

Aquilegia

Magazine of the Colorado Native Plant Society

Volume 44 No. 4 Fall 2020



2020 Photo Contest

This issue of *Aquilegia* features the winners of the annual photo contest. All 2020 entries were posted and voted on via the CoNPS website.

Congratulations to all winning photographers in five categories!

First place winners are featured on the cover. Clockwise from top left. **Landscape** (two-way tie) Caleb Gruber, sky pilot (*Polemonium viscosum*) at Maroon Bells from Willow Pass, and Carol McGowan, Ophir Pass tall mountain chiming bells (*Mertensia ciliata*). **Gardens** Rick Brune, young red fox explores prairie garden with prairie bluebells (*Mertensia lanceolata*), golden banner (*Thermopsis rhombifolia*), and Indian paintbrush (*Castilleja integra*). **Artistic** Rick Brune, showy milkweed (*Asclepias speciosa*). **Plants** Floyd Wright, arctic gentian (*Gentiana algida*). **Wildlife** Kelly Ambler, prickly poppy (*Argemone polyanthemos*) with sleeping bee.

Second place winners start on this page and finish on the back cover. Clockwise from top right. **Garden** Susan Crick, prairie wildflower garden, paintbrush and blanket flower (*Castilleja* and *Gaillardia* ssp.) **Landscape** Tom Lebsack, Fletcher Mountain with paintbrush (*Castilleja rhexifolia* and *C. occidentalis*). **Artistic** Michael Aubrey, mountain mahogany (*Cercocarpus montanus*) with rising smoky sun. **Plants** (two-way tie) Kelly Ambler, Jacob's ladder (*Polemonium pulcherrimum*) and Dina Baker, pasqueflower (*Anemone patens*). On the back cover, clockwise from upper left.

Wildlife (six-way tie) Michael Aubrey, shrubby cinquefoil (*Potentilla fruticosa*) with northern crescent butterfly; Suzanne Dingwell, purple haze (*Penstemon* sp.) and American bumblebee (*Bombus pensylvanicus*) showing purple pollen; Dina Baker, silky lupine (*Lupinus sericeus*) and butterfly; Anna Wilson, subalpine daisy (*Erigeron glacialis*) and butterfly; Rick Brune, ground squirrel breakfast of *Cerastiums*; and Carol McGowan, western tanager in a Rocky Mountain juniper (*Juniperus scopulorum*). See page 38 for other winners.



Aquilegia: Magazine of the Colorado Native Plant Society

Dedicated to furthering the knowledge, appreciation, and conservation of native plants and habitats of Colorado through education, stewardship, and advocacy

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Progress on Conservation Efforts

By Jill Handwerk and the CNHP Botany Vegetation Ecology Team

This symposium began like any other with an announcement to the group about items of interest, this year honoring a long time Colorado botanist, Steve Olson. Steve has been a botanist for the US Forest Service for nearly 20 years covering the Pike San Isabel National Forest and Cimarron & Comanche National Grasslands—a very large area to cover! To facilitate his work there, Steve developed a database of over 2200 plants species from the region with information on life history, habitat, and locations on the PSICC. This database, 20 years in the making, is a wonderful resource that Steve leaves as a legacy to his successor. Steve was recently recognized by the USFS with a Forest Service career achievement award for contributions to his discipline. This was a noteworthy honor not often awarded and a wonderful way to end his career with USFS. Steve is retiring this fall and we will all miss his wit and wisdom as well as his significant botanical contributions to the Colorado flora.

Following brief announcements, the symposium continued with its first presentation of the day **“Five Years In: A Status Review of Conservation Actions from the Rare Plant Addendum to the Colorado State Wildlife Action Plan.”** Colorado Natural

Heritage Program botanist Jessica Smith gave a presentation on her review of the status of meeting conservation actions for 31 Plants of Greatest Conservation Need as listed in the Rare Plant Addendum of the Colorado State Wildlife Action Plan. The SWAP is a document which is the product of Colorado Parks & Wildlife but designed for all conservation stakeholders in the state. It outlines the vulnerabilities of species and habitat and provides recommended conservation actions.

The presentation discussed general threats facing rare plants, overarching conservation actions, and the status of meeting those actions. For 31 of the rarest plants in Colorado, including all federally-listed plants, actions for specific conservation recommendations were ranked. An overall score for each of the 31 plants was presented, as well as an average score for specific actions across species. Detailed results from six plants were presented as examples. The results indicate that actions to limit development and implement best management practices were represented reasonably well through resource management plans by federal and local agencies, city codes, special land designations and advocacy for plants in oil and gas mission change rulemaking mandated in SB19-181. Conservation actions related to climate change were typically lacking. Federally-listed species and rare plants on state lands tended to have more conservation actions in progress; however, many conservation actions fell into the unknown rank.

Check out the Rare Plant Addendum to the SWAP (<https://cpw.state.co.us/Documents/CNAP/Rare-Plant-SWAP-2015.pdf>) to review species of interest and contact Jessica Smith (jp.smith@colostate.edu) to provide information on ongoing or recent conservation actions for PGCN.

The second presentation of the day was **“The Floristic Quality Assessment Coefficients of Conservatism (C value) Update for Colorado”** and was presented by Pam Smith and Georgia Doyle. This presentation provided an overview of the methods used to update the FQA and C values for Colorado. Specifically, in 2019 and 2020, CNHP (as part of a wetland program grant from the US EPA) updated the plant list for the Floristic Quality Assessment. The FQA is an ecological assessment tool using botanical surveys to determine the degree of disturbance in a landscape. It is often used with other assessment tools to determine ►

Colorado Wildlife Action Plan

Appendix A: Rare Plants



By the Colorado Natural Heritage Program

For

Colorado Parks and Wildlife

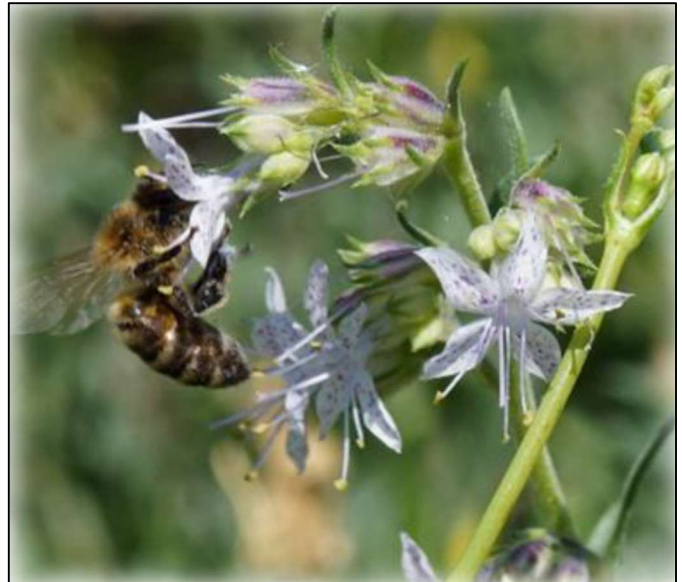
◀ habitat condition and has been hosted on the CNHP website. The update was accomplished by having a panel of 27 botanical experts assign a Coefficient of Conservatism (C value) to individual species focusing on species with no assigned value (~20% of the original species list). Based on two workshops, input from expert panel members and CNHP's wetland condition plot database, they were able to assign values to 600 additional species.

