Volume 30 No. 2 | **Winter 2017**

Kelseya

Newsletter of the Montana Native Plant Society



Kelseya uniflora
ill. by Bonnie Heidel

2016 SMALL GRANT REPORT

Willard High School Students Help Create a Nature Adventure Garden

By Lisa Bickell, Montana Natural History Center

In June 2016, the Montana Natural History Center opened a Nature Adventure Garden adjacent to our headquarters in Missoula with $1,500 "seed" funding from the Montana Native Plant Society. It was an exciting project created for kids, by kids.

From last March until June, MNHC staff worked directly with a class of Willard Alternative High School students to design the space. Willard students began by researching the importance of providing opportunities for children to explore and play in the outdoors. This research led to the development of an interpretive sign that is displayed near the public entrance to the garden. The class was divided into design teams based on their interests and experience: creative play, active play, quiet spaces and natural history education. Each group was responsible for exploring natural play spaces and gathering images and ideas that fit their design topic. Students also researched native plants that would be appropriate for our location and specific site requirements. Student groups presented their design ideas along with proposed plants for the garden spaces.

On June 1, the Willard students and other volunteers worked at MNHC for a full day of planting, setting up play spaces and spreading mulch. The students created a willow tree tunnel, chalkboard mushrooms for art in the garden, a sand pit (maybe for eventually hiding dinosaur bones!), and quiet places to relax and reflect.

Several other partners also stepped up to help with garden elements:

- We worked with a local Eagle Scout and Gecko Fencing to install an attractive fence around the garden site. The Eagle Scout provided all of the labor and guidance for the project, while we supplied materials.
- The City of Missoula provided mulch from spring tree trimming.
- Bad Goat Wood and Heritage Timber donated large pieces of trees to add structure to the space.
- The Missoula Youth Philanthropy Club provided funding to add giant boulders and other play elements requested by the Willard students for their design of the space.
- The Endangered Species Coalition planted milkweed for butterfly habitat.

With the garden opening in June, just before the start of summer camps and our 25th anniversary celebration, we have seen the activity in the space grow steadily. To date, 415 summer camp kids have used the garden for learning, exploration and play; more than 30 volunteers have given time to implementing



Two Willard students enlisted help from their families to build a sandbox for the new garden. Staff use it as a teaching station, but mostly we discovered that preschoolers like to sit in it and feel the sand between their toes! *Photo courtesy MNHC.*

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Chapter Events

Calypso Chapter

Info: Catherine Cain at 498-6198, nativeplants@montana.com.

Clark Fork Chapter

Info: Anne Garde at 721-7627, anniegarde@yahoo.com.

Monday, January 9, 7:30 p.m. Phil Hahn conducted his Ph.D. research on monarch butterflies in Wisconsin and is continuing his studies here in Montana. He'll talk to us about "Monarchs and Milkweed: Ecology, Coevolution and Conservation" at this joint meeting with Montana Audubon. Room 123, Gallagher Business Bldg., UM Campus ***(note the different day and location)***.

Tuesday, January 31, 7:00 p.m. Herbarium Night. Want to make sense of grass taxonomy? Join Peter Lesica for an exposé of "Tribal Behavior in the Grass Family." Room 303, Botany Bldg., UM Campus.

Thursday, February 9, 7:00 p.m. Steve Arno and Carl Fiedler have been studying Montana's forest for decades. Come hear them tell us about "Natural History, Ecology and Ethnobotany of Ponderosa Pine" and purchase a signed copy of their new book on p-pine, with some of the profits going to MNPS. Room L09, Gallagher Business Bldg., UM Campus.

Thursday, March 9, 7:00 p.m. Can you remember the names of all those wildflowers? You haven't seen them for nearly a year. Get an early-season refresher when Clark Fork Chapter photographers show their slides of "Western Montana Forest Wildflowers." Room L09, Gallagher Business Bldg., UM Campus.

Thursday, April 13, 7:00 p.m. Montana Natural History Center's Lisa Bickell will introduce us to their new native garden and how she went about "Building a Native Plant Garden for Play and Education." Room L09, Gallagher Business Bldg., UM Campus. (See related field trip, below.)

Saturday, April 15, 1:00 p.m. MNHC's Lisa Bickell will walk us through their new garden and tell us about the design process; see the native plants specifically chosen to fit and thrive in a children's play area. Montana Natural History Center, 120 Hickory Street, Missoula.

Eastern At-Large

Info: Jennifer Lyman at 426-1227, jenclyman@gmail.com

Flathead Chapter

Info: Tara Carolin at 260-7533, mnps.flathead@gmail.com.

