Castilleja linariifolia

Castilleja

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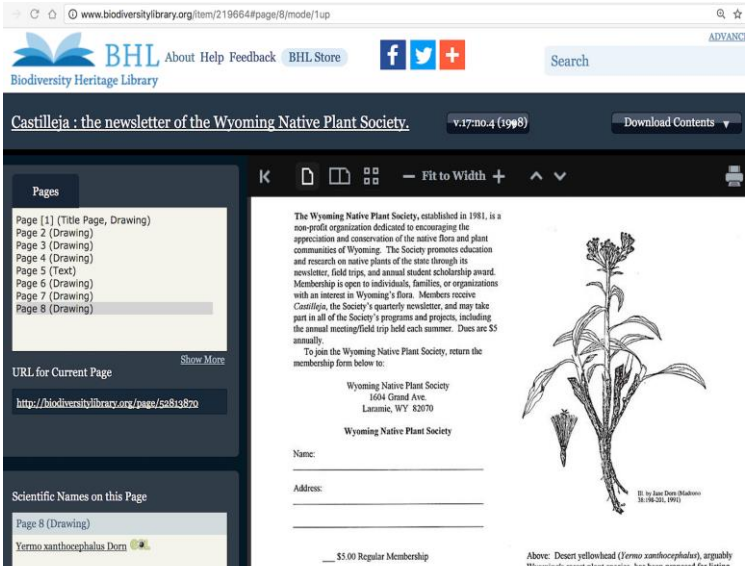
Wyoming Native Plant Society Helps Liberate Plant Names

By Hollis Marriott

Let's say you're writing an article about a plant, or your local flora, or a pioneering botanist. Now … close your eyes and imagine you're in a huge library dedicated exclusively to biodiversity, with 200,000+ holdings (many rare) scattered across the globe. Next, imagine giving the name of your plant or botanist to a "librarian" who then piles all relevant books, articles, field notes, correspondence, etc., on your desk *almost instantaneously!* In fact, this library is not imaginary. It's quite real, though in a virtual kind of way. It's the Biodiversity Heritage Library (BHL)—headquartered at the Smithsonian Institution in Washington DC, but easily accessible from your office, home, or favorite coffee house.

I discovered the BHL in 2014, while researching the history of the lanceleaf cottonwood (*Populus acuminata*). BHL soon became my go-to site for information about botanical exploration of the American West. What I like most is the quick easy access to lots of useful information. Documents that were difficult to access or even unavailable only a few years ago are now just a search and a click away.

BHL is a consortium of natural history and botanical libraries that are digitizing legacy biodiversity literature, making it easily accessible as part of a global "biodiversity commons." Much of this literature has been available only in select libraries, mainly in the developed world, making limited access a major obstacle—for example in research, conservation and education. Providing it online free-of-charge is a radical and exciting change. "Free global access to digital literature repatriates information about the earth's species to all parts of the world."



The screen capture above shows one result from a BHL search for *Yermo xanthocephalus (*desert yellowhead; endemic to Wyoming), providing links to the illustrated journal monograph, related journal articles and ten *Castilleja* articles. Illustration by Jane Dorn.

Put another way, BHL is making biodiversity literature "freely accessible to a global audience … thereby liberating taxonomic names and bibliographic data associated with the content for creative re-use." Among the plant names most recently liberated were those in our very own *Castilleja*, the newsletter of the Wyoming Native Plant Society. It all started last October when the BHL blog featured "A Local Focus: The Native Plant Societies of the US at: BHL blog on Native Plant Societies - http://blog.biodiversitylibrary.org/2016/10/a-local-focus-native-plant-societies-of.html (Cont. p. 11)

In this issue:

WYNPS News

2017 Annual Meeting: ***Bound for the Black Hills!***
An exciting slate of hikes and events is offered June 9-11 in the Black Hills. Please pre-register by 1 June to get the catered dinner at Devils Tower NM…and to simplify planning. A registration form is in this newsletter (p. 5). To register on-line, go to: http://www.wynps.org/activities/2017-annual-meeting/ .

2017 Scholarship Winners: We are proud to announce two scholarship/grant winners in 2017! Congratulations go Rebecca Upjohn, PhD student, University of Wyoming; and Jill Keith, Asst. Prof., University of Wyoming. Restoration of native plant communities after removal of Russian olive is the focus of Rebecca's PhD research. Russian olive alters soil nutrient content in such a way that other invasive species may gain a competitive edge over native species, Rebecca will use field and greenhouse experiments to identify specific characteristics, or functional traits that may allow native shrub species to persist during Russian olive invasion and after removal. Results of these experiments will improve native species conservation and selection for restoration while aiding managers in mitigating the long-term effects of Russian olive invasion in northern Wyoming. Rebecca received $750 from WYNPS.

Jill will use her $500 Small Grants award to study nutritional value of indigenous plant foods. American Indians and Alaska Natives (AIAN) suffer disproportionately from chronic health conditions influenced by diet, and research has shown that indigenous people following a more traditional lifestyle (including diet) are healthier than those following a more contemporary diet. The overarching purpose of Jill's project is to evaluate indigenous plant foods in Wyoming (biscuitroot, yampah, sego lily and white bark pine) for nutrient content, contribution to dietary patterns, and past/present use and value.

