In the fall we often don’t have much in the way of showy native wildflowers to enjoy, other than a few late asters, rabbitbrush or some golden asters, but at least we can look forward to some spectacular colors before our deciduous trees and shrubs lose their leaves for good. But not in 2009! An epic frost hit most of western Montana in early October, before most species even had begun to come into color. This was an event that really showed the true Montana natives. As of early December, many ornamental plants still had not lost their leaves, pointing out how sensitive plants can be to changes in the timing of seasons, and how much you can learn by keeping careful records of phenological changes.

Some data suggest that plants can become more sensitive to early frost damage with climate change, just because they are not as well prepared (not hardened off) for these temperatures when mild temperatures or shorter winters prevail. For many parts of the world, peak fall colors are occurring as much as a week or two later than they have historically, suggesting a possible connection with global climate change. But there is no much good information on the timing of fall colors and leaf fall for Montana.

How trees prepare for winter varies by species, and for ornamentals with where they were bred. The process generally starts when night length exceeds 12 hours, or after the fall equinox in mid September. Cool nighttime temperatures, normally in the 40 degree range, can hasten the process of hardening, in which plants change their chemistry and withdraw their sap deep into their trunks. This enables them to withstand progressively colder temperatures without tissue damage. Plants continue to harden off from the beginning of fall all the way into the dead of winter, when some trees can tolerate temperatures of -30 degrees F or more without visible damage. The ability of trees to tolerate these extreme temperatures, in fact, explains the northern distribution of many tree species, and also why conifers dominate the northern or highest elevation forest regions (they can withdraw more water from outer areas of their trunks than hardwoods, preventing cell damage from expanding ice crystals).

So while here in Montana temperatures of 5 or 10 degrees are something that all our plants should be tolerant of in the dead of winter, when these temperatures occur all of the sudden, and in early October, they can cause a lot of damage! For Missoula, the 30-year normal, first hard frost is in late October or early November. We had our first frost, which was a hard frost (28 degrees F or colder) on October 6, following
Chapter Events

Calypso Chapter
The Calypso Chapter had a Christmas Potluck Brunch December 12, 2009 in Butte at the home of Kriss and Rick Douglass.

Upcoming meetings:
- February -- TBA
- March -- TBA
- April -- Third Annual Gardening Workshop

There will be field trips in May, June and August. The Chapter is hosting the MNPS Annual Meeting July 16-18 at the Birch Creek Center. For more information, contact Linda Lyon at l_lyon@hotdawg.umwestern.edu or 683-2878, or Catherine Cain at ecotour@montana.com.

Clark Fork Chapter
Evening Lectures: Thursdays, 7:30 pm, Room L09 Gallagher Business Building, UM Campus, unless otherwise noted:

- January 14—Biologist Kristi Dubois and her husband Bert Lindler talk about their trip and the natural history of The Gambia.
- April 8—"Montana's High Mountain Wildflowers," photos by Clark Fork Chapter members, taken in and around Glacier National Park during last summer's annual meeting.

Herbarium Nights: Tuesdays, 7:30 pm, Room 303, Botany Building, UM Campus

- January 26—Peter Stickney talks about “Hydrophyllaceae: An Acquaintance with Montana's Waterleaf Family.”
- February 23—Scott Mincemoyer, MT Natural Heritage Program botanist, introduces the genus Juncus, Montana's rushes.
- March 30—Find out what cinquefoil means when Peter Lesica presents the genus Potentilla.

Flathead Chapter
Monthly meetings are the 3rd Wednesday of most months, October through May at Discovery Square, 540 Nucleus Ave. in Columbia Falls (the old First Citizen's Bank). Programs start at 7:00 pm unless otherwise noted. Members are encouraged to attend the 5:30 general meetings to discuss and plan chapter activities and business. Feel free to bring your supper.

- January 20—"Noxious Weeds and Cooperative Management," presented by restoration biologist Joyce Lapp and Dawn La Fleur, Glacier National Park resource staff. Learn basics about noxious weeds and a cooperative effort to pull federal, state and county weed managers together with local gravel pit operators to improve weed management.
- February 17—"Siyeh Pass Virtual Field Trip." Shake off your winter blues and follow Glacier National Park's Jen Asebrook and her camera to the remarkably diverse and spectacular wildflower habitats of Siyeh Pass. This program will follow a short video on conserving the Transboundary Flathead, presented by Dave Hadden.
- March 17—"Nature Journaling," with Karin Connelly. A little drawing, a little painting, a little outside the box. For novice or veteran journal keepers.
- May 19—Talk or field trip with Steve Wirt. Time and subject TBA. Stay tuned!