Come discuss Chapter business and activities at 5:30 p.m., followed by a public program at 7:00. North Valley Community Building (Teakettle Hall), 235 Nucleus Ave., Columbia Falls.

Wednesday, January 18. Flora and Fauna of the Canadian Arctic. Join retired Parks Canada biologists Cyndi Smith and Peter Achuff for a tour of five of the most remote national parks in Canada: Aulavik, Auyuittuq, Ivvavik, Quttinirpaaq and Tuktut Nogait. Riotous growth and activity — from arctic fox pups playing to musk ox grazing amidst colorful flowers — is crammed into the few short weeks of summer while the sun never sets. Peter retired in 2007 as the national botanist for Parks Canada, specializing in rare plants and ecological land classification. Cyndi retired in 2012, after a long national park career spanning park interpretation to law enforcement to vegetation restoration. Both finished their careers in the Waterton-Glacier International Peace Park.

Wednesday, February 15. Ethnobotanical Roots in the Rockies. Anthropologist Sally Thompson will engage the audience in a discussion of plant foods, medicines and materials important to indigenous people of this area. She will draw heavily on her 2015 book "People Before the Park: The Kootenai and Blackfeet Before Glacier National Park." Central School Museum, 124 2nd Ave E N, Kalispell ***(note different location)***.

Wednesday, March 15. Mushrooms. Missoula mushroom guru Larry Evans will present a fungus-related program; exact subject TBD.

Wednesday, April 19. A Phytocentric Hawaiian Vacation. Peter Lesica, botanist, educator and resource management specialist in Montana for over 30 years, has written numerous articles and books on Montana plants, including "Flora of Glacier National Park" and "Manual of Montana Vascular Plants." His latest project is co-editing "Montana's Pioneer Botanists: Exploring the Mountains and Prairies," to be published by the Montana Native Plant Society, Summer 2017. Peter's vacations center around hiking and, of course, native plants. Spend an evening with Peter as he takes us on vacation in Hawaii. (Subject could change to "Utah Wildflowers.")

Kelsey Chapter

Info: Bob Person at 443-4678, thepersons@mcn.net.

Maka Flora Chapter

Info: Libby Knotts at 774-3778, libbyknotts@gmail.com.

The Chapter is hosting the Annual Membership Meeting, June 23-25, 2017 at the Eastern Montana Bible Camp, located near Lambert, MT.

Valley of Flowers Chapter

Info: Jeff Copeland at 539-6029, jouzelcopeland@gmail.com.

Meetings are held in Room 108, Plant Bioscience Bldg., MSU Campus at 7:00 p.m., unless otherwise noted.

Tuesday, January 10. Common Montana Grasses and Allies. Join Matt Lavin, curator and director of the MSU Herbarium, for a seminar on identifying common Montana native and exotic grasses, and grass-like species. Presentation will include plant specimens from the herbarium.

Tuesday, February 21. The More Things Change, the More Things Change: Fire, Climate Change and Native Vegetation. Kristen Emmet, an MSU Ph.D. student in Earth Science and Ecology, will discuss her research on the interactions of fire, climate and vegetation as it pertains to modeling climate change in the Yellowstone Ecosystem.

Tuesday, March 21. Exotic Plants of Southwestern Montana. Dr. Robert Pal, a professor of biology and director of restoration at Montana Tech in Butte, is fast becoming a leading expert on non-native plants in Montana. His uncanny skill at discovering and identifying exotic plants living among natives is already renowned. He will present some of his findings Tuesday night.

Tuesday, April 11. Vital Associates of Native Plants. Cathy Cripps, MSU mycology professor and mushroom foray leader, is an internationally renowned expert on the fungi of alpine and subalpine areas, especially those that live in partnership with higher plants. Come hear her speak about these partnerships, and what her research group is discovering about their role in Montana native plant communities.

Western At-Large

Info: Jon Reny at 334-0459, jreny@kvis.net.



President's Platform

Kathy Settevendemie is enduring time away from Montana's recent arctic conditions on a sail around the Bahamas with her husband. We will welcome her back in these pages next spring.

In her absence, the MNPS Board would like to acknowledge the following people who have made donations at some level over and above their membership this year:

Calypso Chapter: Judy and Roger Chadwick

Clark Fork Chapter: Karen Renne

Kelsey Chapter: Lisa Larson, Jean and Charles Parker, Michael and Debbie Lee

Western At-Large: Pat Muir

We also extend a warm blanket thank-you to anyone who has ever given a financial gift to MNPS in the past. We appreciate your support.

—With gratitude and joyful holiday wishes to all!

Everything Edible Master Gardener Celebration

Master Gardener Montana and the Montana State University Extension Service are hosting a conference on "Everything Edible: Roots to Fork" on Saturday, March 4, 2017 at the Lewis and Clark County Fairgrounds.