Wyoming Native Plant Society
P.O. Box 2449
Laramie, WY 82073

Treasurer's Report: Balance as of 25 Apr 2017: Scholarship = $1,095; General = $6,808; Total = $7,903.

The Next Deadline: Please send articles and announcements for the next issue by 15 Sept. Ideas are welcome any time!

New Members: Please welcome the following new members to WYNPS: Joyce Bateson, Jackson; Jill Keith Laramie; Lindsey Sanders, Jackson; and Rebecca Upjohn, Laramie.

WYNPS Board – 2017
President: Charmaine Delmatier, Laramie & Jackson (delmatier@wyoming.com)
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Message from the President:
"Spring is here - dare we say phenology is ahead this year? Our beautiful Wyoming spring bloom starts on the desert floor and ends in the alpine. We can follow the wildflower bloom for months! Soon, we will be visiting the northeast together; at our annual meeting in the Black Hills. We'll view a variety of plant species and communities including rare orchids, moonworts (*Botychriums*), and native grasslands. We start the weekend with a walk under the full moon on Friday night. After a long day of hikes and educational botanical treks on Saturday, enjoy a campground social with a full dinner. Then we settle in under the stars to hear an incredible author and speaker, David Ode, who will share his vast knowledge of the Dakota Flora. Enjoy the spring and please come join us on June 9th to explore the Black Hills!

~Charmaine Delmatier, President

Contributors to this Issue: Bruce Barnes, Charmaine Delmatier, Robert Dorn, Mark Gabel, Bonnie Heidel, Peter Lesica, Hollis Marriott, Dorothy Tuthill.

Natural History of the Black Hills and Bear Lodge Mountains

By Mark Gabel, Black Hills State University Herbarium

The Black Hills and the northwest extension of the Black Hills, locally called the Bear Lodge Mountains have been described as "an island in the plains." It is an area of large topographic relief, incredibly varied geologic features, a wide range of precipitation and a high species diversity surrounded by a more homogenous, yet beautiful grassland.

Geologically, the Black Hills are cited as a classic example of a dome, and are described in many geology textbooks. Topographically, Darton and Paige (1925) identified four major areas in the Black Hills, the Hogback Ridge, the Red Valley, the Limestone Plateau and the Central Crystalline Core. The former is composed of several layers of sandstone and limestone (Lakota and Fall River Formations; Feldman and Heimlich1980) resulting from the uplifts of the central area. The Red Valley or Racetrack is a flat area that is composed of red shale (Spearfish Formation) that is prominent around the perimeter of much of the Black Hills. The Limestone Plateau is prominent in the western Black Hills and is primarily of the Pahasapa Formation (Feldman and Heimlich1980). The Central Crystalline Core is composed of metamorphic and granitic rocks. The oldest rock samples (gneiss) in the Black Hills dated to this time are from 2.5 billion years before the present (Zartman et al. 1964). This core includes Black Elk (formerly Harney) Peak and the "Needles" area in the south-central Hills. Post-Laramide (Tertiary) igneous intrusions are present across the Northern Hills from Bear Butte on the east to Sundance Mountain and Devils Tower and the Missouri Buttes in the west (Lisenbee et al. 1981).

Homestake Gold mine at Lead, SD operated from 1877 to 2002. While it was operating it was the oldest and deepest mine (>8000 feet) in the western hemisphere. After the end of mining activities, the facility has been converted to the Deep Underground Science and Engineering Laboratory, including the Sanford Underground Research Facility. Numerous experiments are currently underway including the Large Underground Xenon (LUX) experiment is searching for dark matter; the MAJORANA collaboration is trying to determine whether neutrinos are their own antiparticles; and CASPAR (Compact Accelerator System for Performing Astrophysical Research) is studying what happens in stars when they die (Sanford Lab Homestake 2017). The Deep Underground Neutrino Experiment (DUNE), is designed to understand how neutrinos oscillate as they travel through space. The experiment will shoot beams of neutrinos 800 miles through the earth from Fermilab near Chicago to Sanford Lab (http://www.sanfordlab.org/) .

The rich diversity of plant species present in the Black Hills and Bear Lodge Mountains is a combination of species growing on the plains or crossing the plains from other regions that certainly never lived on the dry plains. Several authors (Hayward 1928, McIntosh 1931, Froiland 1990, Van Bruggen 1996) noted that there are representative species from at least five vegetation complexes including 1) The Rocky Mountain forest, 2) the Boreal Forest (Northern Coniferous Forest) complex, 3) the Great Plains Grassland complex, 4) the Eastern Deciduous Forest complex and 5) the Southwestern complex. This ecological crossroads is supported by the wide diversity of habitats that are available to plants in and around the Black Hills.

Get Plant Lists for the Black Hills!

Robert Dorn has made his recently up-dated key to the Flora of the Black Hills available for our use either at: (1) http://hdl.handle.net/10176/wyu:314346; or by going to http://www.uwyo.edu/libraries/ and in the menu click on Libraries and Collections, then UW Digital, then in search box type in Dorn, Flora of the Black Hills. Let it load and then it can be downloaded at the down arrow at the upper right of the page frame. A list of plants known from Devils Tower National Monument is available at the NPS website https://irma.nps.gov/NPSpecies/. At this site, go to Advanced Search, query "Devils Tower National Monument (DETO)", and under Category, select "Vascular Plants" and under Occurrence, select "Present" – also posted with 2017 Mtg. Info.

