Minnesota Plant Press

The Minnesota Native Plant Society Newsletter

www.mnnps.org

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Monthly meetings

Thompson Park Center/
Dakota Lodge
Thompson County Park
1200 Stassen Lane
West St. Paul, MN 55118

Programs

The Minnesota Native Plant Society meets the first Thursday in October, November, December, February, March, April, May, and June. Check at www.mnnps.org for more program information.

6 p.m. — Social period

7 – 9 p.m. — Program, Society business.

Feb. 7: Ecophysiology of Woodland Wildflowers, by Dr. Stephen Saupe, professor, Biology Department of the College of St. Benedict and St. John's University. **Plant-of-the-Month:** White snakeroot (*Ageratina altissima*), also by Dr. Saupe.

March 7: Proposed Updates to Minnesota's List of Endangered, Threatened, and Special Concern Species: An Examination of the Administrative, Ecological and Political Processes, by Richard Baker, endangered species coordinator, Minnesota DNR, with special contributions by others. **Plant-of-the-**Month: TBD.

Symposium: Subject, date to be announced.

MNNPS questions?

Go to www.mnnps.org to see the Society blog, news about field trips, meetings, committees, and all issues of this newsletter since 1982.

Climate change and the temperate-boreal ecotone

by Lee E. Frelich, director, University of Minnesota Center for Forest Ecology. This is a summary of his presentation at the Nov. 1, 2012 Minnesota Native Plant Society meeting.

Two papers recently published by myself and colleagues (references at end of article) show that plants are buffeted from above ground by herbivores such as deer and moose, which are in turn regulated partly by wolves, and from below ground by invasive European earthworms. These trophic interactions will help determine how the temperate forest, composed of species like maple, basswood, and oak, expands into the boreal forest of spruce, fir, paper birch, and aspen.

The paper "Sapling growth responses to warmer temperatures 'cooled' by browse pressure," in the journal *Global Change Biology*, resulted from a project by recently graduated Ph.D. student Nick Fisichelli at the University of Minnesota. It shows that deer can reduce growth rates of temperate tree species as the climate warms.

The study was done in northern Minnesota — plots with high and low levels of browsing by deer were surveyed along a climate gradient from the boreal zone south to the temperate zone. This included the zone of overlap in temperate and boreal species ranges, where the two species groups grow together within one stand of trees. Hundreds of saplings were destructively sampled in the field. "Cookies" were cut from the stems throughout their height so that age, radial increment and height growth could be reconstructed for each sapling. Summer temperature and precipitation, and a measure of deer browsing pressure were estimated for each plot. The summer temperature gradient across the study region was about 4.5 degrees F.

On plots with low deer browsing pressure, boreal spruce and fir height growth was consistently less as summer temperature increased, while temperate species — sugar maple and red maple — grew more with warmer summers. Red oak did not respond to temperature. Most importantly, maple and oak growth rates were higher than boreal

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In this issue

Taxonomy notes

A bibliography of plant families, scientific names

Compiled by Shirley Mah Kooyman

Botany in a Day (5th edition), by Thomas J. Elpel, 2008. HOPS Press, LLC, Pony, Montana. 221 pp. A field guide to plant families of North America using the method of patterns of plant identification.

Plant Systematics - A Phylogenetic Approach (3rd edition), by Walter S. Judd, Christopher S. Campbell, Elizabeth A. Kellogg, Peter F. Stevens, and Michael J. Donoghue, 2008. Sinauer Associates, Inc., Sunderland, Massachusetts. 611 pp. This is the latest book on new thoughts of how families are related, based on current research results from molecular biology. A very thorough book used by many as a textbook for teaching.

Species Plantarum, by Carl Linnaeus, 1753. (Facsimile, reprinted 1957), two volumes, Adlard and Son. Bartholomew Press, Dorking, Great Britain. 1,200 pp. This is the bible for the beginning of the Binomial System of plant classification.