In addition to a vendor trade show, there will be sessions on everything from pollinator pathogens and soil fertility to designing edible landscapes to saving seeds and supporting pollinators. Lunch and snacks are provided with registration. To find out more or to register, contact helenamastergardeners@gmail.com or go to http://www.lccountymt.gov/fileadmin/user_upload/Education/Extension/121316_Registration_Form.pdf.

Chapter News

MNPS "On The Edge"

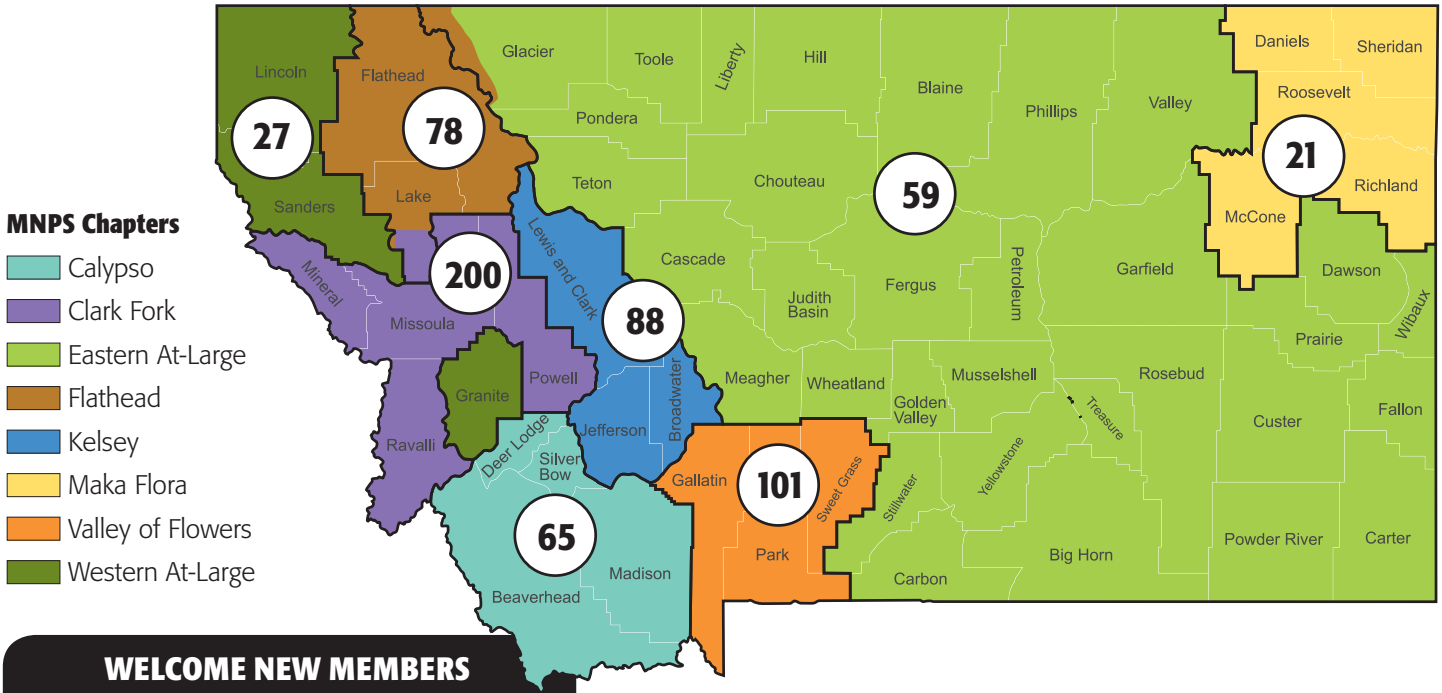
Submitted by Libby Knotts, Maka Flora Chapter

Plan now to venture to the edge of Montana – the eastern edge that is – for the 2017 Montana Native Plant Society Annual Membership Meeting. "On the Edge" is the theme for this gathering, scheduled for the weekend of June 23-25. The Maka Flora Chapter will host the meeting at the Eastern Montana Bible Camp, a rustic camp with modern facilities located in the badlands, 12 miles south of Lambert and about 50 miles north of Glendive. Explore native plants of eastern Montana, including species of the prairie, hardwood draws, badlands and river bottoms. Look for complete information and registration materials in the spring issue of *Kelseya*. Be sure to save the dates!



Discover the plant communities of eastern Montana, June 23-25, 2017.
Photo by Libby Knotts.