The new work by Dorn (2017) is an update of the keys in his 1977 Flora of the Black Hills. Stubbendieck et al. (2017) list 161 species of grasses present in the Black Hills. Marriott (1985) noted 955 taxa from the Wyoming portion of the Black Hills. Marriott et al. (2016) recently described the best remaining alpine grasslands in the Black Hills. The Black Hills State University Herbarium (BHSC) database lists 1523 species as present in the Black Hills. (Cont. p. 4)

Natural History of the Black Hills, cont. from p. 3

Many of the Black Hills species are stranded in their respective habitats. Cool canyons protect the spruce and the ferns, orchids and mosses living beneath them. High, rocky and cold summits provide the environment essential for alpine species, including many species of lichens. The more dry and warm conditions that undoubtedly will accompany a changing climate are conditions under which they may be unable to live, and a rapidly changing climate may signal the demise for some of these distinctive life forms in the Black Hills.

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Back to the Black Hills

A mere 17 years ago, WYNPS embarked on an annual meeting to the Black Hills and published a special issue for the occasion - *Castilleja* May 2000 19(2) (www.wynps.org). It includes gems that are still worth reading:

- Vegetation of the Black Hills, by Hollis Marriott
- A Botanical Crossroads, by Hollis Marriott
- The Black Hills Managed Forest, by Dave Ode
- Which Spruce is This? by Dave Ode
- The Protection Status of the Flora of the Wyoming Black Hills, by Walter Fertig
- Books for the Black Hills Explorer

More Black Hills References

Since 2000, Wyoming botanists haven't stopped learning about the Black Hills! Below are a highlight of more recent references; most are available thru Wyoming Natural Diversity Database (WYNDD).

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Heidel, B. and H. Marriott. 2014. Devils Tower National Monument Flora - Field Analysis, Updating Online Resources and Applications. For National Park Service by WYNDD, Laramie, WY.

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Heidel, B. 2016. Noteworthy Collection - Wyoming. Madroño 63(1): 7. [3 additions from NPS units]

Marriott, H., D. Faber-Langendoen and D.J. Ode. – See references with Gabel article (to left)

Kosovich-Anderson, Y.I. 2016. Bryophytes of Smith Gulch area fens and vicinity, Black Hills National Forest, South Dakota. Prepared for WYNDD and Black Hills National Forest. Cheyenne, WY.

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2017 WYNPS Annual Meeting Registration

This event is open to the public; membership to the Society is not required. However, registration is required to attend. Please pre-register by June 1, 2017 for dinner reservations and to help us prepare. No dogs, please, on any of the hikes. Go to the Crook County Courthouse (3-6 pm Friday) to register or get receipt, and before hikes. Be at the Courthouse by 6:15 pm for the Friday moonlight walk. Be at the Courthouse by 8 am for each of the Saturday and Sunday hikes.

Name _____

Street Address _____

City, State and Zip _____

Email address _____

Phone number _____

How many people are you registering for? _____

Do you plan to join the Friday moonlight walk? Yes No Maybe

Moonlight walk (full moon!) to Inyan Kara Mtn., Black Hills NF, about 25 south of Sundance. App. 1 mile hike to observe culturally significant plants, led by Rylan Sprague, Botanist for Northern Hills Ranger District, Black Hills NF

RENDEZVOUS IN SUNDANCE! Registration will be at the Crook County Courthouse, 309 Cleveland St., open from 3-6 pm Friday and both Saturday and Sunday before hikes that leave at 8 am. Our Annual meeting will also be there @ 7 am Sunday – coffee and some food provide.

SEE MAPS – p. 6

Saturday hike preference

☐ Joyner Ridge, Devils Tower NM (half day). Gentle, 1.5 mile hike in beautiful ponderosa pine forests typical of the Black Hills, with wildflower meadows and excellent opportunities to view Devils Tower, led by Rene Ohms (or staff), Chief of Resource Management, Devils Tower National Monument. Meet at the Courthouse (8 am) or the trailhead (9 am).

☐ Englewood Springs Botanic Area, Black Hills NF, south of Spearfish (full day). Site of the most orchid species on the Forest, an easy to moderate hike visiting springs and streams in the area, led by Rylan Sprague, Botanist for Northern Hills Ranger District, Black Hills NF

☐ Warren Peaks, Black Hills NF, north of Sundance (full day). Montane grasslands with Botrychiums in the forecast! A driving tour with limited walking, led by Nick Drozda, Botanist for Bear Lodge Ranger District, Black Hills, NF.

☐ I'm not participating on Saturday

Sunday hike preference

☐ McIntosh Fen Botanic Area, Black Hills NF, centrally located in the Black Hills (full day). Home to South Dakota's rare willows, led by Kelly Warnke, Botanist for Mystic Ranger District, Black Hills NF.

☐ Dugout Gulch Botanic Area, Black Hills NF, south of Beulah, WY (full day). Relic boreal plants nestled under beautiful paper birch, led by Beth Burkhart, retired Botanist, Great Plains NPS and WyNPS past-president.