Gardener's Latin, by Bill Neal, 1992. Algonquin Books of Chapel Hill, N.C. 136 pp. A type of dictionary for pronunciation and explanation of specific epithets.

Vascular Plant Families, by James Payne Smith, Jr. 1977. Mad River Press, Inc., Eureka, California. 320 pp. Plant families described with line drawings, summary of specific identifying characteristics, and floral formulae.

Botanical Latin (4th Edition), by William T. Stern, 1992. Published in North America in 1995 by Timber Press, Inc., Portland, Oregon. 546 pp. A great book that summarizes the grammar and syntax of botanical Latin. Covers the roots and origins of Latin and latinized terms for anyone who has never taken Latin.

Guide to Flowering Plant Families, by Wendy B. Zomlefer, 1994. The University of North Carolina Press, Chapel Hill, N.C. 430 pp. Nicely illustrated compendium on plant families. This is a compilation of her Ph.D thesis.

MNNPS welcomes new members

The Society gives a warm welcome to 10 new members who joined during the fourth quarter of 2012. Listed alphabetically, they are:

Melissa Bach, Finland, Minn.;
Dale Baumgartner, St. Paul;
Amy Dykstra, Coon Rapids;
Jeanette Holmen, Medicine Lake;
Rosalind Johnson, Bloomington;
Linda and Ron Kuchinka, Faribault;
Scott Leddy, Winona;
Fraser McKee, St. Paul;
Rod Sykora, Minneapolis.

2012 financial report summarized

The Minnesota Native Plant Society closed the year 2012 with total assets of $25,779. This included $16,734 in the checking account, $8,990 in CDs and $55 cash on hand. Income during the year totaled $14,667. Expenses totaled $14,404. The net income gain was $263.

Symposium is being planned

by Scott Milburn

Our annual symposium is currently in the planning phase with a theme similar to last year's symposium. That was "Perspectives in Botany." The date has yet to be decided, but it will either be in April or May. Stay tuned…..

MNNPS Board of Directors

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Stephen G. Saupe: board member, stephen.saupe@mnnps.org

Memberships: memberships.mnnps@mnnps.org

Field Trips: fieldtrips.mnnps@mnnps.org

Historian-Archives: Roy Robison, historian-archives.mnnps@mnnps.org

Technical or membership inquiries: contact.mnnps@mnnps.org

Webmaster: Elizabeth Heck, elizabeth.heck@mnnps.org

Minnesota Plant Press **editor: Gerry Drewry,** 651-463-8006; plantpress.mnnps@mnnps.org

Climate changes

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sapling growth rates at warm temperatures. On plots with high browsing pressure, however, spruce and fir growth rates were about the same as low deer plots (reflecting the unpalatable nature of those species), while growth rates of the three temperate species were lowered compared to low deer plots, so that they all grew less than boreal species. Moreover, the positive temperature response of the maples was flattened by the deer: in warmer areas deer simply ate more. Results for radial growth were very similar.

We think this deer herbivory phenomenon will prevent temperate tree species from increasing their growth rates as the climate warms at the northern edge of their range in areas with high deer populations. This could prevent them from responding to climate change by invading the boreal forest, since boreal saplings will likely continue to grow more than temperate saplings, even when the temperature becomes less than optimal for boreal tree growth. One possible implication would be that boreal species will persist until a threshold temperature is reached, and die suddenly, rather than being gradually replaced by temperate species.

The second paper in the *Philosophical Transactions of the Royal Society-B*, done with the help of a distinguished array of coauthors, explains why moose will be replaced by deer, and earthworm invasion will become more prominent in the temperate-boreal ecotone as the climate warms. The study examines trophic interactions among plants, herbivores like deer that eat plants, predators like wolves that eat deer, and earthworms that recycle nutrients from dead organic matter.

The variable impacts of wolves and landscape configuration on deer populations and stage of earthworm invasion across the ecotone will create a mosaic of impacts draped over the landscape as the temperate forest invades the area now occupied by the southern portion of the boreal forest.