MNPS Membership Map



WELCOME NEW MEMBERS

The Montana Native Plant Society welcomes the following new members:

Clark Fork Chapter
Ryan Hegstad, Paul Buck, Brittany Webr and Samuel Isham

Kelsey Chapter
Justina Dumont, Ken Kailing and Dona Nickel-Kailing

As of December 1, 2016, the Montana Native Plant Society has 682 members, of which 81 are lifetime and 43 are other native plant societies, libraries, botanical gardens and allied nonprofit organizations. Five hundred and ninety members live in Montana, representing 93 different cities and towns; 92 live out of state or country. The above map shows members by Chapter area (some out-of-state members identify themselves with a Chapter).

Officer Nominations
MNPS Wants You!

Consider stepping into a bigger role with MNPS by joining the Board of Directors. It's fun, fulfilling, and there are only three meetings per year. Each year, three of six Officer positions are elected. Other positions are appointed as needed. The newsletter editor and webmaster receive a small stipend, while all other positions are volunteer. Board members are reimbursed for milage and expenses. If you or someone you know might be interested in serving, ask a Board member for more information. They are listed on the website under State Society/ Board of Directors and on the back of this newsletter.

In 2017 we will be electing a President, Treasurer and Western At-Large Representative for two-year terms. The nominating committee is accepting nominations until February 15, 2017. Email inquiries or nominations to Betty Kuropat at bkuropat@centurytel.net, Gretchen Rupp at beesgrmt@gmail.com, or Rachel Potter at jrepotter@centurytel.net.

Small Grants 2017
Proposals Due January 31

It's time to prepare and submit your proposal for a Small Grant from the Montana Native Plant Society. If you don't have a project idea, please share this with someone who might.

The annual Small Grants competition is for projects or studies that: 1) stimulate research, conservation and educational activities that help foster an appreciation of Montana's native plants and plant communities; and 2) promote native plant conservation through better understanding of Montana's native flora and vegetation and factors affecting their survival.

Project or study proposals must pertain to Montana native plants, and applicants must address specific criteria and formatting requirements. All proposals that meet the minimum criteria will be considered for funding up to $1,500. Proposals that demonstrate initiative and cooperation with others, and those that generate data or public support for conservation of native plants in the wild, are preferred. Proposals must be emailed by January 31, 2017. Grant recipients will be required to submit a final report of the study or project accomplishments by January 2018.

Complete eligibility criteria and application instructions are in the "Call for Proposals" on the MNPS website (http://www.mtnativeplants.org/Small_Grants_Program) or you can contact the Small Grants committee chair, Betty Kuropat, at bkuropat@centurytel.net.

Conservation Update

Submitted by Peter Lesica, Conservation Committee

MNPS IS A MEMBER OF A COALITION OF WESTERN NATIVE PLANT SOCIETIES WORKING TO ENCOURAGE THE USDA AGRICULTURAL RESEARCH SERVICE TO DEVELOP NATIVE SOLUTIONS FOR GRASSLAND RESTORATION. Their annual focus group meeting was held in Utah this past autumn. Our coalition was represented by Raven Reitstetter with the Utah Native Plant Society. Here is his report:

The USDA Agricultural Research Service's Forage and Range Research Laboratory (FRRL) held its annual focus group executive committee meeting on 20 September in Salt Lake City, Utah. The group consisted of representatives of the livestock and nursery businesses, U.S. Forest Service, Natural Resources Conservation Service, Bureau of Land Management and western native plant societies.

One of the central discussion points during the meeting was the use of native plants for rangeland rehabilitation and enhancement projects. A presentation on the Presidential Memorandum on Creating a Federal Strategy to Promote the Health of Honey Bees and other Pollinators set the stage for discussions on the need for increased use of native plants, especially forbs, for rangeland restoration projects and suggestions to increase FRRL's involvement in this area. Along these lines, FRRL scientists reported on their research on native legumes (basalt milkvetch, *Astragalus subcinereus var. basalticus*; Western prairie clover, *Dalea ornata*; and Searle's prairie clover, *Dalea searlsiae*) for potential germ plasm release, and their involvement with USFS-driven research on the establishment of "forb islands" for revegetation purposes. The need to investigate the use of plant species other than forage kochia for fire breaks was raised as well. FRRL's focus shift on native plant species may be underlined by the fact that three out of four grass germ plasm releases in 2016 were composed of native species (slender wheatgrass, *Elymus trachycaulus;* Basin wildrye, *Leymus cinereus;* and Thurber's needlegrass, *Achnatherum thurberianum*; with the non-native grass being ForageCrest crested wheatgrass, *Agropyron cristatum*).



Slender wheatgrass *(Elymus trachycaulus)*.