To assign values, they also found that it was necessary to update the list of species for Colorado, incorporating taxonomic updates that have occurred between 2007 and 2020. The FQA species list now includes 3,375 taxa. For 154 species (5% of the total flora) there was not enough habitat data available or expertise to assign a C value (many species are known from only one collection site). For the taxonomic update, CNHP completed a crosswalk between Ackerfield's *Flora of Colorado* (2015) and the original FQA list which was based on Weber's and Wittmann's *Colorado Flora* (2001) and USDA Plants (2005). In addition to updating the species list and assigning C values for 600 additional species, information on wetland status, nativity, and CNHP tracking status was updated for all species on the list of plants for Colorado. The new list, a detailed report and an FQA calculator will be available on the CNHP website in January 2021.

Following the first two informative presentations, summaries of ongoing conservation work by partner agencies was provided

Emily Griffoul with Betty Ford Alpine Gardens began the session. The BFAG are expanding their conservation program by active participation and implementation of the: North American Botanic Garden Strategy for Alpine Conservation. This strategy included four key components: understanding and documenting alpine plant diversity, in-situ and ex-situ conservation, education and outreach and capacity building. This year they were able to collect seed from 19 plant species for ex-situ conservation and surveyed several alpine Important Plant Areas. For more information contact emily@bettyfordalpinegardens.org.

Raquel Wertsbaugh, the Colorado Natural Areas Program coordinator provided an overview of the program, with an introduction to its staff and volunteers, the natural areas being monitored by their volunteer stewards, and rare plant monitoring projects. The Natural Areas Program has on-going monitoring on state lands for Tier 1 SWAP species such as *Ipomopsis polyantha* and *Physaria pulvinata*. Looking to the future CNAP is hoping to increase the representation of state natural areas on the Eastern Plains. For more information go to <https://cpw.state.co.us/aboutus/Pages/CNAP.aspx>



Pagosa skyrocket, *Ipomopsis polyantha*. © CNHP

Jennifer Neale, director of research and conservation at the Denver Botanic Gardens regaled us with beautiful photos of the new Freyer-Newman Center, which includes space for research facilities, herbaria, art galleries, classrooms, the School of Botanical Art & Illustration, the Helen Fowler Library, and more. The new research facilities provide spacious accommodations to support DBG's ongoing population biology, botanical surveys, conservation genetics, ex-situ conservation, restoration, and urban ecology work. Jennifer encourages everyone to visit the new state-of-the-art facilities and explore the gardens. To learn more, go to: <https://www.botanicgardens.org/science-research/biodiversity-research>.

Mindy Gottsegen, conservation services manager for the State Land Board provided an overview of the establishment and mission of the SLB. Established in 1875, state land was set aside to support public schools. The program has provided \$1.7 billion to schools since 2008 by supporting capital construction and supporting the Colorado Department of Education's operation budget. To continue to ensure that the state lands remain intact to support its mission, a Fen Stewardship Action Plan has been developed with three goals in mind: 1) resource conservation; 2) development and how to lease lands in a sustainable manner; and 3) outreach. To learn more about this exciting plan contact Mindy Gottsegen at mindy.gottsegen@state.co.us.

Mit McGlaughlin, a professor and director of the School of Biological Sciences at the University of Northern Colorado, provided an educational look at the ongoing conservation genetics being conducted in his lab at UNC. In 2020, work was completed on *Eriogonum brandegeei*, indicating that there is no gene flow between the two population centers of the species—important information for conservation of ▶

◀ the species as a whole. Updates on *Sclerocactus glaucus* genetic work revealed that the northern population of the species is distinct from the remainder of the population to the south and will be named as a new species, *Sclerocactus dawsonii*. Mit's lab is also working on several other rare plant species and has initiated new projects for several federally-listed species including *Astragalus osterhoutii*, *Eutrema penlandii* and *Eriogonum pelinophilum*. For more information contact: mitchell.mcgloughlin@unco.edu

Aimee Crittendon, a biologist with the US Fish and Wildlife Service, ecological services in Grand Junction, discussed the ongoing Species Status Assessments that are being completed for all the federally-listed and candidate species in Colorado. The SSAs for *Penstemon debilis* and *Ipomopsis polyantha* are in the final stages of review; *Eriogonum pelinophilum*, *Phacelia formosula*, *P. submutica* and *Sclerocactus glaucus* SSAs are in progress. Recovery plans were recently published for *Physaria obcordata* and *P. congesta* and are in progress for *Penstemon debilis* and *Ipomopsis polyantha*. *Astragalus schmolliae* has been proposed for listing as threatened and the 60-day comment period is ongoing. For more information visit the USFWS website <https://www.fws.gov/mountain-prairie/>.

Following a lunch break, the symposium continued with a presentation from Western State University Master's student Bronwyn Taylor. Bronwyn shared preliminary data from her master's thesis project "The Reproductive Ecology of *Astragalus microcymbus*." Her first-year results yielded amazing images of pollinators and insect visitors of *A. microcymbus*, but evidence of seed set in her study was complicated by browsing of flowering stems. The innovative use of

wildlife cameras on her study plots found the culprits to be predominately rabbits. Her exhaustive reproductive study will continue next year and we very much look forward to her final results. Bronwyn can be reached at bronwyn.taylor@western.edu.

The final session of the day "Rank and Status Review for Select Colorado Front Range and Plains Plants of Concern" was presented by CNHP botanist Susan Panjabi, who led the review of the 14 plants listed below. Summary information was presented on each taxon including a distribution map, photos of the plant and habitat, last observation date, population size estimates, management concerns, and land ownership patterns associated with the known distribution.

Additional data and photos are needed for all of these taxa, and we welcome efforts from the CoNPS members and others to help expand our knowledge of these plants through targeted field surveys and observations. Contact Susan at susan.panjabi@colostate.edu if you would like to contribute information on these species.

The day ended with a virtual happy hour that was well attended and provided a wonderful way to catch up with fellow botanists. All of the presentations from this meeting as well as previous symposia are available online at the Colorado State University, Colorado Natural Heritage Program (CNHP) website: www.cnhp.colostate.edu.