This will lead to various impacts on the future temperate forest. In areas with low deer and earthworm impacts, the historic sugar maple-dominated forest will expand into the boreal forest, along with its iconic plants such as large-flowered trillium. But in areas with high earthworm and deer impacts, the future temperate mesic forest is likely to be dominated by red maple (probably with ironwood, basswood and some oak), and an herb layer dominated by Pennsylvania sedge and related sedge species. Thus, the filters determining which plant species are successful will lead to a regional-scale mosaic of plant communities with varying degrees of novelty.

This white spruce (*Picea glauca*) at the left, a species unpalatable to deer, shows no evidence of browsing. The red oak (*Quercus rubra*) has no height growth and is clearly a favorite of deer. Photos by Nick Fisichelli.

References

Fisichelli, N., L.E. Frelich, and P.B. Reich, 2012. Sapling growth responses to warmer temperatures "cooled" by browse pressure, *Global Change Biology* 18: 3455-3463.

Frelich, L.E., R.O. Peterson, M. Dovciak, P.B. Reich, J.A. Vucetich, and N. Eisenhauer, 2012. Trophic cascades, invasive species, and body-size hierarchies interactively modulate climate change responses of ecotonal temperate-boreal forest, *Philosophical Transactions of the Royal Society-B* 367: 2955-2961.

Mille Lacs Moraine SNA is designated

The Minnesota DNR, with help from The Nature Conservancy, recently acquired and designated 318 acres in Crow Wing County as the new Mille Lacs Moraine Scientific and Natural Area. Located near Garrison and Lake Mille Lacs, the SNA consists of steep hills dotted with small lakes and wetlands. It supports a variety of native plant communities from red oak-basswood forest to northern poor fen wetland. Red-shouldered hawks and cerulean warblers, two species of special concern in Minnesota, nest in the vicinity. The Nature Conservancy worked with the land's owners, the Hormel family, to ensure the land would be protected.

Eastern larch beetles are threat to tamarack forests

by Fraser R. McKee, Ph.D. candidate, Department of Entomology, University of Minnesota. This summarizes his MNNPS talk Dec. 6, 2012.

Bark beetles (*Coleoptera: Curculionidae*) are one of the most important insect herbivores of conifer ecosystems. Bark beetles colonize the phloem layer of trees, disrupting the movement of water and nutrients between the roots and the tree crown, often resulting in tree death. Thus, bark beetles are important agents of forest mortality and can influence tree age, size, and genetic structure; floral and faunal diversity; hydrology and water quality, as well as fire patterns within forest stands.

Bark beetles are considered as either "aggressive" or "non-aggressive." Aggressive species exist for long periods of time as small, endemic populations, attacking weak or unhealthy trees. However, when environmental conditions are favorable, aggressive bark beetles can undergo population outbreaks.

During outbreaks, aggressive bark beetles attack healthy trees, resulting in severe, widespread forest mortality. In contrast, non-aggressive bark beetles exist through time as small, chronic populations and do not undergo population outbreaks. Non-aggressive bark beetles only colonize weakened or recently dead trees and do not cause large-scale forest mortality.

The eastern larch beetle is small, approximately 4 mm long, with a black body and iridescent, maroon wing covers. The beetle is native to North America and has a large distribution that closely matches that of its principal host tree, the eastern larch, or tamarack (*Larix laricina*). Within its range, the beetle will also attack non-native species of larch planted as ornamental trees. The main stem, large branches, and exposed roots are colonized on trees attacked by the eastern larch beetle.

The eastern larch beetle (*Dendroctonus simplex*) is related to some of the most economically important bark beetle species, such as the mountain pine beetle (*D. ponderosae*) and southern pine beetle (*D. frontalis*). Historically, the eastern larch beetle has not been considered a species of economic importance. As a non-aggressive bark beetle, eastern larch beetles typically attack trees that have recently died, are moribund, or suffer from some form of stress (e.g., drought, mechanical injury).