Dave Powell, USDA Forest Service (retired), Bugwood.org

continued from page 1

and maintaining the garden; an estimated 300 adults and children attended our community celebration on June 15, which included staff-led activities in the garden; several groups visited MNHC throughout the summer for organized programming, serving an estimated 200 children; and an estimated 100 people visited MNHC each week during our summer of free admission.

In the few months that it has been open, the Nature Adventure Garden has become an essential space for our summer camp and school field-trip programs. We've had families spend time there during the day. We notice that logs and stumps are moving around the garden daily as kids tip them over to find insects. We continue to be impressed with the value it adds to our neighborhood.

But the greatest impact we experienced was with our Willard partners. The kids were easily motivated to learn about native plants, children and nature, and how to design a garden for many uses. They had lots of ideas based on their own childhood experiences and what they believed kids would want to see in a garden designed for nature-based play. They approached the project with seriousness and commitment. It was exciting to arrive on work day to find them already here and ready to go. They planted the dozens of shrubs and flowers that we purchased from Nature's Enhancement without complaint! They were thrilled to see the big boulders located exactly where they wanted them for quiet reflection or climbing. One group designed a willow tunnel and another group put together a chalkboard mushroom forest.



Willard High School students complete their garden projects at MNHC on June 1. New native plants were installed throughout half the space, and students created areas for learning, artistic exploration, quiet reflection and active play. *Photo courtesy MNHC.*

The kids were easily motivated to learn about native plants, children and nature, and how to design a garden for many uses.



Native plants were used to design different zones for activity. Here, a grouping of aspens surround a future sand pit and found-object area.. *Photo courtesy MNHC.*

The most inspiring project was the sand table. Two of the students — sisters — asked their brother to construct a wooden table that could hold sand, allowing kids to gather around for play or exploration. On our work day, their brother arrived with the table and, as we installed it and added sand, they were already wanting to find different materials to add to enhance the play. One of these students was recently featured in the *Missoulian* as the first high school graduate in her family, and we saw her return with her whole family to show off their work during our 25th Anniversary Community Celebration on June 15th.

We at the Montana Natural History Center want to thank the Montana Native Plant Society for providing the first funding commitment of $1,500 for this project. We are beyond thrilled with the results. This garden will continue to grow and thrive, and we expect that our programs will grow right along with it.

The Redeeming Value of Weeds

From Anthropocene Weekly Science Dispatch, (12/2/2016)
(www.anthropocenemagazine.org)

Poor weeds. They get a terrible rap in the plant world. And to be fair, they mostly deserve it. They force farmers to apply herbicides and, for some crops, use transgenic seeds that are resistant to those herbicides. And they are a major source of lower-back pain for hobby gardeners forced to rip them out of their flower beds.

Antonio DiTommaso of Cornell University is as well versed as anyone in the nutrient-stealing effects of weeds. Yet in a provocative, first-of-its-kind paper, he and his co-authors say we may be overlooking the redeeming value of weeds.

The paper, published recently in Weed Science, makes a case for weeds by showing, through modeling, that leaving some milkweeds standing in cornfields can minimize yield losses from another corn menace, the European corn borer. It's kind of like how two negatives makes a positive. In this case, it's slightly more convoluted: milkweed is home to aphids, which secrete honeydew, which is food for wasps that attack corn borer eggs.

"We look at weeds with blinders on. We need to step back and see the entire picture because it is not all completely negative," says DiTommaso, adding that his paper presents a weed-management decision-making framework that includes the costs and benefits of this weed. "This has never been done before in a systematic way in weed science."

The researchers created formulas to calculate, for different levels or corn borer infestation, the Economic Injury Level of milkweeds. In other words, they determined the threshold of milkweeds above which a farmer must take action because costs outweigh benefits. Of course, the more corn borer eggs that are present, the more milkweed a farmer can leave in a field. They found that the maximum amount of milkweed for which the benefits outweigh the harms is 8 stems per meter, given a corn borer infestation of 1.5 egg masses per leaf. For lower infestations, fewer milkweed stems can be left standing. This figure could vary depending on the specific case, the authors say.

They also point out a conservation benefit of milkweed as a host plant for struggling monarch butterfly populations.

Currently farmers use transgenic herbicide-resistant corn coupled with glyphosate to battle milkweed, and a transgenic corn to battle European corn borer. But DiTommaso says this isn't an option for those growing for the organic or non-GMO market, and in the future, plants could become resistant to the herbicide.

There's much research to be done to figure out how a system in which some but not all milkweed is left standing could be applied in the field, and to determine what other crops might also benefit from the presence of weeds. But DiTommasso says he hopes this paper "sows the seed" for this kind of thinking in agriculture.