Jill is the botany and vegetation ecology team leader at the Colorado Natural Heritage Program, where she has worked for more than twenty years. She and her team work closely with many partners throughout the state to develop and maintain a statewide database that serves as the central repository for information on over 500 rare plant, lichen, and moss species and plant community associations. ☯

Scientific name	Common name	G Rank	S Rank
<i>Aletes humilis</i>	Larimer aletes	G2G3	S2S3
<i>Asclepias uncialis</i> ssp. <i>uncialis</i>	Dwarf milkweed	G3G4T2T3	S2
<i>Astragalus sparsiflorus</i>	Front Range milkvetch	G2	S2
<i>Bolophyta alpina</i> (<i>Parthenium alpinum</i>)	Wyoming feverfew	G3	S2
<i>Dalea cylindriceps</i>	Andean prairie-clover	G3G4	S2S3
<i>Erigeron radicans</i>	Taproot fleabane	G3G4	S1
<i>Grindelia hirsutula</i> var. <i>acutifolia</i>	Raton gumweed	G5T1	S1
<i>Grindelia hirsutula</i> var. <i>revoluta</i>	Rolled gumweed	G5T2	S2
<i>Oenothera coloradensis</i> (<i>Gaura neomexicana</i> ssp. <i>coloradensis</i>)	Colorado butterfly plant	G3T2	S1
<i>Oenopsis foliosa</i> var. <i>monocephala</i>	Rayless goldenweed	G3G4T2	S2
<i>Penstemon versicolor</i>	Variable-color beardtongue	G3?	S3
<i>Physaria bellii</i>	Bell's twinpod	G2G3	S2S3
<i>Solidago capulinensis</i>	Capulin goldenrod	G2	S1
<i>Spiranthes diluvialis</i>	Ute ladies' tresses	G2G3	S2tabl

2020 Annual CoNPS Conference Report

Here's What You Missed

In this issue of *Aquilegia*, we feature reports of the 2020 conference sessions. Many thanks to the members who watched and summarized the virtual conference for *Aquilegia* readers. Conference attendees can also re-watch the sessions. For anyone who missed the conference, the sessions will be available soon for \$25. MM

Conference Presentations

The Richness of Plants in the Mountains Benefits People

Presenter: Heidi Steltzer, Ph.D.

Reported by Rachel Puttmann

Dr. Heidi Steltzer kicked off the conference. Her discussion focused on how the richness of plants in the mountains benefit people. Dr. Steltzer is a professor at Fort Lewis College, an environmental scientist, explorer, storyteller, and expert on how climate change affects mountain and Arctic ecosystems.

Dr. Steltzer began by acknowledging the land that she lives and works in as the ancestral lands and territories of the Ute, Apache, Pueblo, Hopi, Zuni, and Diné nations. She stressed the importance of not only land acknowledgement, but also consciously acting to include Native peoples' values, knowledge, and spaces when working in these areas. Through her experience teaching and interacting with Native peoples at Fort Lewis College, she has learned of the concept of holism, or the idea of seeing people and nature as one. She considers herself fortunate to be a professor at Fort Lewis College where there is a high level of Native student enrollment. Dr. Steltzer also acknowledged CoNPS's work of building enthusiasm, sharing knowledge, and creating a community in which plants are celebrated.

The conversation was framed to discuss the benefits of native plants for people. This was done to highlight the importance of impacting and influencing policy and

decision making. She described four main benefits to people from mountain plants:

- Mountain plants can be a bridge;
- Mountain plant communities are resilient;
- Mountains are a refuge; and
- Mountain plants provide beauty and solace.

Mountain plants act as a bridge to connect people across countries and cultures, as many plants found in the mountains of Colorado are also found in mountain habitats throughout the world, such as the Tibetan-Himalayan Plateau of China and the Arctic ecosystems of Alaska and Greenland. She noted that stressors, such as increases in snowmelt brought on by climate change, collectively impact all people. This importance is reinforced by the fact that we are seeing more people moving to higher elevations. This migration is in part to escape cities and higher temperatures, but also because people see mountains as desirable because they provide beautiful landscapes and settings.

To sustain an appealing mountain refuge environment that continues to connect communities, we need to understand the importance of them and act to make them lasting. This comes down to policy- and decision-making: By proactively engaging in conversations and reactively challenging outdated practices.

Rachel Puttmann has been in the environmental sciences field for more than 14 years. She holds a BS in Biology from Colorado State University and an MS in Environmental Sciences from the University of Colorado Denver. Rachel has worked, volunteered, and played from Alaska to Belize to Iceland, but she will always favor spending time on the public lands of Colorado and the mountain west.

Colorado's Circumboreal Alpine Plants and a Little Biogeography: Links to Eurasia and South America and What's Unique

Presenter: Mike Kintgen

Reported by Rachel Puttmann

Mike Kintgen is the curator of alpine collections at the Denver Botanic Gardens where he has been volunteering and working since he was 11 years old. ►



*"The richness of plants in mountain systems, includes some species that occur across broad elevation gradients and across the state, such as *Erigeron* and *Potentilla*, and some that are tucked away in microsites that are uniquely*

cooler, wetter. or drier due to topography and the presence or absence of snow. The richness of species is why mountain growing seasons are resilient, as snow cover changes." Heidi Steltzer

◀ Mr. Kintgen began his discussion by expanding his initial topic of Colorado's circumboreal plants to include other elements such as circumpolar species, amphiberigian species (found on both sides of the Bering Strait), the Western North America/Eastern Maritime Canadian/Greenland connection, Middle Asian influence, Patagonia connection, and Colorado high elevation endemic species.

Colorado's circumboreal plant species are sometimes overlooked because they tend to be less showy and charismatic than other plant species. To emphasize the value of our alpine plant species, he outlined links to other parts of the world as well as highlighted what is unique to Colorado's alpine flora.

The difference between circumboreal versus circumpolar flora is that circumboreal species are found in the boreal, or forested, regions of the northern hemisphere while circumpolar species are found in polar, or tundra, regions of the northern hemisphere. Colorado's link to Middle Asia by way of Greenland may be better described as oroboreal—a term coined by the late William Weber describing flora found throughout the highland and steppe (mountainous) regions of the northern hemisphere. It is also thought that these connections, as well as those to both sides of the Bering Strait and northeastern North America, represent relict flora populations of a more common and widespread ancestor. Another interesting alpine flora bridge is the Colorado—Patagonia connection. There seems to be a heavy North American influence on Patagonian flora. There are a couple of reasons why this is evident, one being that the Andes Mountains provided a mobile highway for flora to move south, the other being that many birds migrate back and forth from the boreal, polar, and mountainous regions of North America to Patagonia and could help aid in distribution.

It should be pointed out that not all common biogeographical alpine flora links are distributed evenly throughout their habitat ranges. Distribution is sometimes disjunct with large gaps. There are common circumboreal plant genera and species that are not known to exist in Colorado, and there are genera and species that are endemic to the high elevations of only Colorado.