Kelsey Chapter
Meetings are free and open to the public. The following meetings will be held at the Lewis & Clark Library. For more information, call Kathy at 449-6586.

- January 19—John Beaver from Westech will present a program on the results of restoration work he has been involved with and his thoughts on restoration strategies.

- February 16—Chris Smith from Montana Fish, Wildlife and Parks will discuss plans for the Montana Outdoor Education Center at Spring Meadow Lake. The center will establish a native plant garden as one of several outdoor features. Jointly sponsored with Last Chance Audubon.

- March 24—Loren Bahls presents “Exploring the Little World of Diatoms: Montana’s Smallest Native Plants.” Learn why diatoms are plants, even though they don’t have leaves, stems, roots or flowers. Bahls explains why diatoms are important, and will discuss some current work he's doing in Glacier National Park and at Indian Meadows Research Natural Area.

Valley of the Flowers Chapter
Chapter meetings are the second Tuesday of each month at 7:00 pm in Room 108, Plant BioSciences Bldg, MSU Campus.

- January 12—“Master Gardener Program,” presented by Toby Day, Extension Horticulture, MSU
- February 9—“Sagebrush Steppe Communities: Documenting Plant Biodiversity,” by Matt Lavin, Dept of Plant Sciences & Plant Pathology
- March 9—“Biomimicry: Borrowing Ideas from Plants,” by Robyn Klein, Biomimicry Institute, Missoula, MT
- April 13—“Wildflowers of the Southwest,” presented by Sharon Eversman
Well, it’s winter here in Montana again, whatever that means these days. The latest data from the climate scientists shows that the global climate is continuing to heat up but, as we all know, short-term weather predictions are a pretty tough business. Where I live we just got our first blast of below zero temperatures, although it seems like overall it has been fairly mild and dry recently. I hear that moderate El Nino conditions are currently in place, which affect our seasonal weather and often mean a drier and warmer than average winter in the Northern Rockies. This can have a big impact on our snowpack conditions, which can have a big impact on a lot of our native plants. It will be interesting to see how the weather plays out this winter and what our plants do next spring and summer as a result.

Another effect of El Nino often is wetter than average conditions in the southwest deserts, especially in southern California. If you’re thinking of heading south early this spring to see the desert bloom, it may be a good year. But nothing is guaranteed with short-term weather, so you’ll have to pay attention over the next couple of months to see what actually happens.

So wherever you’re thinking of traveling, or even if you’re just staying home, keeping track of the weather can be pretty useful for understanding what’s going on with native plants. And no matter what, there are sure to be surprises!

~ Dave Hanna
Our affinity for gardening runs deep. We grow backyard vegetable gardens, befriend neighbors with seed swaps and rhizome divisions, enter our prized “Dolly Parton” tea rose hybrid in the county fair, generally and puzzle our way through life’s hardships with our hands in the dirt.

The idea of gardens as teaching tools – “outdoor classrooms,” – has been generating a lot of excitement in recent years, and is one of the fastest growing trends in environmental education today. Throughout history, in families and communities, one generation has guided the next in the art of cultivating plants. What elders didn’t have to contend with, however, was the competition from 3D video games and instantaneous access to unlimited information and entertainment.

According to the Children and Nature Network, children spend an average of 45 hours a week in front of a screen. They will only spend an average of 30 minutes engaged in unstructured play outdoors. Troubling statistics like these make us stop and think, what sort of outdoor opportunities are we offering our children?

Teaching gardens offer one practical solution, providing safe places for kids to engage hands-on with the world around them.

Native plant gardens, in particular, are great places to begin reconnecting kids with nature. They demonstrate our regional biodiversity, affirming and building on our sense of place in the world. Learning to identify some common species, and later recognizing them in natural areas, is a source of pride and delight at any age. Native plant communities also provide needed habitat, bringing local wildlife ecology right into our backyards. Many of us have practically stopped noticing robins, grasshoppers, squirrels and other such mundane animals, but up-close encounters with these creatures is what shapes our world when we’re young.

In a native garden, there is more to learn than just “how to grow plants.” Garden planning, installation and caretaking all offer opportunities for real world lessons in math, literature, art, economics and more. A diverse collection of native plants is a living history of our natural world, and a starting point for exploring human culture. And within the garden, you’ll find a ready-made science lab, teeming with experiments to be performed, measurements to be collected and observations to be recorded.