Source: DiTommaso, A. et al. Integrating Insect, Resistance, and Floral Resource Management in Weed Control Decision-Making, Weed Science (2016)



European corn borer

Recent computer-based modeling suggests that, due to plant-insect interactions, leaving some milkweed standing in corn fields can reduce crop loss from the European corn borer.



Common milkweed

Keith Weller, USDA Agricultural Research Service, Bugwood.org

Ohio State Weed Lab , The Ohio State University, Bugwood.org

For the Armchair Botanist

New Glacier Field Guide

Review by Rita Braun, Nursery Staff, Center for Native Plants

"Trees and Flowering Shrubs of Glacier National Park and Surrounding Areas," by Shannon Kimball and Peter Lesica, is the only Park-specific field guide available to help you identify the trees and shrubs of Glacier National Park. Other plant guides for trees and shrubs reference more species and cover a greater geographic region. They are also larger books. At less than an inch thick, Kimball and Lesica's "Trees and Flowering Shrubs" won't take up as much room in your pack.

The idea for this guide grew out of a need by stymied Glacier National Park employees trying to identify plants, and as a way to deepen Park tourists' connection to the land. But for any native plant lover who would like a field guide written in accessible language with a proper smattering of nerdiness, this book offers a lot.

For starters, the colored images are big and, with a few exceptions, in excellent resolution. What really sets this field guide apart is the great length the authors have gone to capture tree images, both in their entirety and in their natural habitat. Capturing the full image of a tree in a dense forest is challenging. Once you start backing up to get the full image of, say, a ponderosa pine, you bump into another one. Or the outline of the pine gets blurred by surrounding ones.

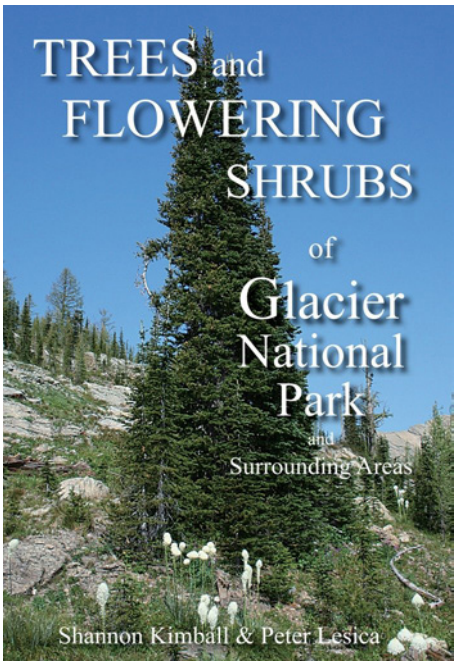
This guide opens with brief and extremely understandable presentations that give a basic understanding about the Park's forest: its climate and geology, types of vegetation, and effects that disturbances such as wildfire, pests and disease have on forest health. This background information puts the rest of the book into a holistic perspective. In other words, once you acquire the bigger picture of what affects and shapes the Park's forest, the sense of awe you get while driving along the Going to the Sun Road only deepens. It will make you want to get out of the car to see more.

In other words, once you acquire the bigger picture of what affects and shapes the Park's forest, the sense of awe you get while driving along the Going to the Sun Road only deepens. It will make you want to get out of the car to see more.

Before getting into the meat of the book—plant identification—take a moment to read the extended presentation on "Tree Pests & Diseases." Doing so will help you develop an awareness of what the forest's health is up against, and the management styles and climate considerations that are beneficial — or not.

Two obvious sections make up the bulk of the book: "Trees" and "Shrubs." The "Trees" section is organized into two subsections: "Needle-leaved" and "Broad-leaved." The "Shrubs" section is organized by flower color—brown and green, white, yellow, and pink—represented by colored tabs at the top of pages. From there, species listings from page to page become unordered. This is only a problem if you're expecting either the scientific or family names to be in alphabetical order. The book's robust index, however, will quickly get you to the species you're after.

Circling back to the book's images, the "Trees" section, at a minimum, contains photos of tree bark, needle- or broad-leaf shapes, cones of needle-leaved trees, and (as already mentioned) the full tree size in its natural habitat. In the "Shrubs" section, you can observe a shrub's flower, fruit and leaf shape.



The detail you want, and need, to identify a species is all there, and more. You'll learn species' habitats (sun, moisture, temperature and elevation requirements) and the general areas of the Park in which they occur. The "Needle-leaved" subsection includes commentary on pests and diseases. All species have a "Notes" section that includes a variety of additional detail, such as interesting ways Native Americans made use of species, or the types of pests and diseases to which species are prone.