☐ I'm not participating on Sunday

Saturday evening dinner

Saturday evening dinner is at Devils Tower National Monument covered picnic shelter, catered by Christine Galloway with Four Seasons Catering. Menu: Pulled beef sandwiches (with vegetarian and vegan options), baked potato bar, waldorf salad, chocolate cake, and a cookie tray for hikes the next day. The cost is $20/person. No alcohol is sold but you may bring your own. How many $20.00 Saturday evening meals do you want to sign up for? _____

If attending the Saturday evening meal, please indicate if you or anyone you're registering for have any special dietary restrictions or needs. _____

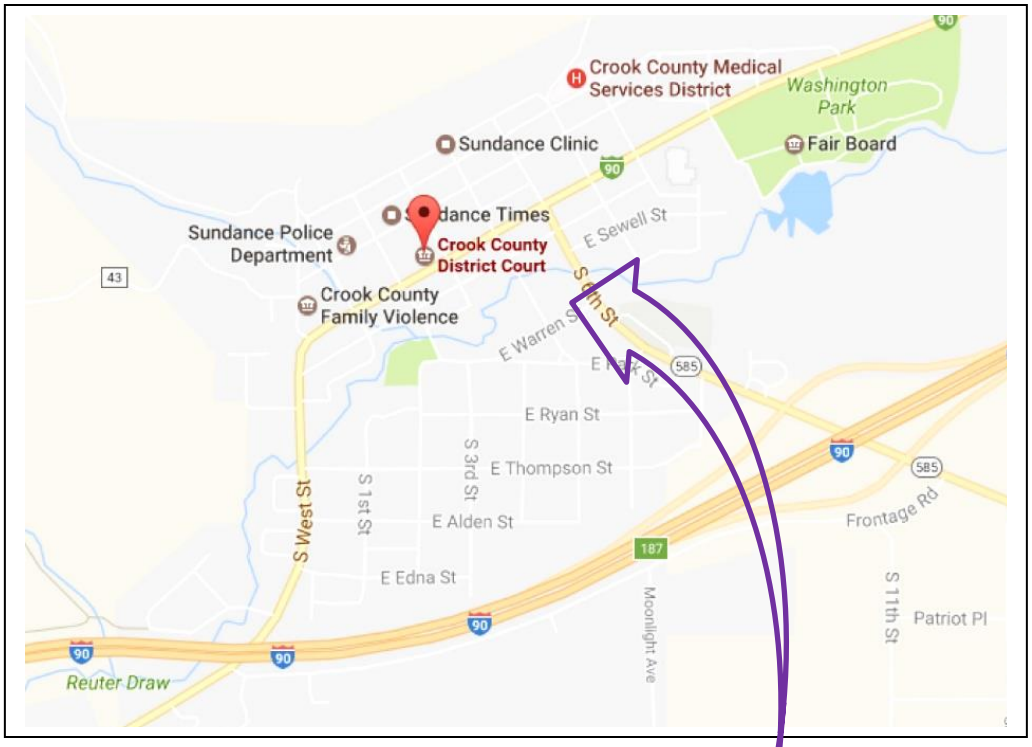
Group camping

We have two group sites reserved at Devils Tower NM for Friday and Saturday nights. The cost will be $5 per night, payable to WYNPS on arrival. Parking is limited to four cars per group campsite, but is available nearby.

