



Kemp's Point

Volume 21, Number 1, Spring 2020

News from the University of Wisconsin-Madison's Kemp Natural Resources Station

Scavenging For Light: Understanding how plants grow in the dense shade of Sugar Maples

By Amanda Salvi & Steven Augustine, UW-Madison

The shade below Kemp Station's large sugar maple stands are a stunning habitat to walk through. One can feel a noticeable drop in temperature with the first step into this shadowy habitat, as the bright light of the sun is stolen away by a thick blanket of leaves hanging in the canopy. While shady sugar maple stands are a welcome excursion for most naturalist enthusiasts on a hot day, they are incredibly dark by plants' standards. A life under low light conditions means photosynthetic starvation for most vegetation. The oak or pine sapling unlucky enough to begin its life under a sugar maple stand is often doomed to an early death. But this is not so for all plants. Understory plants, those species that spend their entire life beneath taller trees that cloud the canopy, manage just fine in the shade. How?

Plants in the understory have evolved some clever adaptations to manage living in low-



Little grows beneath the canopy of sugar maples (above). Sugar maple saplings, mosses, and leatherwood are the only plants that can be found scattered within the dense shade. Leatherwood seedlings can often be found emerging through the thick litter underneath the sugar maple canopy (below, left). After emerging, leatherwoods grow up to a couple meters in height, but never reach the tree canopy above them (below, right).



light conditions within the understory. Spring ephemerals, such as the spring beauty, race through their entire life cycle before the tree species above them fully develop their leaves. In this way, they grab all the light they can before the canopy closes and darkness falls upon them. These individuals don't reappear in the understory until the following spring, when the fullness of light has returned.

Evergreen species, such as the winterberry and yew, hold onto their thick leaves throughout a full year and beyond. With leaves always present, these species can and do photosynthesize in any season. As a tradeoff for long-lasting leaves, they can only photosynthesize small amounts of carbon at a time, but make up for it with a growing season that is much longer than other plants.

These two life strategies
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are successful across Wisconsin forests. Yet there is one particular species that stands apart from others. The leatherwood (*Dirca palustris*), a small deciduous shrub, is similar to spring ephemerals in that they open their leaves before the canopy closes. However, while the spring ephemerals senesce and end their growing season, leatherwood continues to develop, grow, and hold their leaves long after the canopy has closed and the shady darkness has fallen upon them. Like the evergreens, leatherwood is able to utilize autumn light once sugar maple leaves have yellowed, dropped, and opened the canopy. Nevertheless, the leatherwood is deciduous, not evergreen, and cannot utilize the winter light on which evergreens also depend. With spring, summer, and fall all being a possible time for leatherwood plants to create sugars from light, the question arises: when does leatherwood perform most of its photosynthesis?

Steven Augustine and Amanda Salvi, two PhD graduate students of Botany at the University of Wisconsin – Madison, along

with Professor Tom Givnish, set out to investigate this understory plant and its unique behavior. It is possible that leatherwood, mirroring a spring ephemeral, does most of their photosynthesizing in the spring, when there is plenty of light. It could be that leatherwood follows the “slow and steady” mantra that have allowed evergreens to do so well in understory conditions; the leatherwood might have low rates of photosynthesis across the long spring to summer to fall growing season. Or perhaps leatherwood instead holds its leaves through the summer so that the plant can get one final burst of sunlight in the fall, after the sugar maples have dropped their bright yellow leaves. Visiting sugar maple stands and the leatherwood beneath it at Kemp Station during the spring, summer, and fall of 2019, Steven and Amanda measured rates of photosynthesis and water transport of several leatherwood individuals. Results suggest that spring, when light easily falls through open sugar maple canopies, is the season when leatherwood photosynthesizes the most. Similar to evergreen species, leatherwood strengthens its

leaves as the summer progresses, allowing it to capture the last rays of light that reach the understory during the fall, when the sugar maples have dropped their leaves.

Steven, Amanda, and Tom are plant ecophysio- logists, meaning they study how plant physiology is adapted to and affected by their ecology (the environmental and biotic conditions in which they grow). Studying Wisconsin’s native flora is a privilege that few ecophysio- logists experience in their lifetime. Wisconsin is home to diverse and unique flora, with communities most noticeably characterized

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Measuring photosynthesis on leatherwood can be a challenge. The thin leaves that emerge early in the spring tear easily when clamped into the Photosynthesis System (LI-COR 6400, above), so a little creativity is needed to support them when they are inside the chamber -- a stacked tote box and cooler (left).