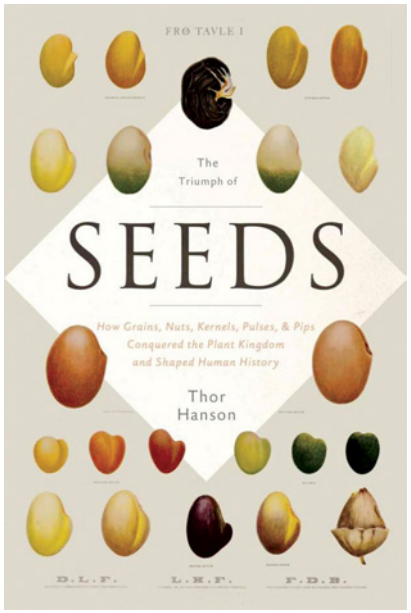
"Trees and Flowering Shrubs of Glacier National Park and Surrounding Areas" is available at amazon.com and at the Center for Native Plants in Whitefish (www.centerfornativeplants.com).

Consider the Seed

Review by Ellen Kehlmann, Washington Native Plant Society
[Reprinted with permission from the Winter 2015 issue of *Douglasia*]

In "The Triumph of Seeds: How Grains, Nuts, Kernels, Pulses, and Pips Conquered the Plant Kingdom and Shaped Human History," Thor Hanson offers the reader a smorgasbord of the science and lore of seeds or, as Hanson calls them, "baby plants in boxes with their lunch."

The book is divided into five sections: each section is two to four chapters long and focuses on one area of seed biology. Hanson's choice of topic order at first seems askew, with the section on evolution and genetics tucked in between a discussion of seed energy storage and one on seed dormancy and seed banking. He also places seed dispersal at the end of the book after the section on seed defenses.



Although the order of the sections seems counterproductive to building a deeper understanding of the nature of seeds, the book's structure works due to the links Hanson builds between chapters. The author ends each chapter by introducing the topic of the next, linking the information just presented with what is to come. Also Hanson often revisits information from previous chapters, connecting one aspect of seeds with another. In this way the chapters do build on each other and lead to a deeper understanding of seeds and their place in the world.

Hanson, following the recipe developed in his acclaimed book "Feathers," breathes life into the sometimes dry topic of seed biology by weaving a colorful tapestry of stories that entertain as well as inform. For example, to introduce a discussion of why seeds have spice compounds, Hanson talks about how Columbus wanted to find black pepper and instead found chili pepper. Some of his stories are about his own experiments, both the exotic, such as his field work in the tropics on almendro trees, and the prosaic, as in his attempts to recreate Mendel's pea experiments in his home lab "The Raccoon Shack."

In addition to historical and personal anecdotes, Hanson interviewed and in many cases visited seed biology experts. Particularly interesting were his talk about seed evolution with Bill DeMichele, fossil plant curator for the Smithsonian, and his discussion about seed anatomy and dormancy with seed biologists Jerry and Carol Baskin. DeMichele has postulated that the Carboniferous Period may not have been as swampy as many have thought, while Carol Baskin relayed that the evolution of seed dormancy may be driven more by the requirements of the seedling than those of the seed.

In contrast to several other books on seeds I've read that were chock-full of information but had prose so somnolent I could hardly keep my eyes open, "The Triumph of Seeds" is eminently readable. Hanson is a great storyteller and writes in a conversational style, so reading the book is like having an extended conversation with an entertaining friend. The only drawback is that sometimes tales meant to illustrate end up seeming to be the star instead of a supporting character. For example, when discussing the dispersal strategy of cotton, Hanson goes on at length about cotton's role in the Industrial Revolution and the economics of slavery in the American South. This is interesting stuff, but in the process the reader many lose the track of the reason cotton seeds have fluff: to help the seeds travel.

At times the breadth of the book limits its depth; there is only so much space to delve into each topic given all Hanson covers here. This makes the book in a sense a highlight reel. Hanson was most intrigued by the influence of seeds on human history and culture, and spends more space on people-seed relationships than on other aspects of seed biology. However, through this focus the reader gains a sense of just how thoroughly seeds permeate our lives.

"The Triumph of Seeds" is a thoroughly fun read, perfect for anyone wanting an introduction to seeds or for those who enjoy lively natural history. Knowledgeable plant enthusiasts will find much of interest as well, and likely will discover new information and interactions they hadn't previously considered. Through this book seeds are revealed to be marvelously variable and ingeniously designed. This book is valuable by being both scientifically accurate and accessible to the general audience. It deserves to be widely read and reread. I will keep it in my collection, knowing that I will refer to it as a reference for years to come.

Ellen Kuhlmann is a professional botanist who collected native plant seed for six years as Project Manager for Rare Care's Seeds of Success collection team. For this project she collected seeds from throughout Washington State for the Kew Millennium Seed Bank and the National Native Plant Materials program.