The lifecycle of the eastern larch beetle consists of an egg stage, four larval growth stages (instars), a pupal stage, reproductively immature teneral adults, and reproductively mature adults. Up to three larval broods may be established per year, although only a single reproductive generation is produced.

The lifecycle begins in late April or early May, when reproductively mature beetles emerge from their natal host trees, disperse, and locate non-attacked tamaracks in which to reproduce. Female beetles emerge slightly before the males and are the host-selecting sex. As the female beetles fly through the forest, they use air-borne chemical signals emanating from host trees, as well as visual cues of tree size and shape, to orient towards trees that may be suitable hosts for beetle reproduction.

After alighting onto the bark of a potential host, the beetles chew through the outer bark and into the phloem layer. While tunneling into the tree, the beetles encounter resin pockets used by the tree to defend against insect and pathogen invasion. The chemical composition and toxicity of the resin is evaluated by the invading beetles. If the beetles find the resin noxious, they will abandon the attack and disperse to a more suitable host. If the beetles are not deterred and the host is suitable, they will release aggregation pheromones to attract conspecific female and male beetles to the focal tree undergoing attack.

Beetles arriving at the focal tree also release aggregation pheromones, resulting in a rapid increase in the number of attacking beetles on a focal tree. As the density of attacking beetles increases, anti-aggregation pheromones are released to repel and re-direct arriving beetles into nearby trees. The use of anti-aggregation pheromones prevents over-crowding within a single tree and avoids intraspecific resource competition among the beetles.

Once attacked, tamaracks undergo an induced resin response that increases the production of resin throughout the tree tissues. Increased resin production creates an effective physical barrier to beetle entry. Also, the toxicity of the resin is increased to maximize mortality levels among the attacking beetles. Tamaracks that rapidly up-regulate the resin defense response during the initial phases of beetle attack may kill the beetles before they release aggregation pheromones and avoid further attack.

There is an energy cost associated with increased resin production within a tree. Healthy trees with large energy reserves are better able to increase resin production to defend against beetle attack relative to weakened or stressed trees that have small energy reserves. Because defending against each beetle attack requires an expenditure of energy by the tree, each new beetle attack reduces the tree's ability to defend against subsequent attacks. The use of aggregation pheromones by the

beetles often results in the attraction of more attacking beetles than a tree can successfully defend against. This use of aggregation pheromones to initiate a mass-attack is an evolutionary strategy used by the beetles to overwhelm the defensive ability of the host tree. Eastern larch beetles also vector symbiotic fungi that rapidly invade the phloem and sapwood of the host and reduce the tree's ability to increase resin production in response to beetle attack.

Once a host tree is successfully killed, the beetles begin to construct egg galleries. Initially, egg galleries are excavated vertically up the trunk of the tree and have a slightly winding "S" shape. As more egg galleries are excavated; the galleries begin to intersect one another to form a network. Eggs are laid in small niches cut into the sides of the egg gallery. Each niche contains from zero to four eggs for an average of 1.2 eggs / cm of egg gallery. Eggs can be found in the galleries from mid-May to late June.

Upon hatching, larvae feed in individual larval galleries that are oriented away from the egg gallery. Larvae feed through four growth stages (instars) and are present in the host tree from late June to early August. Fourth instar larvae create a chamber at the end of the gallery in which to pupate. Pupae can be found from mid-July to mid-August.

Teneral adults are found from late August to the following May and are the predominant over-wintering life stage. Some teneral adults remain in the pupal chamber over the winter, while others emerge, drop to the base of the tree, and over-winter in a small, newly constructed gallery. The following spring, the teneral adults engage in a period of maturation feeding under the bark and then emerge as reproductively mature beetles, completing the lifecycle.