One Stinky Cat

By Karla Ortman

One particularly warm and humid night last summer I was awakened by an odor. Lacking home air conditioning, the windows were open and fans were providing some relief. Unfortunately, the fans distributed the sharp, rank odor throughout the house.

There was no question the odor was from a skunk. Or more accurately, the odor was the sulfur-containing chemicals produced by the skunk's anal glands. According to Wikipedia, "Skunk spray is composed mainly of three low-molecular-weight thiol compounds, (E)-2-butene-1-thiol, 3-methyl-1-butanethiol, and 2-quinolinemethanethiol, as well as acetate thioesters of these. These compounds are detectable by the human nose at concentrations of only 10 parts per billion." Clearly, a little goes a long way!

According to literature about the skunk, the animal tends to be reluctant to expel its offensive spray unless it feels very threatened or scared and must protect itself. That said, younger skunks may be more "trigger happy" than older, wiser animals. The signature black and white, conspicuous coloration of a skunk is an "aposematic signal" telling predators that it is not worth attacking or killing the animal because of what lies within. Before a skunk sprays, a series of warning signals are usually made, including defensive posturing with the tail puffed up and held erect. The animal may also hiss, stamp its feet, and do a mock charge toward the threat. When all else fails, "thar she blows!"

To understand the skunk and its amazingly odifer-

ous defense mechanism, one must understand the animal's rear anatomy. Like most mammals, skunks have two anal sacs or glands, one on each side of the anus. What makes the skunk anatomy unique is the nipple-like protrusions, called papillae, that can be extruded from the anus and pointed in the direction the skunk wishes to spray. It has been shown that the target accuracy of these little shooters is very good. And there is power behind the spray, as it can reach up to about 10 feet. The power comes from the muscles surrounding the anal glands which are engaged when the animal needs to spray.

Thanks to modern technology and You Tube, if a person wishes, they can see a close up of a skunk's anal glands in action! You know you want to: www.youtube.com/watch?v=QnSTOsIt1f8

Once we get past the hideous odor, the skunk is a relatively shy, quiet creature with poor eyesight. Any vocalizing usually occurs in response to another skunk or other stimulus that causes the animal to react in some way. A skunk may hiss, squeal, screech, whine, whimper, or grumble, none of which are done very loudly.



Scavenging.... (Continued from Page 2)

by changes across the Tension Zone – from fiery prairies in the south to quiet bogs in the north. Exploring how species are adapted to these specific environments is a quest like no other. Each system has a plethora of strategies that allow resident plants to compete and thrive there. Researching these strategies allows us to understand the role these environments have on the adaptations we see, as well as understand how Wisconsin has such amazing plant diversity. 🍄

About the size of a cat, skunks are short legged and slow moving. They spend much of their waking hours ambling along in search of food. Skunks utilize their excellent sense of smell and hearing to locate food items. They eat a variety of plant and animal items and their diet differs some by season, based on what is available. Favorites include insects, small rodents, and eggs, but they also eat berries and

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seeds. We have often seen the telltale sign of skunk in our yard -- small holes in the ground, likely dug to extract insect larvae. Due to the presence of adult junebugs around our house last summer, I suspect the skunks find our property like a buffet! It is quite amazing the skunk can smell the larva where it lies a couple of inches below the ground surface.

Skunks are most active from dusk until dawn and spend that time foraging. During the daylight hours, they return to their den to rest. Dens may be dug under buildings or rock and wood piles, or a skunk may utilize an existing den abandoned by another animal. Skunks do not hibernate over winter but instead become dormant and enter a state of torpor. Torpor is a deep sleep where the body temperature drops and metabolism slows. The animal survives off fat stores in its body. They will sometimes den with other skunks to share body heat, and will close off the entrance to their den with leaves and grass to keep the cold out. On a warmer winter day a skunk may come out and forage for food.