While any garden can offer opportunities for learning and discovery, there are some key elements to consider when designing a teaching garden. First, consider your audience. Is this a public space that adults will use? If so, interpretive signs, plant labels and sources for more information will enrich the experience. Quality interpretive materials can transform an ordinary garden into a model for homeowners and other organizations interested in developing their own native gardens. Is this a space primarily for kids? Kids see the world a little differently, and taking the time to look at things from their point of view can make all the difference. Most importantly, kids like to play; it’s how they gather information about the world. Places to hide, climb and run are essential. Plants should be sturdy and relatively trample-proof, or protected by obvious barriers. Clearly defined boundaries will create a “safe zone” where kids can move about as they choose.

To enhance the educational potential, think about dividing the garden into thematic areas. Groups of wetland plants, prairie habitat or plants that attract particular pollinators all demonstrate distinct, interesting and observable characteristics. Focusing on how these plants form habitat for wildlife also is appealing, and snags, fallen logs and nesting boxes can enhance this.

Creating native gardens is a great way to promote regional biodiversity. It is a fortunate benefit that these gardens might also cultivate future generations’ relationships with their environment.
weeks of mild weather. We had hard frosts every day for over a week, including the worst on Oct 13 at 3 degrees F! Three more days with temperatures below 10 degrees continued to hit our plants over the next two weeks.

In our area, the main effects of several days of severe frost were most obvious in the gray, brown or black colors and the curled up leaves of native plants, which held firmly onto their twigs and branches weeks after they normally do. So why were there few colors on the leaves of native plants, and why didn’t the leaves fall when they normally should?

Although cool (but not freezing) temperatures can accelerate the process, most temperate plants use day length to determine when to start hardening off, and when to start cutting off the flow of water to leaves and the flow of sugars from leaves to stems. If a severe frost occurs before leaves have begun to turn colors, it is likely that they have not completed growing an “abscission layer,” or a corky growth that cuts off the flow of liquids between the base of the leaf and the stem. So, in essence, leaves were “freeze dried” to stems this year.

A few native plants, such as ninebark (*Physocarpus malvaceus*) and quaking aspen (*Populus tremuloides*), had developed their abscission layer before the frost, and so lost their leaves close to the normal calendar date. Western larch, a deciduous conifer, turned colors close to its normal date (but with much less vibrance), presumably because it also was more hardened off when the frost occurred. But most of our common native species, such as chokecherry, snowberry, serviceberry, cottonwood, elderberry and mountain ash, had stiff brown leaves, some of which persisted for weeks after their normal drop-off dates.

Of course, for native Montana plants, this is something most of them have survived before. The crazy variation in weather, in fact, has been a powerful force in selecting for the few species that can thrive in our state. Some tender twigs may have been damaged, but overall our shrubs and trees should still put out a healthy flush of green leaves next spring whenever the soils thaw out and the air warms up enough for them.

As scientists have become more interested in how weather affects plants, the old science of “phenology,” or the study of the timing of nature’s events, has become re-invigorated. All over the world, scientists are working with naturalists, native plant enthusiasts, gardeners, school children and others so that we can have better observations and data on when leaves and flowers come out in the spring, and when leaves turn colors and fall off in the autumn. Every year is different, so it is especially interesting and valuable to document these patterns in Montana over time. Please visit the website for Project BudBurst (www.budburst.org) and register your favorite walking spot and wildflowers, trees or shrubs so that you can help with this effort next spring. For more information, contact Paul Alaback (palaback@gmail.com), or call 493-1842.
Dodder: Hardly Doddering
by Peter Lesica

Dodders (Cuscuta spp.) are surely among the world’s most unusual plants. They are parasitic on other flowering plants and lack leaves or any photosynthetic tissues. This is odd enough, but unlike most other parasitic plants, such as broomrapes (Orobanche spp.), paintbrushes (Castilleja spp.) or even mistletoes (Arceuthobium spp.), dodders have no roots. They can be annuals or perennials that overwinter in stem segments. Our Montana species have yellow or orange twining stems.

Dodders are closely related to morning glories, but the flowers are inconspicuous though sometimes with intricately ornamented corollas. There are about 150 species of dodder worldwide, most common in subtropical and tropical America. Only four or five species have been reported in Montana, where they often have been been collected parasitizing native and introduced legumes, as well as spotted knapweed and other members of the Aster family.