Reports of eastern larch beetle

Fully mature eastern larch beetle adult. Photo by Fraser R. McKee.

activity have been recorded in North America for over 100 years. Historically, instances of beetle outbreaks were confined to small, localized areas that were predisposed to beetle attack due to some form of stress (e.g., insect defoliation, flooding, and drought), although beetles were reported to attack healthy trees after the supply of stressed material had been exhausted. This low-level tamarack mortality indicated that eastern larch beetles should be considered as non-aggressive bark beetles.

However, in 1973, an outbreak of eastern larch beetles began in Alaska. The initial cause of the outbreak was uncertain, but repeated defoliation of tamarack by a species of larch budmoth (*Zeiraphera* spp.) in 1975 and 1976 caused the outbreak to rapidly increase in size to 215,000 hectares by 1977. Over 3.3 million hectares of tamarack were affected by 1980, when the outbreak ended.

Similarly, from 1973 until 1986, outbreaks of eastern larch beetles occurred on the east coast of North America from Newfoundland, Canada south through the Maritime Provinces of Nova Scotia, New Brunswick, and Prince Edward Island, and westward into Quebec.

In the United States, the outbreak affected large areas of Maine, New Hampshire, Vermont, and New York. Causes of the outbreak varied by region. Predisposing factors linked to the beetle outbreaks were defoliation by western spruce budworm (*Choristoneura occidentalis*), larch sawfly (*Pristiphora erichsonii*), and larch casebearer (*Coleophora laricella*). A general decline in tamarack health was also credited as a predisposing factor to beetle attack in some areas. In other areas, the cause was unknown. Tamarack mortality within affected stands throughout the east coast outbreak exceeded 75 percent in some areas. Estimates of timber volume loss were not made for all areas of the outbreak; however, more than 1.4 million cubic meters of tamarack were killed in the Maritime Provinces.

The eastern larch beetle outbreaks in Alaska and the east coast of North America were the first records of large-scale outbreaks by this insect. An outbreak of eastern larch beetles in Minnesota has been occurring since 2000. To date, more than 160,000 hectares of tamarack forest have been affected, causing severe tamarack mortality. In many areas, more than 90 percent of the available tamarack has been killed. The cause of the present outbreak is not clear. Tamarack defoliation by a concurrent outbreak of larch casebearer does not appear to be associated with beetle activity.

Research by the Minnesota DNR has determined that only 5 percent of tamaracks killed by eastern larch beetles have been previously defoliated by the larch casebearer. The DNR data suggest that above-average annual temperatures, particularly during the past decade, may be a factor in the outbreak. Warmer temperatures during the spring and summer would allow beetle larvae to develop more rapidly and be fully mature before the onset of cool weather in the fall. Also, warmer fall and winter temperatures may reduce the level of over-wintering beetle mortality. This could result in larger populations of

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Can you identify this weed?

by Gerry Drewry

The weed in the photos at the right is a mystery to the farmer who found it, to the local elevator, and to Syngenta Seed employees at Stanton, near Northfield, Minn. Now our Society has been asked to identify it.

Do you know what it is? We do not think this plant is normally found in Minnesota. So we are turning to our readers. This is the information we have:

•The weed grows in a field near Northfield, in Rice County.

•It was first noticed about three years ago after hog manure had been spread on the farm.

•The field has been in continuous corn for the last three years.

•This weed shows up in August, after the corn has tasseled and is setting ears.

•It is three to four feet high by harvest time. However, some plants growing along the fence line are six to seven feet tall.

•The main stem is approximately ½ to ¾ inch in diameter and remains sturdy after the plant dies.

•There are approximately 12 sets of opposite branches on the main stem.

•The serrated leaves are long and pointed.

•Seeds are in pods under the leaves.

We have received several possible identifications but have no definite answer. One guess is *Acalypha rhomboidea*, "though none of the *Acalypha* sp. get much over two feet tall." The dried plant looks like *Ambrosia trifida*.

If you know what plant this is, send an e-mail with your answer to plantpress.mnnps@mnnps.org We will print the ID in our next newsletter.