Mr. Kintgen provided tables of common genera and species sorted based on a specific element (e.g., circumboreal). Specific numbers of species vary depending on whether observations are lumped or split. Often time species complexes get lumped together, but they could also be split into more distinct numbers of species being present. He also supplemented this discussion with numerous photographs to help provide

visuals of alpine plant species observed throughout both Colorado and other parts of the world.

Rachel Puttmann has been in the environmental sciences field for more than 14 years. She holds a BS in Biology from Colorado State University and an MS in Environmental Sciences from the University of Colorado—Denver. Rachel has worked, volunteered, and played from Alaska to Belize to Iceland, but she will always favor spending time on the public lands of Colorado and the Mountain West.

Colorado Native Plant Availability in the Green Industry

Presenter: Jennifer Boussetot, PhD

Reported by Jenifer S. Heath

Dr. Boussetot opened her session with a salute to her mentor, Jack Carter, who passed away this spring. She hopes to emulate this great man, who was her mentor over many years, and who has left his mark on both the academic and the applied communities interested in native plants.

Jennifer is an ambassador and advocate for Colorado native plants and was led to her wholehearted embrace of Colorado native plants in the process of her research on green roofs. She realized that native plants are ideally suited to the harsh growing conditions on top of buildings. She strives to embody Douglas Tallamy's book title of *Bringing Nature Home*, and believes that it is important to make the connection between what we enjoy in nature and what we enjoy in our landscapes. In this session, Dr. Boussetot imparted practical information related to a very common challenge: Where can we buy native plants for gardens or larger projects?

Due to the ubiquity of challenges to finding native plants to buy, CoNPS long ago developed a list of retail sources for native plants and native plant seed in Colorado. This list, available on the CoNPS website at <https://conps.org/wp-content/uploads/2019/01/Vendors-2019.pdf>, was most recently updated January 2019. Because a number of garden stores have recently closed (and new ones may have opened or started including native plants), Dr. Boussetot and Lisa Olsen are working on further updating the list. The update may be presented at the spring conference on native plants in landscaping.

Most retail customers make purchases based on the appearance of the plants that are for sale at nurseries, and many native plants—not having been bred to attract customers—do not show well to retail customers. Hence, Dr. Boussetot is actively involved in a multi-year research project to help growers of native plants produce plants that are more attractive during the retail selling season. The first year of research focused on the substrate in which about a dozen studied species are grown, including ►

◀ Sun Gro® Sunshine® LC1 (control) and LC1 mixed with materials like mason sand, a proprietary mix of enzyme-producing microbes, a native clayey soil from a recent scrape near Horsetooth Reservoir, or a proprietary compost. Several variables were measured and combined mathematically to produce a growth index that was used to evaluate the efficacy of various substrates.

Preliminary results suggest that different native plant species thrive in different substrates. There may be no one-size-fits-all solution. The second year of research will continue and refine evaluation of substrate, and add evaluation of watering frequency. Most retail sellers of native plants water daily, which has not been the typical watering pattern for native plant growers.

One of the many discussion topics in the session's chat box was about how to encourage neighbors to plant native. Ideas included: demonstrating use by planting native yourself; explaining or demonstrating how native plants can help neighbors achieve garden goals (such as attracting pollinators); and sharing free native plant seed or mature native plants with neighbors. Dr. Boussetot shared that Front Range Wild Ones is a source of information about how to influence HOAs to include native plants in shared spaces.

Jennifer Heath is a professional toxicologist who has recently become interested in using native plants to simulate native habitat as a way to leave her small corner of the world a better place than it was when she came.

Thistle Be Fun

Presenter: Jennifer Ackerfield

Reported by Pat Butler

Jennifer Ackerfield reported on her genetic research to classify native thistles, specifically those growing at high altitudes, which she described as a very challenging task. For example, some early classifications (dating back even to Parry's collections identified by Gray) appear inconsistent, and herbarium specimens often are not complete (and, at best, do not show flower color and sometimes other important characteristics). Jennifer's genetic research examining five thistle species currently reported to exist in Colorado revealed that some of them are not actually in our state and others require different classifications.

For example, *Cirsium arizonicum* (Cainville thistle) is likely to exist in western Colorado, but the former variety *arizonicum* var. *bipinnatum* should be classified as *C. pulcherrimum* (Wyoming thistle). *Cirsium clavatum* (Fish Lake thistle) exists only in Utah, and Colorado plants currently included in that species should instead be called *C. centaurea*, *C. griseum*, or *C. griseum* var. *osterhoutii*. Likewise,

Cirsium eatonii (Eaton's thistle), thought to live here at high altitudes, actually exists only in Utah and this species in Colorado probably should be labeled *C. griseum* (now including *C. osterhoutii*). She said more research is needed to determine if this plant is a new species, a new variety of *C. griseum*, or possibly a hybrid of *C. griseum* and *C. scopulorum*.

The thistle found in our highest mountains, *C. eriocephalum* (also known as *C. scopulorum* or mountain thistle) has been seen with several forms and flower colors found in different parts of the state. Jennifer's analysis revealed that the purple-flowered form is *C. scopulorum* var. *hesperium*, and the tall form on Pikes Peak appears to remain *C. scopulorum*. The yellow-flowered form (found from south of



Cirsium funkae (proposed name).
© Jennifer Ackerfield

Breckenridge) is a new species that Jennifer proposes naming *C. funkae* to honor her late mentor Vicki Funk, PhD, senior curator of the Smithsonian National Museum of Natural History. *Cirsium scariosum* (elk or meadow thistle) actually is two species: *C. tioganum* (acaulescent) and *C. coloradense* (caulescent).

In discussing the importance of native thistle species for pollinators, birds, and animals like pikas, Jennifer also noted the several invasive species common throughout the state, including: *C. arvense*, (Canada thistle), *C. vulgare* (bull thistle), *Carduus nutans* (musk thistle), *Centaurea solstitialis* (yellow star thistle), and *Onopordum acanthium* (scotch thistle). She stressed the importance of distinguishing them from natives, which some people mistakenly destroy, thinking "all thistles are bad."

She observed that speciation is a process, not an event, and concluded with the observation that many of Colorado's two dozen or so beautiful native thistle species have not been carefully studied and may be endemic to small geographic areas and deserve more research. ►

◀ *Patricia Butler is an amateur botanist, member of the Boulder chapter steering committee, native thistle fan, invasive thistle control volunteer, and participant in Jennifer Ackerfield's "Team Thistle" collecting high altitude thistle specimens for the research discussed in her presentation.*

Light Pollution Affects Invasive and Native Plant Traits Important to Plant Competition and Herbivorous Insects

Presenter: Shannon Murphy, PhD
Reported by Laura Nelson

Dr. Shannon Murphy presented on an interesting research study assessing the impacts of light pollution on invasive and native plant traits important to plant competition and herbivorous insects. Dr. Murphy introduced the audience to Artificial Light at Night and its many effects on organisms, such as misdirecting baby sea turtles towards buildings rather than the ocean after hatching. With a focus on ALAN, Dr. Murphy addressed how ALAN affects native and invasive grass traits.