In Wisconsin, skunks' mate from mid-February to mid-March. The male searches for a receptive female – a female skunk who is not willing to mate will give off a scent to repel the male, which is different from the defensive spraying. (I have caught a whiff of skunk at this time of year and was puzzled by it, but no longer!) An average litter size of 6 kits are born with closed eyes about two months after mating occurs. At about three weeks of age, their eyes open, and they remain with mom in the den for about 6 weeks total before venturing out with her. The young learn quickly to forage for food items and at 8 weeks old are able to use their spray as defense.

The great horned owl is the only known regular predator of the skunk due to the owl's minimal ability to smell. Other predators, like coyote, wolf or fox, may try to take a skunk but would learn quickly that it may not be worth the price; likewise with domestic dogs, although I suspect there are dogs out there who have been through more than one "de-skunking" treatment.

There are benefits to having skunks around – they eat a lot of insects and rodents that

may otherwise cause damage to property, gardens and crops. And seeing a skunk moseying along, perhaps with a litter of youngsters, can be a neat wildlife sighting. However, their way of living does not always fit well with ours. If you prefer to not have troubles with skunk, understanding how they live will help prevent those troubles. Check out the side bar for some tips on living peaceably with your neighborhood skunks.

As for our little homestead in the woods, we have a "wild" yard and don't mind the skunks treating it like an Old Country Buffet. However, we are considering central air conditioning so we will not only have relief from the summer heat and humidity, but also from the odor coming from the buffet line. 🍷

Living with Skunks

(Adapted from "Skunk Ecology & Damage Management," a publication from UW-Extension, USDA Wildlife Services & Wisconsin DNR)

A few simple tips can go a long way in preventing troubles with skunks:

- *No dinner invitations!* Skunks will eat practically anything, including carrion and food waste, so a bowl of pet food or an open garbage bin may be viewed as an invitation.
- *No vacancy!* As a denning animal, a skunk will take advantage of any space that meets their lodging requirements. This may include the space beneath a porch, a woodpile, or outbuildings. Take a look at your property through the eyes of a skunk and eliminate access to spots that look den worthy.
- *No admittance!* Skunks will eat eggs so if you have a hen house, make sure the structure is skunk-proof.
- *Remain calm.* Skunk in a window well? Place a 2x4 board as a ramp and let it crawl out on it's own. Mom and kits under the porch? Wait for them to leave on their own and close up the access point.



Bud Capping Protects Kemp White Pines from Deer

By Dr. Glen Stanosz, UW-Madison

Most of us who frequent the Northwoods know that white-tailed deer are among the greatest sources of damage to forest trees, shrubs, and herbaceous plants. Eastern white pine (*Pinus strobus*) is one of the favorites for browsing by deer during winters when other food sources are unavailable. White pines at Kemp Natural Resources Station are victims of repeated browsing that threatens their future contribution to a beautiful and sustainable forest.

Deer browsing on seedlings and saplings, especially feeding on the buds of white pine terminal shoots, is particularly problematic. In addition to decreasing tree height, sweeps or crooks in stems develop as undamaged side branches continue to grow and compete for dominance. Even limited browsing can kill small seedlings, and repeated browsing can kill even well-established saplings, potentially leading to failure of new white pine plantings or loss of valuable advanced regeneration in maturing stands.

A determined landowner can protect terminal shoots in yards and small acreages with an easy technique referred to as “bud capping” each fall. Pieces of ordinary photocopy paper are cut into rectangles pieces approximately 3 x 5 inches. Be green and consider computer paper destined for recycling! Load one coat pocket with paper pieces, and another with your household stapler and extra staples.

To apply bud caps, hold a paper horizontally against the white pine shoot with the terminal bud cluster just below the top of the paper. Fold the paper in half around the shoot so that needles are captured and staple two or three times through the paper and needles (upper right photo shows Dr. Stanosz attaching a “bud cap”). The bud cap will be held in place by the staples, deter feeding by deer, and will break down naturally after 3 to 4 months. It is important to ensure that the bud cluster is just below the top

of the paper (lower left) so that when spring arrives, the buds will open and the expanding shoots will grow up out of any remaining bits of the bud cap.

Unfortunately, it is necessary to repeat bud capping each fall until saplings are well above the “browse line” (height hungry deer can reach to feed). Remember, deer can walk on deep, frozen snow, and browse even on rather tall saplings. During the winter of



2018-19 terminal shoots on white pines over seven feet tall were browsed at Kemp! So it may be necessary to gently bend over such tall saplings to secure bud caps.