In some ways, dodder acts more like an animal than a plant! Other parasitic plants, such as broomrape, have seeds that germinate only when they are contacted by host root exudates, but not dodder. Dodder seeds germinate on the surface of the ground and then forage for their host. The stems grow outward, waving around until they reach a host plant. The juvenile stems can reach up to 6 cm (2.4 inches), but they must find a host within a few days or die trying. The way dodder is able to choose a host is reminiscent of an insect herbivore or parasite. Researchers have demonstrated that dodder stems will orient toward a tomato plant or even a vial of tomato extract as long as the odor can be detected. Other studies have shown that dodder can locate a host by the quality of light reflected off the host’s leaves and will even preferentially move toward hosts with higher chlorophyll content, which presumably contain more sugars.

As soon as a dodder stem twines around its host, it begins to form haustoria, specialized short stems that tap into the host vascular tissue. Dodder develops two different extensions from its haustoria: a hand-like form that surrounds the phloem and a straw-like form that pierces the xylem. In this way dodder can obtain everything it needs from its host.

Most species of dodder can parasitize many different host plants, but studies have shown that dodder grows better on some hosts than others. Furthermore, several studies have shown that dodder is able to infect preferentially those hosts that provide the most benefit. Colleen Kelly, from Oxford University, found that the choice is based on chemicals in the bark that dodder can detect before forming haustoria. Kelly also found that having two different hosts was better than one, although a second independent study failed to confirm this result.

The effects of dodder go beyond just individual host plants. By the end of a growing season a single dodder plant may form thousands of haustorial connections with many different host species and cover an area the size of a small house. Of course this can have significant effects on plant communities. Since they are somewhat host-specific, dodders can alter community structure by preferentially damaging some species more than others. For example, University of Montana’s Ray Callaway and his collaborators found that dodder reduced the dominance of glasswort (Salicornia) in favor of sea-lavender (Limonium) in California coastal marshes. Dodders also may damage commercial crops, such as tomato, pumpkin and alfalfa. Indeed, this is why we know so much about dodder ecology. Dodders’ negative impacts also extend beyond simple parasitism. For example, they can be conduits between host plants for viruses, including disease-causing pathogens. Some diseases can spread more quickly through a crop field infested with dodder than one without.

On the positive side, a native Chinese dodder has been used to control bittersweet (Mikania), a serious invasive weed in China as well as Puerto Rico. The native dodder causes a decline in the invader, resulting in greater nutrient availability to native members of the community.

Although it might seem like host plants are defenseless against the wily dodder, this may not always be the case. Recently researchers have found that some host plants transfer messenger RNA (mRNA) into their dodder parasites. Some of these mRNAs can incapacitate dodder’s genetic machinery, thereby reducing its ability to make proteins and grow. This discovery has spawned an interest in genetically engineering crop plants that produce dodder-destroying mRNA. With luck agriculturalists may be able to turn dodder’s voracious appetite against it.


MNPS Chapters & the Areas They Serve

CALYPSO CHAPTER - Beaverhead, Madison, Deer Lodge, and Silver Bow Counties; southwestern Montana
CLARK FORK CHAPTER - Lake, Mineral, Missoula, Powell, and Ravalli Counties
FLATHEAD CHAPTER - Flathead and Lake Counties plus Glacier National Park
KELSEY CHAPTER - Lewis & Clark, Jefferson, and Broadwater Counties
MAKA FLORA CHAPTER - Richland, Roosevelt, McCona, Sheridan, and Daniels Counties
VALLEY OF FLOWERS CHAPTER - Gallatin, Park, and Sweet Grass Counties plus Yellowstone National Park

All MNPS chapters welcome members from areas other than those indicated. We’ve listed counties just to give you some idea of what part of the state is served by each chapter. Watch for meeting announcements in your local newspaper. Ten paid members are required for a chapter to be eligible for acceptance in MNPS.

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Your yearly membership fee includes a subscription to Kelseya, the quarterly newsletter of MNPS. We welcome your articles, field trip reports, book review, or anything that relates to native plants or the Society. Please include a line or two of “bio” information with each article. Drawings should be in black ink or a good quality photocopy. All items should be typed, saved in Microsoft Word or rich text format (rtf), and sent electronically to: carokurtz@gmail.com or mailed to Kelseya Editor, 645 Beverly Avenue, Missoula, MT, 59801.

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The deadline for each issue is Fall–September 10; Winter–December 10; Spring–March 10; Field Trip Guide–April 10; Summer–June 10. Please send web items to our webmaster concurrent with these dates.

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