Coming Summer 2017

"Montana's Pioneer Botanists: Exploring the Mountains and Prairies,"

Rachel Potter and Peter Lesica, editors.

We are pleased to announce that MNPS is publishing this book of 31 stories, beginning with First People and ending with Klaus Lackschewitz. A big thank you to Peter Achuff and Alice Okon for coming up with the winning title — they each will receive a free copy! Stay tuned for more details on how to get yours!

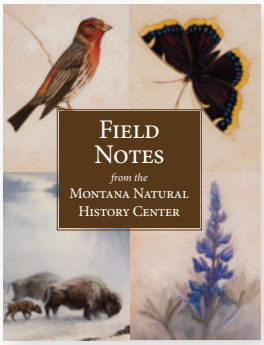


Klaus Lackschewitz.
Photo by Libby Sale.

Available Now

"Field Notes from the Montana Natural History Center."

This collection of 134 "idiosyncratic and topically diverse" nature essays, originally broadcast by Montana Public Radio over the last 25 years, captures the "variety of personal experience of natural phenomena and the brilliance of seasonal change in Montana."



About half the essays are plant-related, many of them written by MNPS members. Copies are available for $17.95 from the Montana Natural History Center (www.montananaturalist.org) and at Fact & Fiction in Missoula.

Gotta Like Those Lichens

By Kevin Murray, University of Montana

They grow just about everywhere — on rocks, trees, soil, your fence, even sometimes on your driveway. They sport enchanting names like moon glow, angel's hair, fog fingers and dragon's funnel. Walk in local forests and you'll rub shoulders with them. They're lichens. Curiously shaped, sometimes brightly colored little "plants" hanging from trees, clinging to rocks or quietly embracing grasses, mosses and forest debris. Sometimes they are conspicuous, like the yellow-green "wolf bane," or barely noticeable as subtle patterns on rock surfaces.

For many years, first as a graduate student in biology and later as University professor, I have been intrigued by these organisms and their Lilliputian world. As Thoreau once wrote: "I find myself inspecting little granules on the bark of trees — little shields or apothecia springing from a thallus — such is the mood of my mind, and I call it studying lichens."

So what are "lichens"? Lichens are not plants. They are an intimate symbiosis between a fungus and photosynthetic green algae. The fungi are relatives of such culinary delights as morels and truffles, and the algae are related to those greenish patches on garden pots or tree trunks. According to the fossil record, 400 million years ago fungi began to gently acquire carbohydrates from algae as a food resource; "gently" because the fungi didn't kill the algae in the process. Fungi began to "farm" algae; they nurtured these little food factories. What manifests as a lichen is a composite organism — a chimera of sorts: part fungus, part algae — with the fungus creating the body of the lichen (known as a "thallus") wherein reside the food-producing algae.

Lichens play many roles in nature, including as nesting material for birds, sources of natural dyes, air quality indicators, and food for caribou and other animals — even people. They have even been used to date events like landslides and glacier movement. Well, fundamental to any of these applications is lichen growth. You may have heard that lichens grow very slowly. But just how do they grow? What makes a lichen tick? Regardless of location, three factors limit lichen growth: moisture, temperature and sunlight.

When dry, lichens are in a state of suspended animation technically known as cryptobiosis. Neither fungus nor algae exhibit signs of life. Remarkably, a lichen can survive for decades or even centuries in this state. When rehydrated and exposed to sunlight, however, it's back to work. Algae begin to photosynthesize and the fungus goes about harvesting some of the excess carbohydrates for its own energy and growth needs. Low temperatures don't seem to bother lichens, as metabolic activity can be measured at temperatures as low as just above freezing. This is made evident by the abundance, diversity and productivity of lichens in arctic and boreal regions.

However, as temperatures increase lichens can enter a danger zone. This is because fungal metabolism can out-pace the algal capacity to make food. Under these conditions our gentle farmer can show a darker side, leading to the demise of the algae. This spells doom for the lichen as a whole because, in most cases, the fungi are fully dependent on their algal partners; they've become obligate symbionts. Through evolutionary specialization the fungi have lost their capacity to use other food sources. Without algae the fungi starve to death. Incidentally, this isn't true for the algae, which survive perfectly well on their own.

So lichens, which appear tough and hardy, result from a delicate balance between producer and consumer. But what a remarkably successful balance. Just look more closely at trees and rocks. Four hundred million years and more than 30,000 species later, lichens are still going strong.

Kevin Murray is a lecturer in Biology at the University of Montana. His research interests center on plant physiological ecology, community structure, conservation biology and exotic plant invasiveness. This Field Note, originally aired in 2008, appears in "Field Notes from the Montana Natural History Center."

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