In two days during November 2019, Professor Glen Stanosz and wife JoAnne placed bud caps on many hundreds of young white pines at Kemp Station. Hopefully, with repeated protection, many of these white pines will grow to someday replace overstory trees lost due to age and disease. While requiring patience and persistence, bud capping is simple and can be a “bonding experience” or used to “build character” of younger family members. And it is can be easily accomplished in late fall while simultaneously using your portable radio or digital device to listen to the Packers defeat the Vikings or Bears on sunny Sunday afternoons. 📻



Protecting Rare Trees

By Dr. Scott Bowe

We can all appreciate the beauty of wood. Aesthetically by its color and grain and scientifically by its carbon negative environmental footprint. Substituting wood for non-renewables is a wise choice for consumers. I have had the opportunity to see some beautiful wood samples on the UW-Madison campus in the USDA Forest Products Laboratory Wood Collection. The Lab's wood collection represents some 25,000 tree species with more than 100,000 wood blocks. Many of the wood samples have backing, which is a herbarium collection of leaves and flowers. This backing allows for a second means of tree identification using tree foliage from the same tree the wood sample was taken. The Forest Products Lab has the second largest wood collection in the world, second only to a collection in Holland.

Not all species are created equally. Some are valued for their unique beauty and can be extremely expensive. Some of these species are rare, which drives up their value. Simple supply and demand. When a particular species is rare, there is a risk of overharvest. To protect against this, countries around the world have passed laws making it illegal to harvest certain tree species. The United States implemented the Lacey Act of 1900, which prohibited interstate trade in illegally taken wildlife, fish, and plants. The primary focus of the Lacey Act was on wild game and birds. In the last century, there was a significant trade in bird feathers for women's hats, which was detrimental to certain domestic bird species.

The Lacey Act was amended in 2008 expanding its protection to a broader range of plants and plant products. It is illegal to import into the United States plants, including wood, that have been illegally harvested contrary to federal law, state law, indian tribal law, or foreign law. For example, if wood from a tree has been harvested in violation of the law, that wood would be seized by US Customs officials. Another aspect of the updated Lacey Act requires documentation called a plant and plant product import declaration, which lists the genus, species, and country of harvest of every plant found in commercial shipments.

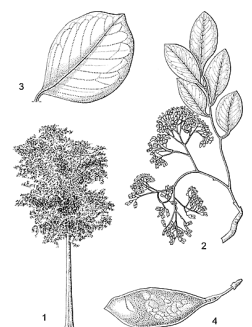
A friend and colleague of mine teaches wood identification courses for U.S. and foreign custom officials, so they are able to quickly identify wood species that people are trying to ship illegally. For example, they may try to ship a banned species such as Rosewood from Madagascar, and label the contents of the shipping container as common legal species. The Lacey Act works in conjunction with the CITES database, a list of animals and plants banned from trade. CITES stands for the Convention on International Trade in Endangered Species, a multilateral treaty. If you Google CITES, you will find a database and checklist list of banned species.

You might remember the news story about the Gibson Guitar Company, which was raided by federal authorities in 2009 and 2011. Federal prosecutors seized wood from Gibson facilities, alleging that Gibson had purchased smuggled Madagascar ebony and Indian rosewood, both CITES listed species. Gibson initially denied wrongdoing then agreed to a criminal enforcement agreement with the Department of Justice, admitting to violating the Lacey Act. Gibson paid a fine of \$300,000 in addition to a \$50,000 community payment, and to abide by the terms of the Lacey Act in the future.

Another well-known Lacey Act violation involved Lumber Liquidators in 2016. It was fined \$7.8 million in criminal fines, \$969,175 in criminal forfeiture, and more than \$1.23 million in community service payments for illegal lumber trafficking. The sentence also included five years of probation, and additional government oversight. The U.S. Department of Justice said it was the largest financial penalty ever issued under the Lacey Act.

There are many beautiful domestic wood species and many abundant tropical wood species that we can use without violating the Lacey Act. Use and enjoy wood in your home, truly a beautiful and sustainable natural resource. 🌳

Rosewood is a valued "tonewood" used in the construction of musical instruments like guitars and cellos. While the raw lumber is protected under CITES, instruments made of the wood were made exempt from trade restrictions in 2019.