In one study, Dr. Murphy and her team assessed the impact of light pollution on the following traits of smooth brome (*Bromus inermis* Leyss.): leaf toughness, aboveground biomass, and C:N ratio. For the experiment, grass samples were collected from streetlight-illuminated and un-illuminated areas in the Denver Metro area. The team found that there was no difference in the C:N ratio or aboveground biomass of the grasses collected from the streetlight-illuminated and un-illuminated areas. However, the grasses grown under the streetlights were tougher than those growing in darkness. This had implications for *Apamea sordens* (a type of moth) larvae, which Dr. Murphy and her team found had lower mass and fitness when grown on smooth brome from under streetlights. This finding suggests that streetlights may increase invasive plants' resistance to insect herbivores.

Dr. Murphy's talk also covered the Ecological or Evolutionary Trap theory. The theory is that organisms respond to environmental cues, such as baby sea turtles using moonlight to direct them to the ocean. When the environmental cue changes (moonlight to streetlights), the organism responds to the new environmental cue (baby sea turtles head toward developed areas instead of the ocean) and thus ends up in an ecological or evolutionary trap. Following this theory, Dr. Murphy highlighted how ALAN can be an ecological trap for moths. This ecological trap has implications for native plants, because many moths are native plant pollinators.

Laura Nelson is an outdoor enthusiast and recently joined CONPS to learn more about the native flora of Colorado. She is also interested in ecology and holds an MS from the University of Wyoming where she studied the effects of

climate change on plant roots and soil carbon cycling in a shortgrass prairie. She enjoys continuing to learn about native plants and pollinators through the events hosted by CoNPS.

Finns? Or Fins? No...Fens!

Presenter: Steve Yarbrough
Reported by Cathi Schramm

Steve Yarbrough, wetland ecologist with TetraTech, gave a very informative talk about fen ecosystems in Colorado. Fens are peaty wetlands fed by ground water that form on the margins of ponds, lakes, and streams, and make up a mere 0.1% of the Colorado landscape. Fens help filter and store water, mitigate floods, capture carbon, and provide habitat for a variety of rare plants and other wildlife. They're pretty cool things!

Fens have their own "micro-topography," from the lumpy bumpy hummock and hollow formations to floating mats in "quaking fens." Steve explained that fens fall into categories based on their pH levels, ranging from acidic iron fens that are lower in quality and nutrients, to rich fens that are pH neutral, and extremely rich fens that are on basic end of the spectrum. The type of fen depends on the minerals that its water flows through. As you might expect, the richer the fen, the greater the biodiversity in it.

After describing the qualities of different types of fens, Steve described the enormous variety of plant life found in them. Fens support everything from mosses to sedges, forbs, shrubs, and trees. Sedges (*Carex* spp.) are very common in fens, and decomposing sedges are the primary source of the fens' peaty underlayer. Steve showed lovely pictures of some of the many species that make their homes in Colorado's fens, including hooded ladies' tresses (*Spiranthes romanzoffiana*), common bladderwort (*Utricularia vulgaris*), little elephanthead (*Pedicularis groenlandica*), alpine meadow rue (*Thalictrum alpinum*), Greenland primrose (*Primula egaliksensis*), and Colorado blue spruce (*Picea pungens*), to name just a few.

If you're hoping to see a fen in person, Steve mentioned a few that are noteworthy. Geneva Creek fen is an iron fen in the Clear Creek County open space system; High Creek Fen is a rich fen in Park County that is rife with biodiversity and managed by The Nature Conservancy; and Willow Creek fen is a high-altitude fen near the Buffalo Peaks area of Pike National Forest. If you do decide to go, be respectful! Fens take centuries to form their peat layers and would require centuries to regenerate if damaged. As such, they are high on the list for conservation and preservation. Thanks, Steve, for helping us learn about these irreplaceable treasures in Colorado's high country!

Cathi Schramm is a technical writer and instructional designer, native plant enthusiast, and amateur ►

◀ *conservationist hoping to someday turn her amateur status to professional.*

Climate Change in the High Country

Presenter: Tim Seastedt

Reported by Cathi Schramm

As the final presentation of the conference, Tim Seastedt spoke about the impact of climate change on herbaceous plant communities in the Colorado Front Range, particularly in high elevation ecosystems. As part of his work as professor of ecology and

evolutionary biology at the University of Colorado, Tim has spent a great deal of time with the Niwot Ridge Global Monitoring Laboratory, a long-term research program studying the impacts of rising temperatures on plant life. The Niwot Ridge monitoring station has been recording temperatures, carbon dioxide, and other

atmospheric gasses since 1968. Researchers have noted earlier snow melt, reduced snowpack, glacial melt, and increased rain in the alpine and sub-alpine zones. Over the years, the threat of acid rain has abated, but a new issue of dust from southwestern North America has taken its place. The dust changes the rate of snow melt as well as the soil and water chemistry in the ecosystems where it settles.

So, what does all this mean for the plant communities in these ecosystems? Many mountain plant species are perennial and adaptive to a range of temperatures and available precipitation. To study changes in these systems under controlled conditions, Tim and his fellow researchers manipulated snow melt, temperature, water conditions, and nutrient levels, and then observed how various plant communities fared. Not surprisingly, most plant communities (other than graminoids) fared worse without additional water. The group also studied the relative volume of plant communities at different elevations. They found that the percentage of deciduous shrubs was increasing in the higher elevations and that in general, plants were moving uphill. There has been a massive increase in willow cover, which is putting high-elevation ecosystems such as moist mountain meadows at risk.

As with everything, there are species winners and losers in this scenario. For example, ground nesting birds such as ptarmigans may benefit from an increase in cover. Some pollinators may suffer as forbs and grasses give way to willows and Douglas

firs. Although Tim's talk did not focus on changes in fire regime due to climate change, he did mention that forests are regenerating more slowly after fire than they have in the past. This scenario has led to an increase in meadows in south-facing areas that had previously been wooded.

The character of mountain ecosystems is surely changing with the climate, and the Niwot Ridge Laboratory will continue to track these changes. It is possible that the warming of high-elevation

ecosystems will add to the problem, since tundra soils are loaded with carbon that is escaping rapidly as the world warms. Subalpine areas have traditionally been carbon sinks, but this may not hold true with the increase in fire activity. At this point, if we want our mountains to maintain their characteristic plant life, our best bet is to do everything we can to

reduce greenhouse gas production and mitigate the effects of climate change on our world.

