, and if they biofluoresce differently, might say something about how a female might choose her mates. Differences between individuals might also result from diet or age, so we are also collecting fecal samples and catching both juveniles and adults.

It is possible that in these animals biofluorescence serves no biological function. Biofluorescence could just be a characteristic of proteins or other components of their tissues. But what if that isn't the case? Fluorescence affects aggression in some marine fishes and may impact mate choice in some birds. We see a variety of fluorescent patterns and colors in salamanders and frogs. One of our goals is to determine if these glowing patterns in



A Cranwells frog (*Ceratophrys cranwelli*), a species native to parts of Argentina, Bolivia, Paraguay, and Brazil, fluoresces green under blue light. J.Y. Lamb & M.P. Davis.



Some species fluoresce throughout their life cycles, as shown in the hind limb of a Gray treefrog tadpole (*Hyla versicolor*). J.Y. Lamb & M.P. Davis.

amphibians and reptiles might affect an individual's survival or success.

I have studied amphibians and reptiles for more than a decade but have only recently come to the field of sensory ecology. Part of what intrigues me is that the way we (humans) perceive the world is not how other animals, or even other humans, experience it.

Several years ago, as an undergraduate, my partner and I stood next to our poster at the state science conference for student research in Mississippi. He and I were speaking to a faculty judge about our work surveying for amphibians and reptiles. The judge interrupted, "You mean you caught snakes?" he asked me directly. I laughed, confused, and responded that my friend and I had both handled these animals. "But a *woman*, catching *snakes*?" he continued. We smiled through our shock. The judge moved on.

That was not the first or last time that someone would perceive my identity as being incompatible with my interests. But that early interaction seeded self-doubt – was there a place for me in my chosen field? Today there remain large gaps in gender, as well as race, ethnicity, and sexual orientation in STEM (science, technology, engineering, math) fields.

The current lack of representation among voices in STEM means that our understanding of reality is, and will continue to be, patchy. Our personal backgrounds and lived experiences shape the questions we ask, the career paths we pursue, and the insights we bring to a team. Consider the last time you wrestled with a challenge and went to someone else for insight. You likely benefitted from their lived experiences which may have been different from your own.

There are huge areas of the natural world left to explore. We need more people with diverse perspectives and skills to interrogate the unknown so we can see the pieces that we're missing. So if you spot us out in the Abbey Arboretum, stop by and ask us questions. Who knows what new areas of inquiry we can inspire?

Jennifer Lamb is an assistant professor of biology at St. Cloud State University who studies ecology, natural history and behavior of amphibians through a variety of lenses. Her team of undergraduate and graduate researchers is investigating biofluorescence of reptiles and amphibians living in the Abbey Arboretum.

1. Lawrence, R.F. 1954. Journal of the Entomological Society of Southern Africa 17(2): 167 - 170.
2. Lamb, J.Y. and Davis, M.P. 2020. Scientific Reports 10. https://doi.org/10.1038/s41598-020-59528-9
3. Taboada, C. et al. 2017. PNAS 114(14): 3672 - 3677. http://dx.doi.org/10.1073/pnas.1701053114
4. Yovanovich, C., et al. 2017. Phil. Trans. R. Soc. B. http://doi.org/10.1098/rstb.2016.0066
5. Gerlach, T. et al. 2014. Proc. Biol. Soc. 281(1787): 20140787. http://doi.org/10.1098/rspb.2014.0787
6. Hausmann, F. et al. 2003. Proc. Biol. Sci. 270(1510): 61 - 67. http://doi.org/10.1098/rspb.2002.2200
7. Pew Research Center, April, 2021, "STEM Jobs See Uneven Progress in Increasing Gender, Racial and Ethnic Diversity."
8. Cech, E.A. & Waidzunas, T.J. 2021. Science Advances 7(3). http://doi.org/10.1126/sciadv.abe0933

A male Painted Turtle (*Chrysemys picta*) from an angle that a female might see.
J.Y. Lamb.

A Tiger salamander (*Ambystoma tigrinum*) is black with yellow patterning under white light (top). Under blue light (bottom) the yellow pattern fluoresces a brilliant green.
J.Y. Lamb.

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world nervous since they started to really spread across the country throughout the last decade. Great Lakes Worm Watch received our first reports from the Ohio area in 2008 and documented our first Minnesota populations in 2010. But the populations did not gain serious attention until 2019 when gardeners in Wisconsin and Minnesota started documenting jumping worms as well as their negative impacts.

Jumping worms have feeding and burrowing habits that radically alter both the structure and chemistry of the soil differently than European worms. Unlike castings from European earthworms that look like fresh dirt in small clumps throughout our garden soils, jumping worm castings are left near the surface and easily erode taking soil nutrients with them. They primarily impact the top few inches of soil where they feed on fresh organic matter (including mulch). Jumping worms are parthenogenic (don't need a mate to reproduce), can grow to sexual maturity in 60 days (compared to 150 for the nightcrawler), live in high densities, have voracious appetites, and can break down woody material, making their ecosystem impacts hard to mitigate.