Two photos of mystery weed. ***Weed placed in elevator office.***

President's column

by Scott Milburn

If you have not heard yet, the Minnesota DNR has proposed updates to the *Minnesota List of Endangered, Threatened and Special Concern Species*. This list is supposed to be updated every three years, but was last revised in 1996. The proposed revisions are posted online at http://www.dnr.state.mn.us/ets/rulesrevision.html. This site also lists the associated hearing dates and locations.

The only metro hearing will take place the evening of Feb. 7, which conflicts with our monthly meeting. The conflict in dates is unfortunate and disappointing. What I encourage our members to do is to be active and to provide written comments if you see a problem with a proposed status change.

I would also like to bring up my personal opinion regarding the lengthy time span between revisions. This sets a poor precedent, as, with climate change, we may encounter future situations that could result in population crashes of certain species. The moose serves as a prime example of what I am worried about. This species is being proposed for the status of Special Concern. Consider a situation of a severe population crash in the next few years. There is no legislation that allows for an immediate change in status if warranted, and 17 years plus between revisions is not what we need. This should be addressed in these hearings.

Additionally, please question whether some of these status changes or the lack of a status change are the result of science, or of politics and pressure from special interests groups. It is obvious that our Society is often overlooked, but now is a critical time to provide input and to speak up.

Blooming mountain maple shrub (Acer spicatum). Photo by Peter Dziuk.

Larch beetle

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reproductively mature adult beetles the following spring, increased beetle attack on tamaracks, and larger beetle populations. Finally, Minnesota has been experiencing drought conditions throughout much of the state over the last decade. Prolonged drought stress lowers tree health and vigor, reduces the defensive ability of the trees, and makes the trees more susceptible to beetle attack.

The outbreaks of eastern larch beetles in Alaska and eastern North America have prompted some forest entomologists to suggest that the eastern larch beetle should be considered as an aggressive bark beetle species. Certainly, the size, severity, and longevity of the current beetle outbreak in Minnesota reinforce such sentiment. While outbreaks of eastern larch beetles have previously been a rare event, the outbreak in Minnesota provides excellent opportunities for research.

Current research by the forest entomology laboratory of Professor Brian Aukema at the University of Minnesota and the DNR is directed at studying the biology of the eastern larch beetle in Minnesota, determining the cause of the beetle outbreak, and examining the interactions between the beetle and its host tree that affect the reproductive success of the beetle.

Plant Lore

by Thor Kommedahl

What is mountain maple?

Mountain maple is *Acer spicatum*, in the maple family — the only maple shrub.

What do its names mean?

Maple is an Old English word used in the 14th century. *Acer* is a Latin word for maple, and *spicatum* means spiked, referring to its inflorescence.

Where does the plant grow?

It is native to the wooded areas in northeast Minnesota and in border counties of southeast Minnesota. It is often an understory shrub or small tree in both coniferous and deciduous forests.

What does the plant look like?

It is a shrub or small tree with dark or somewhat greenish bark, velvety-hairy twigs, and three- to five-lobed leaves. The many yellowish-green flowers are borne in an erect panicle — a "spiked" inflorescence. The winged fruit is a schizocarp of two mericarps (or a double samara). It forms colonies by sprouting from underground stems and by layering.

Does it have any medicinal value?

The Potawatomi Indians used the inner bark materials for making a cough syrup, and the Micmacs made an infusion from the outer bark to treat sore eyes. This species was listed in the *U.S. Pharmacopeia.* The pollen is a moderate allergen.

Has it any other values?

It is browsed by deer, moose, and cottontails, and the buds are eaten by ruffed grouse. It is sometimes planted as an ornamental.

Minnesota Native Plant Society
P.O. Box 20401
Bloomington, MN 55420

Winter 2013

Thompson County Park:
360 Butler Ave East, West St. Paul, MN 55118

Directions:
Take Highway 52 to the Butler Ave. E. exit in West St. Paul.
Go west on Butler 0.2 mile to Stassen Lane.
Go south on Stassen Lane to Thompson County Park.