Cathi Schramm is a technical writer and instructional designer, native plant enthusiast, and amateur conservationist hoping to someday turn her amateur status to professional.



Niwot Ridge, INSTAAR Biogeochemistry Laboratory.
<https://instaar.colorado.edu/research/labs-groups/biogeochemistry-laboratory-i/>

Missed the Conference?

Watch the Presentations on YouTube

Video recordings of all virtual annual conference presentations will soon be available to watch from the comfort of your own home. Paid registrants will automatically receive links to each of the programs below.

For members who did not register for the conference, access will be available for \$25 at the CoNPS website. Watch your inbox for a future E-News that will promote the release date.

In addition to the conference presentations, the following Friday Night Social presenters will also be featured in the videos:

Kelly Ambler

“Commemorating the 1820 Ascension of Pikes Peak by Edwin James, Botanist”

Tom Schweich & Denise Wilson

“CoNPS Members in the Field”

Suzanne Dingwell & Denise Wilson

“Meet the People at CoNPS” 🌀

Featured Story

Celebrating the Bicentennial of Stephen H. Long's Expedition Part 4 of 4: Noteworthy Species from the Arkansas River Valley to the Colorado-New Mexico Border

By Mike Kintgen and Jen Toews

This is the final of four articles in a series about the Long Expedition to the Rocky Mountains.

After Edwin James's July 13-15 ascent of Pikes Peak, Long's party lost no time in reassembling for the rest of their journey. By 5:00 AM the next day, the men had left their horse camp on Fountain Creek and were headed south towards the Arkansas River.

Before reaching its banks, the party found themselves staring down at the river from the edge of a steep cliff. Unable to continue, they were forced to backtrack to a ravine, which, according to written descriptions by James or Bell, was not an easy feat to descend. The group was presumably relieved when they finally arrived at their camp sometime that afternoon, after having traveled a total of 28 miles that day.

With the completion of the Pueblo Dam in 1975, the area looks very different today. However, based on a Samuel Seymour drawing, authors Goodman and Lawson have placed Long's camp near the mouth of Turkey Creek, which is located along the northwest inlet of present-day Pueblo Reservoir.

The party remained camped here for several days while the adventurous and indefatigable James and three others attempted to follow the Arkansas River into the mountains. Many details of this side trip are lacking; but on the first day, the group followed the Arkansas until the terrain became too difficult. They turned onto a Native American trace along Beaver Creek, then followed Eightmile Creek towards Six Mile Park (a mountain park between present-day Phantom Canyon and Cañon City), and finally camped at Bell's Springs (named after Captain John R. Bell who accompanied James on this side trip).

Goodman and Lawson asked locals about the springs and learned that out of seven total, Soda and Iron had been tourist attractions for some time. However, Bell's Springs disappeared into obscurity when the final two were destroyed with the widening of Highway 50 and when improvements were made to the grounds of the Colorado State Penitentiary.

On the second day of James' side trip (July 18), the men found themselves staring down into the over 1200-foot deep Royal Gorge. In their writings, they

commented on the unique geology and dramatic scenery of the area. Instead of attempting to explore further, they began their 28.5-mile journey back to their camp on Turkey Creek.

James later wrote: "In the excursion I found a few new plants which I have no time to examine." Due to insufficient documentation likely due to time constraints, it is difficult to determine which plants were collected and where. However, based on the known distribution of *Frankenia jamesii* Torr. ex A.Gray (James's seaheath) and where the expedition's routes overlap, this is certainly a species that could have been encountered. Goodman and Lawson contend that James may have collected the type specimen along the Arkansas River somewhere between Canon City and Rocky Ford. The only member of the seaheath family represented in Colorado, *F. jamesii* is a small salt-tolerant shrub with linear, revolute leaves and white flowers. It is found in limestone, gypsum, and shale slopes.

On July 19, Long's party prepared mentally for leaving the mountains. Thirteen days earlier, the group had reached the eastern slope of the Southern Rockies and now it was time to bid farewell. Although their goal of reaching the headwaters of the Platte River had not been attained, they still hoped to find the headwaters of the Red River. ►



James's seaheath, *Frankenia jamesii*. © Jen Toews

◀ Emotions were mixed. Perhaps unsurprisingly, James wrote: “It was not without a feeling of something like regret that we found our long-contemplated visit to these grand interesting objects, was now at an end.” Bell, on the other hand, looked forward to “enjoying the benefits & pleasure of civilized society and the fond welcome of our friends.”

After breaking camp near present-day Devine, the party spent the next two days traveling eastward along the Arkansas River. On July 20, James described passing the mouth of the Huerfano River and noted mounds on the prairie both west and east of present-day Boone. The following day, the group met the first Native Americans they had seen since leaving the Pawnee Villages in central Nebraska June 14. They were persuaded to show Long’s party a suitable river crossing a few miles downstream.

From the night of July 21 to July 23, the party camped near present-day Rocky Ford. During this time, James described what authors Goodman and Lawson speculate was *Baccharis salicina* Torr. & A.Gray (Great Plains false willow): “a syngeneceous shrub,

probably a vernonia” that was growing as an understory shrub in a wooded area near their campsite.

On July 24, the Long Expedition split into two groups. One group, headed by Captain Bell, would continue down the Arkansas River towards Fort Smith; The other group, led by Major Long, would travel southward into Spanish Territory hoping to find the start of the Red River. Edwin James was in the latter party.

That night Major Long’s party camped in a ravine near present-day Packers Gap, which is 8 to 10 miles northwest of the Purgatoire River. In his diary, James mentioned the “small but beautifully shaped” junipers as well as the two species described below.

Although James described *Ratibida tagetes* (E. James) Barnhart (green prairie coneflower) in a July 24 diary entry, it would not be recognized as distinct until 1857. First it was treated as a synonym of *Lepachys columnaris* var. *pulcherrima* (*Ratibida columnifera*) and then as a variety of the same species (*L. columnaris* var. *tagetes*). In terms of morphological differences, *R. tagetes* has a globular instead of ▶



Green prairie coneflower, *Ratibida tagetes*. © Jen Toews



James's galleta, *Hilaria jamesii*. © Jen Toews

◀ cylindrical receptacle and much shorter rays than *R. columnifera*. The type specimen was likely collected near present-day Rocky Ford.

Also listed in James' diary on July 24 is a grass "having spikelets involucred with a tuft of down." Torrey described *Hilaria jamesii* (Torr.) Benth. (galleta) under the name *Pleuraphis jamesii*. The herbarium sheet, found at NYBG, lists a vague location: "On the high plains of the Trap Formation at the sources of the Canadian River." Authors Goodman and Lawson speculate that this was collected in present-day Otero County, several miles southeast of where the party crossed Timpas Creek (see References).