Through due diligence we can still slow, or even stop, the spread of jumping worms in Minnesota. Avoid activities that we know spread earthworms.

- Throw unused earthworms from fishing trips in the trash rather than the water or land;
- If you have composting worms, freeze the compost before you use it for at least one week (one month is even better) to kill any earthworms and their egg cases;
- Don't transport leaves, mulch, compost, or soil from one place or another unless you know that no earthworms or egg cases are present;
- Clean the tires of ATVs or other vehicles with deep treads that hold soil before moving to new places.

All that being said, the common refrain among those who work with invasive species: the best thing you can do to combat invasive species in not introduce them in the first place. When it comes to jumping worms, this still holds true for most of Minnesota.

RYAN HUEFFMEIER *is a research, outreach, and education specialist in forest ecology and invasive species. He is currently the program director at Boulder Lake Environmental Learning Center in Duluth, Minn. For the past decade Ryan has been part of the Great Lakes Worm Watch. Check out the resources below for more information on earthworms in Minnesota.*

1. Great Lakes Worm Watch: nrri.umn.edu/WORMS
2. Meet the Jumping Worm: jwp.cfans.umn.edu/meet-jumping-worm

The castings of invasive jumping worms are very visible on the surface of the soil since they primarily feed on fresh organic matter near the soil surface. DOUG DIRKS.

The soil around the plant roots pictured above has been completely worked by jumping worms and is now all castings, eroding away. BETH SOLIE.

Get Involved

SAINT JOHN'S OUTDOOR UNIVERSITY

Abbey Conservation Corps Workdays

Wednesdays weekly

csbsju.edu/outdooru/events/volunteer

1:00—3:00 p.m.

Help with land stewardship efforts in the 2,944-acre Abbey Arboretum this season. Meet in Science Lot 1 and be prepared to drive individually to work sites. No experience necessary.

Summer Prairie Hike

Tuesday, Aug 3

Free and open to the public. No registration required.

7:00—8:30 p.m.

Meet at the prairie kiosk for an evening hike on the Boardwalk Loop. Learn about what's blooming in the prairie and watch for wildlife in and around the wetlands. Prepare for about a 3-mile hike.

Member & Volunteer Appreciation Open House

Sunday, Sep 26

1:00—4:00 p.m.

Watch for your postcard invitation to arrive in August.

New this year, we are bringing back our annual open house celebration, but moving it outdoors to the beautiful oak savanna in the fall. Join us as we celebrate the contributions and accomplishments of the past year with live music, refreshments, and outdoor activities. Families welcome! Alternative date, in the case of inclement weather: Sunday, Oct 10.

Save the dates...

Upcoming events already on our calendar. Watch for updates throughout the year.

Wreath Making Sessions	week of Nov 29
Winter Naturalist Series	Saturdays, Jan 8, Jan 29, Feb 12
Snowshoe Making Workshops	Saturdays, Jan 15 or 22
Lake Sagatagan Luminary Hikes	Thurs-Sat, Feb 17-19
Maple Syrup Festival	Saturday, Mar 26
Spring Birding Day	Saturday, May 7
Paddle Making Workshop	Fri-Sat, May 13-14

Meet Amy Shook

2021-22 ENVR. EDUCATION FELLOW

Hailing from Dubuque, Iowa, **Amy Shook is the 2021-22 Outdoor U environmental education fellow**. She has a MS in biology from the University of Louisana at Monroe and a BS in environmental sciences from the University of Dubuque. She recently completed a term with AmeriCorps at the Georgia Sea Turtle Center as part of their education team.

She looks forward to sharing her passion for the environment here in Minnesota. In her spare time, she plans to be out on the cross-country ski trails and enjoying other winter activities while she's here. We look forward to welcoming her in August!

Amy Shook, with an Alligator snapping turtle (*Macrochelys temminckii*) during graduate school.
AMY SHOOK.

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SAGATAGAN SEASONS

Summer 2021

Saint John's OUTDOOR UNIVERSITY

The Program

Saint John's Outdoor University provides environmental and outdoor education through classes, events and initiatives with the Abbey Arboretum, Saint John's University and the College of Saint Benedict.

The Place

Saint John's Abbey Arboretum is more than 2,500 acres of lakes, prairie, oak savanna and forest owned by Saint John's Abbey and surrounding Saint John's University.

In This Issue...

Annual Member & Volunteer Appreciation Open House

Join us for a fall celebration outdoors in the oak savanna.
Invitations will be mailed in August.