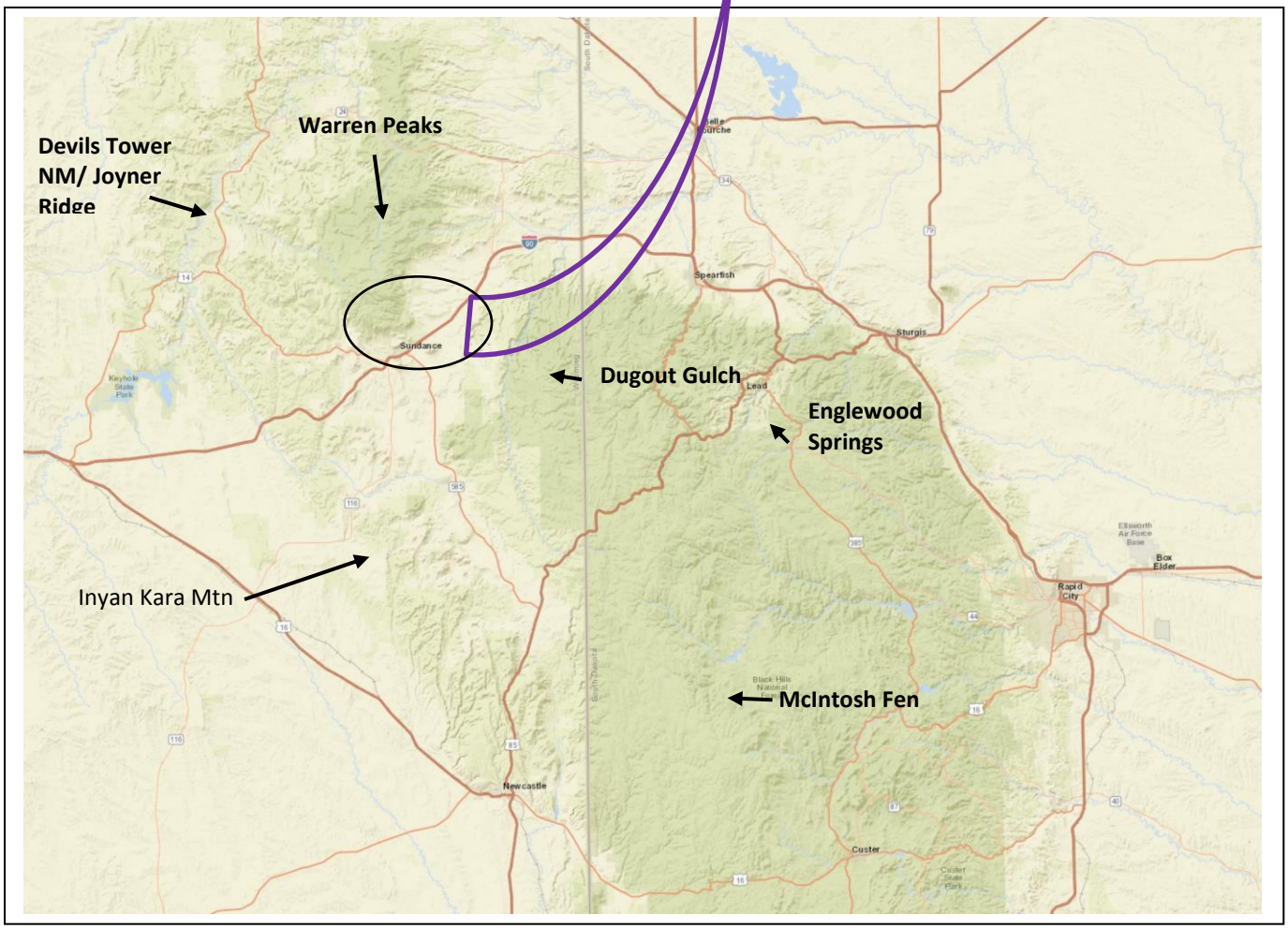
Are you planning to camp at the group site at Devils Tower NM? Yes No [See also USFS campground and motel options, on-line]

Please send check for $15/person registration fee, $20/person dinner and optional WYNPS membership ($10) to:

Wyoming Native Plant Society
P.O. Box 2449
Laramie, WY 82073



Directions to Crook County Courthouse, 309 Cleveland St., Sundance - the hub of Annual Meeting activity – registration, start of hikes, site of official Annual Meeting (Friday – Sunday). Accessible from either of the two I-90 exits to downtown Sundance. *…See you in Sundance!*



„„More Hikes and Events!!

May 19, Habitat Restoration on Small Acreage Workshop, 8:30-5, Laramie Comm. College, Cheyenne WY. Join UW Extension and the UW Reclamation and Restoration Center are offering a one-day workshop to discuss tips and techniques landowners can adopt to improve property value and protect natural resources. During the day, we'll discuss a range of topics that include soil erosion control, livestock concerns, native plants and weed management. There is a $25.00 registration fee. To learn more and register via Eventbrite:
https://tinyurl.com/n8k7ddb

May 30, Discover Native Plants, 9-4 pm, Thomas the Apostle Center, Cody, WY. Join UW Extension for a one-day interactive program to learn more about native plants, introduced species and their ecology in Cody, Wyoming on May 30. Participants will take an outdoor plant walk and spend time learning to identify plant species at the Thomas the Apostle Center in Cody. There is a $25.00 registration fee that includes workshop materials. To learn more and register via Eventbrite:
http://tinyurl.com/discovernativeplants

June 3, 9:00 am: Wildflowers of Johnny Behind the Rocks, Lander, WY**.** Come see desert wildflowers at a favorite local trail system. We will meet at the parking lot/trailhead at 9 am, walk the trails to check out plants within red rock, sagebrush, and juniper communities, and wrap up ~ 11:30. The terrain varies from gentle to steep in a few places. We will cover 3-4 miles with plenty of time to stop and smell the flowers! Be sure to bring sun protection, water, and a snack. The trailhead is located on the north side of Hwy 287, app. 15 miles southeast of Lander. Please contact BLM Botanist Emma Freeland if you plan to attend: 307-332-8410 or efreeland@blm.gov.

June 6, 5:00 pm; Spring Wildflower Walk, Pinedale, WY. Come get a peek at local spring wildflowers. We will meet at the BLM Pinedale Field Office at 5 pm. Lead by Julie Kraft and all who come!

June 17, all day, Spring EXPO, Pinedale, WY**.** Stop by the BLM-SCCD parking lot, in Pinedale, for demonstrations galore.

August 1, 3:00 pm: Tall forb community in Dry Piney, Pinedale, WY**.** We will meet at the BLM Pinedale Field Office at 3 pm. Lead by Jill Randall and Sparrowe's.

August 26, 9:00 am: Montane Botanical Tour, Meeteetsee, WY**.** Join a fun and educational botanical exploration for all ages in the Absaroka Mountains near Meeteetse, WY. Topics will include basic identification, ethnobotany, and management of the area. We will meet at the Meeteetse Museum at 9 am and caravan - 4x4 or AWD with high clearance are recommended. Bring a lunch, water, sun protection, and your curiosity! This hike will be at elevation in August, so please come prepared for those conditions. This tour is moderate in difficulty (mostly due to elevation) to moderately strenuous, led by Kassy Skeen, Ecologist with Shoshone Natl. Forest.