On July 25, the party continued southward and around midday entered the precipitous-walled canyon of the Purgatoire. As it was July, the temperatures could have been in the 90s or above. To make matters worse, the terrain was challenging. In his diary, James described a tributary they traversed: "this we found so narrow and so obstructed by fallen masses of rock, and almost impenetrable thickets of alder and willows, as to render our progress extremely tedious and painful." To avoid the thickets, the men walked through the stream bed, but encountered deep mud. Next, they attempted to climb out of the canyon, but as they neared the rim, realized it would be impossible. Eventually they returned to their original course. Historians theorize that the branch of the Purgatoire Canyon they were in was Chacuaco Canyon.

Two type specimens were collected from this area. The first was the low-growing herb with satiny-purple

flowers, *Quincula lobata* (Torr.) Raf. (purple ground cherry). James also described a "*Prunus* with leaves alternate obliquely cordate" and peduncles axillary solitary one flowered." This species was in fact *Celtis reticulata* Torr. (netleaf hackberry), a deciduous tree still found on rocky slopes and in canyons in southeastern Colorado.

Sometime on July 26, the party entered Bachicha Canyon, which is in Las Animas County eight miles north-northeast of the junction of State Highway 389 and US. Highway 160. Several more species were collected from this area. First, James described a sprawling herb of the legume family with bipinnately compound leaves and bright yellow flowers: *Pomaria jamesii* (Torr. & A.Gray) Walp. (syn. *Caesalpinia jamesii*) (James' holdback).

James likely collected three forbs in this canyon that had not yet been described to science: the pinkish-purple flowered *Dalea formosa* Torr. (featherplume), which he referred to as "A beautiful *Dalea*" and two buckwheats, *Eriogonum jamesii* Benth. (James' buckwheat) and *E. tenellum* Torr. (tall buckwheat).

On July 27, the party continued south towards the head of Bachicha Canyon, where they hoped to exit and return to the plains above. However, the canyon's narrow head was blocked by large rocks, preventing their passage. (It is based on this description that Goodman and Lawson deduced that the group had been traveling through the remote Bachicha Canyon.) The men retraced their steps a mile and a half until they were able to find an exit. James described his ▶



Clockwise from left. Rim of Purgatoire Canyon; purple ground cherry (*Quincula lobata*) © Jen Toews; netleaf hackberry (*Celtis reticulata*) © Mike Kintgen; James' holdback (*Caesalpinia jamesii*) © Patrick Alexander; James' buckwheat (*Eriogonum jamesii*); © Mike Kintgen; tall buckwheat (*E. tenellum*) © Erin Goulet.

◀ relief upon leaving the canyon: “We emerged from the gloomy solitude of its valley, with a feeling somewhat akin to that which attends escape from a place of punishment.”

In addition to the species listed above, James could have collected the type specimens of many other taxa from this portion of the trip. However, location information was either not recorded or was lost. These species include:

- *Artemisia filifolia* Torr. (sand sage);
- *Gaillardia pinnatifida* Torr. (red dome blanketflower);
- *Palafoxia sphacelata* (Nutt. ex Torr.) (desert palafox);
- *Mirabilis multiflora* (Torr.) A.Gray (Colorado four o'clock);
- *Berlandiera lyrata* Benth. (chocolate flower);
- *Dalea jamesii* (Torr.) Torr. & A.Gray (James' prairie clover); and
- *Sporobolus airoides* (Torr.) Torr. (alkali sacaton).

Finally, James collected a specimen of *Sarcobatus vermiculatus* (Hook.) Torr. (greasewood) that should have been the type specimen. According to Torrey, “This remarkable plant [...] was first collected by Dr. James about the sources of the Canadian, (in Long's expedition) but was omitted in my account of his plants published in the Annals of the Lyceum of Natural History.” Instead, a collection made years later by the British botanist Joseph Hooker became the type. Based on this species' range, Goodman and Lawson believe that James' specimen was collected in Pueblo, Otero, or Las Animas Counties.

July 27 was the last night that members of the Long Expedition camped in present-day Colorado. Their campsite was about eight miles northeast of Branson and about ten miles south of the mouth of Bachicha Canyon. The following day they crossed what would become the Colorado and New Mexico state line. The expedition would continue through northern New Mexico, the Texas Panhandle, and into Oklahoma via the Canadian and Arkansas Rivers.

On September 13, 100 days and approximately 1,600 miles from Engineer Cantonment, Nebraska, Long's party arrived in present-day Fort Smith, Arkansas, where they were reunited with Bell's party. James carried with him around 700 plant specimens, well ▶

Long Expedition Provided Foundation for Subsequent Scientific Work

Major Stephen H. Long's 1820 expedition has never received the notoriety of the Lewis and Clark Expedition (1804-1806) or even the Pike Expedition (1806-1807). Yet, subsequent scientific work in Colorado owes much to this expedition. James' keen eyes and hands noted and collected some of Colorado's most charismatic plants, along with a large suite of more subtle natives. Two-hundred years later, fourteen western species still bear James' name in the specific epithet, commemorating his work. The genus *Jamesia*, whose members are endemic to western North America, commemorates him as well.

Another contribution of the Long Expedition is the paintings by Titian Ramsey Peale and Samuel Seymour, which allowed U.S. citizens a physical image of what the Southern Rockies and Great Plains looked like. The naturalist and entomologist, Thomas Say, also contributed a sizeable collection of insects, the first large scale collection made in the American West. In the years that followed, Say described approximately 160 insect species from the expedition (Evans, 238). Finally, the descriptions of the landscapes and the maps generated from this journey created a baseline for further work in our region.

Edwin James: Life After the 1820 Expedition

After completing his assignment as the botanist, geologist, and doctor for the 1820 Long Expedition, James was anxious to embark on another expedition. However, this would be his first and last. James moved back east, married, published an account of the expedition, and then moved to the Midwest for various military medical assignments; during this time, he and his wife Clara had a son, Edwin James Jr.

While working in the Wisconsin and Michigan territories, James became friends with John Tanner, of whom he wrote a biography. He had contact with Native Americans and, with the help of John Tanner, translated the New Testament from Greek to Ojibwe. He also created a series of Ojibwe lexicons and grammars, a language that is now considered severely endangered by UNESCO.

After a short stint in New York, where James became involved with the temperance movement, he accepted a government post as a subagent for the Potawatomi tribe. Outraged with the forced relocation of indigenous people, James resigned and moved to southeastern Iowa, where he would live out the rest of his life as a farmer. He continued to support the temperance movement, advocate for the welfare of Native Americans and became involved in the abolition movement (he ran a station on the Underground Railway). An anachronistic character who embraced unpopular beliefs of his time, we believe James would have taken a keen interest in the struggles of today and would have continued the fight for equality among all people.