Kemp Participates in Wisconsin Insect Biodiversity Survey

Dr. Dan Young of the UW-Madison's Department of Entomology was one of several key players in last year's Wisconsin Insect Fest held at Kemp Station. Now he has selected Kemp as a site to survey as part of the long-term Wisconsin Insect Biodiversity Study. Dr. Young is the Director of the Wisconsin Insect Research Collection (WIRC). According to WIRC's website, the collection contains "...nearly 3,000,000 curated specimens. The collection also houses more than 5,000,000 additional uncurated specimens in bulk, primarily in ethyl alcohol."

Insect survey work has not been conducted in or immediately around Kemp Station, so this will gather baseline data on the beetle diversity, Young's area of speciality, and will augment survey work in other areas of the state. In April, two malaise traps were established to passively collect actively flying insects in the trap sites, which will be in place until fall. Every 7-10 days the captured insects will be gathered



from the traps. Additional on-site hand collecting and collecting by means of other standard insect sampling protocols is expected when Young visits the Station. All insects (beetles and other) will be sorted and research voucher specimens will be deposited in the WIRC.

Although the survey work is primarily a research project, prior to the COVID-19 pandemic, Dr. Young had hoped to incorporate student class

Outreach Programming Pending for 2020

In the back pages of the spring issue of *Kemp's Point* one would expect to find a list of outreach sessions, but, as we all know, this year is different. At the time of publication, it is unknown whether Kemp will be able to hold any outreach events. All University of Wisconsin events are cancelled until June 30 and the ability of Kemp to hold group events after that is still unknown.

Due to the uncertainty, we offer the following list as "save the date, but check back with us." If these or any other events are to be held, additional information will be available at the Kemp Station website, kemp.wisc.edu, and at the Kemp Station Facebook page. An email will also be distributed to our current contact list.

Possible Summer Programs:

Fish Up Close! (for kids)
July 7, 10:00 am (July 14 bad weather date)

Plant Identification Workshop
July 17, 8:30 am-12:30 pm

Wisconsin Insect Festival
July 24 evening - July 25 all day

Fungi Festival
August 21 evening - August 22 all day

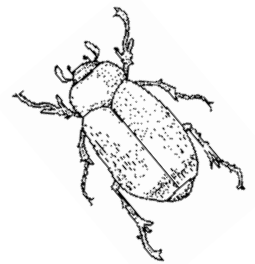
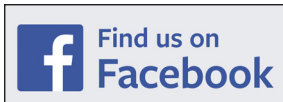
Stay tuned for updates and stay safe and well!

visits to Kemp Station into the survey work, as well as outreach during this year's Wisconsin Insect Fest. While it has yet to be seen if those opportunities will come to fruition, one thing is for certain, many more insects will be added to the WIRC, compliments of Kemp Station! 🐞 -K.O.

Learn more about the Wisconsin Insect Research Collection at <http://labs.russell.wisc.edu/wirc/>



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Junebug (*Phyllophaga* spp)

My grandparents loved to go fishing. Visits to the farm often included an outing to a pond or lake, but first, we had to dig worms. As a kid, this was probably the best part of the adventure...grabbing the “angle worms” as Grampa or Gramma turned over a shovel of soil at the edge of their massive garden. Sometimes during the hunt for bait, we would come upon “a grub” -- a fat, white, curled up, worm-like creature with little legs which I refused to extract from the soil! It went in with the worms and I could tell from the reaction, it was a special find. What I did not know then was that the unearthed grub was the larva of the Junebug. This makes sense to me now because we always saw Junebugs on the farmhouse porch at night, banging against the illuminated windows. Junebugs are beetles and Wisconsin is home to a few species that have a 2-3 year life cycle. Adult females lay eggs in the soil and most of the insect’s life is spent underground in larval form. Feeding on plant roots, they grow larger through three larval stages. The unfortunate ones become fish bait or dinner for animals and birds, such as skunk, raccoon, turkey and sandhill cranes, who dig to find the grubs. As adults, Junebugs only come out at night, feed on plants, mate, and are drawn to the lights. Because they are bulky and clumsy, finding one on its back, waving legs in the air is not uncommon. I will rescue them, but do so carefully as their feet are mighty clingy. Watching a dog or cat deal with the upturned Junebug is something to see. Watch for Junebugs in your yard this summer! -K.O.

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