September 19, 5:00 pm: Trees and Flowers in Fall, Pinedale, WY**.** We will meet at the White Pine Ski Area. Lead by Brook Lee and Robyn.

ALSO: Check the Teton Plants homepage (https://tetonplants.org/) all summer long for hike announcements!

News of a New Botanical Nonprofit

Bruce Barnes, Volunteer Executive Director

Flora ID, a 501(c)(3) nonprofit organization with the mission of promoting botanical education and research, and developing plant identification tools, is now continuing the production and development of the interactive plant identification software previously produced by Flora ID Northwest. One of our first actions has been to release new comprehensive apps for Android devices. These apps, simply named "(state/province/region) Plants," are a major step forward. Each of the new apps include all the native and naturalized vascular plants of each region named in the app title, including one for Wyoming Plants. They are in effect a complete flora on your phone or tablet in your pocket, independent from wifi or cell towers. The apps are now on the Google Play store; search for "flora id" including quotation marks, and look for their mostly white icons. They work the same as the wildflower apps published 3 years ago which are still available (with mostly green icons). All net proceeds from the sale of apps or PC software go to support the mission of the organization.

Fungus Flowers Fool Botanist

By Peter Lesica, adapted from *Kelseya*, newsletter of the Montana Native Plant Society, Spring 1998

Buttercups are usually the first flowers on the grassy hills around Missoula, Montana. They rarely occur on the stony ridgetops, but prefer the deeper soils of the slopes and flats. Often at this time of year my eye will fall on a yellow spot of color among the green foliage, and I'll bend over to see what it is, only to find it's not a flower at all. It's the right size for a buttercup, but it looks like a cluster of light yellow leaves covered with small crystalline pustules.

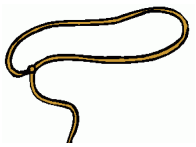
This plant is our common rockcress (*Arabis* or *Boechera holboellii*) in the mustard family. Rockcress usually produces long stems with numerous white flowers later in the spring. But this plant is infected with a rust fungus in the genus *Puccinia*. Infection of rockcress occurs in the fall, and the fungus grows in the host plant during the fall and winter, altering the buds that produce next year's growth. In the spring, the plant is stunted with numerous short leaves instead of a normal, tall flower stem. Near the tip of the stunted stem the leaves are clustered and yellow with the reproductive structures of the fungus. A sugary nectar and even a mild scent is produced by the fungus at the same time. These yellow clusters of leaves that produce nectar are called pseudoflowers. Flies and sometimes even bees are attracted to these pseudoflowers, and these insects are required for sexual reproduction between different strains of the rust fungus occurring in the same area. Pseudoflowers serve the same function for the fungus as real flowers perform for plants; they affect mating. But since the fungus can't produce flowers of its own, it resorts to forcing its host to do the job for it. But that's only part of the story. Barbara Roy studied buttercups and the buttercup-like pseudoflowers of rockcress where they occur together in Colorado. She found that more insects visited the true buttercups when they were with rockcress pseudoflowers than when they were with other buttercups. And more insects visited the fungally-produced pseudoflowers when they were with buttercups. Each receives more insect visits when in the company of the other than by themselves. Roy found that buttercups produce a large pollen reward for visiting insects but have little nectar. On the other hand, the fungal pseudoflowers produce no pollen, but have copious nectar. Apparently the pollen and nectar rewards together are more attractive than either alone. The more visiting insects, the more likely is successful mating for both buttercups and fungus. In this unlikely way, the buttercup and fungus help each other produce more offspring.

Nature sometimes makes strange bedfellows. The fungus can infect the hapless rockcress and fool the insects, but it won't fool me again … at least until next year.

Left: *Puccinia* fungus producing a false "pseudoflower" at the stem tip of a rockcress (genus *Arabis* or *Boechera*). Small yellow pustules on the infected leaf surfaces contain fungal spores that can be transported by flies to other plants. Photo by Peter Lesica.

Reference

Roy, B.A. 1994. The effects of pathogeninduced pseudoflowers and buttercups on each other's insect visitation. Ecology 75:352-358.



Bee-rustling in Wyoming?

Native solitary bees are increasingly being trapped in the wild for their pollination services in U.S. food production, particularly in almond, cherry and apple orchards (Tepedino and Nielsen 2017). Many major canyons from southern Idaho to central Utah have increasing amounts of unregulated, illegal wild native bee trapping, mainly for bees that nest in existing wood holes.

"Bee-rustling" impacts the ability of the target species of bee to pollinate native plants. It can impact many non-target species of insects that are "bycatch" and their associated ecosystem services. Finally, the shipping of bees into areas where they do not occur naturally can make them or their associated pathogens into new invasives.

Is there bee-rustling in Wyoming? The telltale signs are trap nest cans full of hollow bamboo or other wooden tubes resembling straws, mounted onto trees (see Tepedino and Nielson 2017). Incidents in adjoining states (Idaho and Utah) are reported from public lands administered by the U.S. Forest Service and Bureau of Land Management.

The authors maintain that bee trapping as a commercial enterprise might become sustainable if there were better data defining impacts, "bee allotments" for trapping as managed by agencies, traps set up at strictly the dimensions used by the target species, an education program for trappers, and a reporting system. The preferred target has often been the "Blue Orchard Bee" (nickname: "BOB"; a type of Mason bee - *Osmia lignaria propinqua* Cresson). For more information about Mason bees and their conservation, see Young et al. (2015): http://www.natureserve.org/sites/default/files/web_-_natureserve_osmia_report_brochure.pdf .

If you see bee traps out on public lands this year, record the location, get a photo of the trap nest if practical, and convey the information to the corresponding public land-managing office. bh

Growing Native Plants

Part 24. Short Shrubs for Foliage

By Robert Dorn

Artemisia frigida, Fringed Sage, grows mostly to 4 inches high but rarely reaches 16 inches. It forms mats less than a foot across. The leaves are dissected, gray-green, less than 1 inch long, aromatic, and usually remain green in winter. The flowers are in small heads on a stem to 18 inches tall and appear from July to September. The plants occur naturally in open, often dryish sites from the plains and basins to alpine areas in the mountains. They prefer full sun and dryish well drained soil. They are drought tolerant but not tolerant to excess moisture. They can be sheared to produce a uniform tight mound. They are easy to transplant or can be grown from the tiny seed which should be surface sown and kept moist until established. It is also in the nursery trade.

Artemisia frigida, Goshen County

Artemisia tridentata, Big Sagebrush, is represented by three varieties in the state. Variety *tridentata* gets quite tall and was treated earlier in this series. Variety *vaseyana* is the mountain variety which grows to 4 feet tall. Variety *wyomingensis* is the basin and plains variety which grows to 18 inches tall. The leaves are gray-green, to 2 inches long, usually tipped with 3 teeth or lobes, and strongly aromatic, especially when wet. The leaves persist over winter and are replaced by new leaves in the spring. The flowers are in small heads in elongate panicles and appear mostly in August and September. The plants occur naturally in moist to dry, open areas in the plains, basins, valleys, and mountains. They prefer full sun and deep loamy soil that is near neutral (pH 6-8). They are cold and drought tolerant but do not tolerate excessive moisture nor alkaline soils. Variety *vaseyana* is more tolerant of wetter soils than is variety *wyomingensis*. The plants can be grown from seed or stem cuttings. Winter cuttings are best and should be dipped in rooting hormone before placing in soil. The seed of lowland forms may not ripen until January so should be collected after that time. Cold stratification for 10 days or more may be helpful for commercial seed. Surface sow for light exposure. Small plants can be easily transplanted.

Artemisia tridentata var. *vaseyana*, Albany County

Artemisia tridentata var. *wyomingensis*
Albany County

Grayia spinosa, Hopsage, grows to 4 feet tall and wide and is somewhat spiny. The leaves are thickish, to 1 inch long and less than half as wide. The flowers are inconspicuous, male and female often on different plants. They appear from April to June. The fruits are oval to round in outline, flattened, to 0.6 inch across,

and change from green to yellow to pink and red, often coloring the entire shrub. The plants occur naturally in dry, often sandy open places in the basins and valleys. They prefer full sun and well drained soils. They are alkaline and drought tolerant. It can be grown from seed sown outdoors as soon as ripe. Seed is commercially available.

Grayia spinosa, Sweetwater County

Krascheninnikovia lanata, Winterfat, grows to 18 inches high and 2 feet wide. The leaves are gray or silver from hairs, to 1.5 inches long and narrow. The flowers are inconspicuous appearing from May to July. The bracts around the fruits become white and cottony and remain well into winter. The plants occur naturally in dry open areas of the plains and basins. They prefer full sun and dryish, well drained soils. They are drought and alkaline tolerant. It can be grown from seed sown in the fall after temperatures cool or in early spring. Seed is commercially available. It can also be grown from stem cuttings.

Rhus aromatica (*Rhus trilobata*), Skunkbush Sumac, suckers to form dense thickets to 4 or occasionally 6 feet tall and 10 feet or more across. The leaves are bright green, compound with 3 leaflets, each to 1.75 inches long, and turn yellow, orange, or red in the fall. When brushed or damaged, the leaves have a strong pungent odor. They are slow to leaf in spring. The flowers appear before or with the leaves in April to June, are light yellow, about .25 inch across, and are in small tight clusters. The fruits are berry-like, fuzzy and sticky, bright orange to dull red, and sought after by birds. The plants occur naturally on dry rocky slopes and in canyons or along upper banks of streams and in other open areas in the plains, basins, and foothills. They prefer full sun or light shade. They tolerate wind, drought, and moist to dry, alkaline to slightly acid soils. It can be grown from rootstock divisions. It is difficult to grow from seed which needs 90 days cold stratification for spring planting. It is also in the nursery trade.

Krascheninnikovia lanata, Platte County

Rhus aromatica, Albany County

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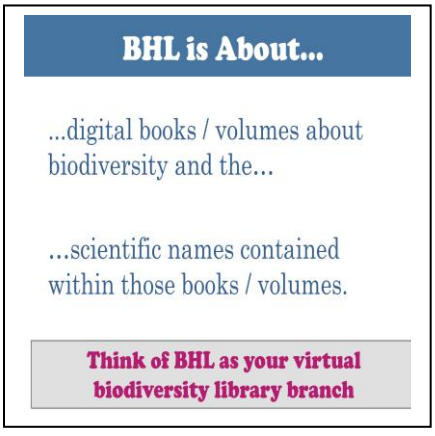
To see these plants in full color, go to the Wyoming Native Plant Society homepage and open the newsletter: www.wynps.org.

WYNPS Helps Liberate Plant Names (cont. from p. 1)

When I read that native plant society newsletters were being added to the collection, I contacted Project Investigator Susan Fraser at The New York Botanical Garden to see if *Castilleja* were part of the plan. Indeed it was. "We would be thrilled to include *Castilleja* in the project," she replied.

Adding native plant society newsletters to BHL is part of "Expanding Access to Biodiversity Literature"—a two-year project designed to "preserve and provide access to small natural history and botanical collections and publications." It's conducted by the New York Botanical Garden in partnership with Harvard University, the Missouri Botanical Garden, and the Smithsonian Institution Libraries. https://biodivlib.wikispaces.com/Expanding+Access+to+Biodiversity_Literature .

> "We are grateful to the native plant societies who have generously shared their local expertise by making their newsletters available to researchers through BHL. In addition to the biodiversity information they contain, these publications are a wonderful snapshot of the small, dedicated groups of people working all over the U.S. to document and preserve our native plants." –Patrick Randall, Community Manager, *Expanding Access to Biodiversity Literature*; Ernst Mayr Library, Harvard University



Before *Castilleja* issues could be processed, a permissions form had to be signed; President Karen Clause took care of this. Fortunately, PDFs were available for all issues. Editor Bonnie Heidel transmitted them en masse to BHL. Then the techies worked their magic. Now, whenever someone searches BHL for *Boechera pusilla* or *Yermo xanthocephalus*, for example, relevant issues of *Castilleja* appear on the results list. We've hit the big time!

Search contents can be printed or downloaded, either the entire work or selected pages. I've used the latter option many times. Usually the pages arrive well within the hour, whether from the newsletter of a neighboring native plant society, or from a rare old book in a library thousands of miles away.

How did BHL manage to find *Yermo xanthocephalus* among the 51,749,439 pages in the collection? It was magic!!! No, not really … sorry. But it's just as cool as magic. As texts are processed, scientific names are extracted from each page using *Global Names Recognition and Discovery* (GNRD), a taxonomic name recognition algorithm. GNRD provides an open and global-names-based infrastructure to index, organize and manage biodiversity data. Like BHL, GNRD aims for easy public access, with the goal of spurring widespread and innovative use of biodiversity data. A noble goal indeed! (Cont. p. 12)

Postscript: Shortly after Castilleja was incorporated into BHL, it was also added to the Digital Public Library of America "when BHL was harvested by DPLA."

Tribute: Martha Christensen

We regret the loss of WYNPS member, Dr. Martha Christensen, who died in Madison, WI, on March 19. Martha was a member of the UW Department of Botany from 1963 until 1989, conducting research on soil microfungi and teaching courses in mycology, bryology and phycology, as well as botany. In 1999 she moved back to Madison, where she had spent many good years as a Ph.D. student. Her mycological work received national and international recognition; locally, she was better known for her tireless advocacy for Wyoming wild spaces. Martha was a life member of WYNPS, a generous contributor to the scholarship fund, and an educator who opened the eyes of many students to the beauty and diversity of the natural world.

(Editor's note: We pay tribute to all members, and ask for your input and understanding in this regard.)

WYNPS Helps Liberate Plant Names (cont. from p. 11)
So if you're in need of biodiversity literature, especially if it's old or rare or otherwise difficult to access, pay a visit to the BHL; your adventure starts here: http://www.biodiversitylirary.org/ . And if you're looking for a good time, browse the always-interesting BHL blog: http://blog.biodiversitylibrary.org/ . Warning: you'd better have plenty of time on your hands!

Above: Seed catalog cover, 1900. There are over 11,000 seed and nursery catalogs besides technical botany in the BHL collection! From: "Leading Ladies in the World of Seeds" (http://blog.biodiversitylibrary.org/2015/03/leading-ladies-in-world-of-seeds-part_25.html).

Wyoming Native Plant Society is a non-profit organization established in 1981 to encourage the appreciation and conservation of the native plants and plant communities of Wyoming. The Society promotes education and research through its newsletter, field trips, annual student scholarship and small grants awards. Membership is open to individuals, families, or organizations. To join or renew, please return this form to:

Wyoming Native Plant Society
P.O. Box 2449
Laramie, WY 82073

Name: _____

Address: _____

_____

Email : _____

Check one: [ ] New member [ ] Renewing member

[ ] Renewing members, check here if this is an address change.

[ ] Check here if you prefer to receive the newsletter electronically

Membership

[ ] WYNPS annual membership: $10.00

[ ] WYNPS annual membership + scholarship support: $20.00 ($10.00 for membership and $10.00 for Scholarship fund)

[ ] WYNPS Lifetime membership: $300 ($150 for membership and $150 for Scholarship fund)

[ ] Sublette Chapter annual membership: $5.00

[ ] Teton Chapter annual membership: $5.00

Total enclosed: _____ THANK YOU!

Wyoming Native Plant Society
P.O. Box 2449
Laramie, WY 82073