From the top. Red dome blanketflower (*Gaillardia pinnatifida*) © Patrick Alexander; desert palafox (*Palafoxia sphacelata*) © Mike Kintgen; Colorado four o'clock, (*Mirabilis multiflora*) © Jen Toews.

◀ over 100 of which were previously unknown to science. Of the 700 specimens, approximately 166 were noted as being collected in Colorado. Around 52 of the 166 became type specimens. An additional 66 species (including 18 type specimens) were possibly collected in Colorado, due to their distribution; however, location information was missing.

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Mike Kintgen is the curator of Alpine Collection at Denver Botanic Gardens. His work has taken him across the globe to biomes similar to the Rocky Mountains and steppes of Western North America. He greatly enjoys working with regionally native flora and learning the botanical history of Colorado.

Jen Toews works in the Plant Records department at the Denver Botanic Gardens and is a Colorado Native Plant Master® who advocates for native plants at every opportunity. In her free time, she enjoys expanding her native plants garden, hiking, birdwatching, botanical photography, and writing. ☺

From the editor

Many thanks to Mike Kintgen and Jen Toews for this four-part series about the Stephen H. Long Expedition! Colorado provides for some fascinating geography and botany history.

Put Pikes Peak on Your 2021 Hiking List

There are several places around Pikes Peak that provide optimal viewing of wildflowers documented by Edwin James.

In July, Kelly Ambler led a commemorative hike of on Pikes Peak, hiking between The Crags campground and Devil's Playground. She presented photos from this hike during the Virtual Social at the Annual Conference in September.

In October, Elizabeth Taylor and Barbara Harbach presented a Virtual Wildflower Hike to the Denver-Metro Chapter. This hike covered wildflowers found in the Dawson Butte Open Space, another region chronicled by the Long Expedition.

Featured Story

Front and Center: A Suburban Yard Makeover

By Jennifer Boussetot

This spring my family embarked on a journey—about the only kind of journey we could attempt due to the pandemic. We refurbished our front yard. When we moved in eight years ago, it was the standard suburban front yard with one tree in turf and a little rock edging. At the time, I had an infant so I knew I would not get to it anytime soon. Eight years and another child later, we finally had time.

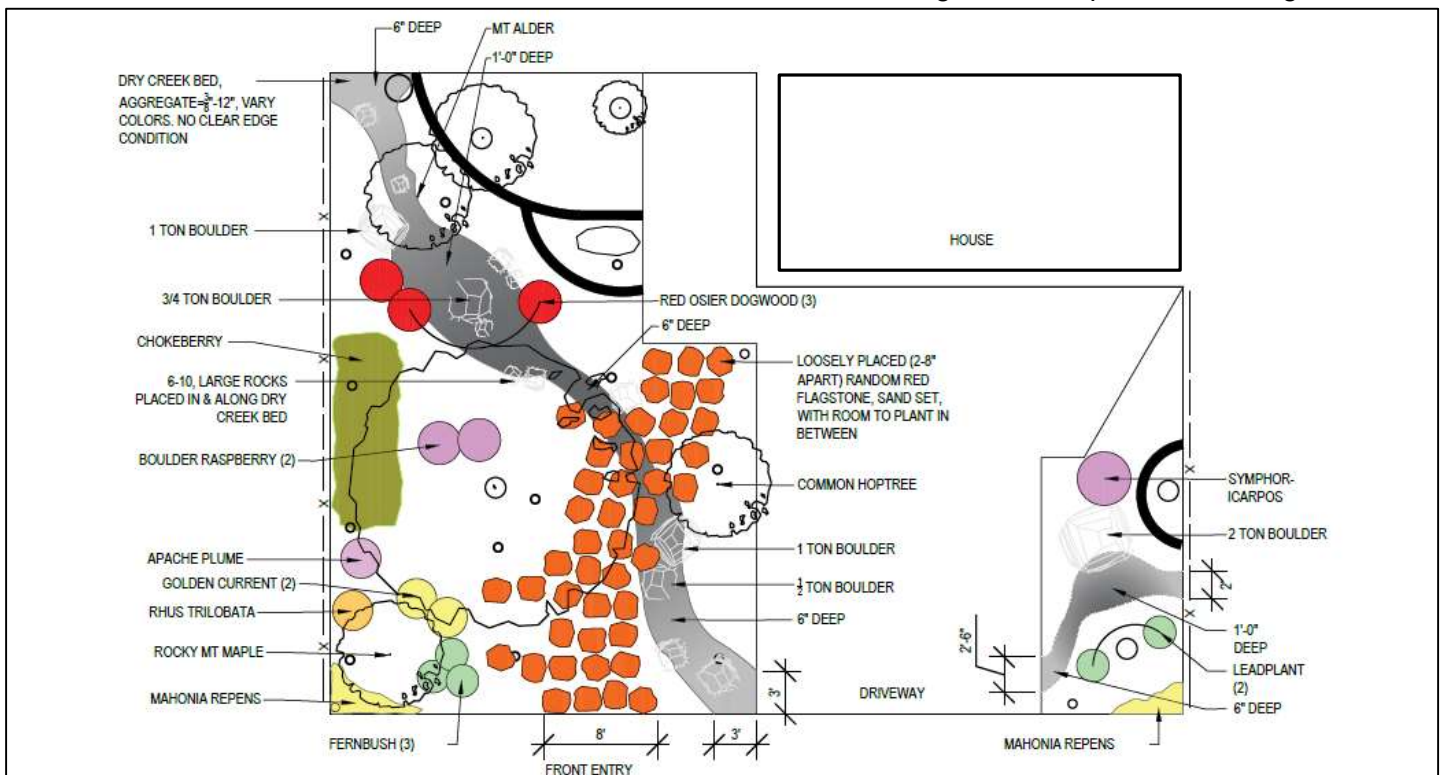
A landscape architect friend of mine, Karla Dakin of K. Dakin Design, often works with Colorado native plants in her practice. We asked her to do a design that would weave in onsite materials, plants, and hardscapes while removing turf and adding only native plants. We were interested in creating a mostly native oasis (there were some nonnatives already in the landscape) in an otherwise turf-heavy neighborhood.

The nonnative tree is a European linden (*Tilia cordata*) and we debated cutting it down. However, it provides luxurious shade and privacy for our house. Plus, it represents a LOT of sequestered carbon. So, we decided it would stay and that the newcomer plants would be all native. We had a fairly established border garden in the rock area around the perimeter of the

front yard—one that I had slowly planted over the last eight years with plants from CoNPS native plant sales and gifts from friends. That would all stay too. The real challenge was to add interest to the landscape and weave in plants and hardscape features that would be appealing to us *and* our neighbors. Karla did an incredible job!

The central focus of the design was the dry creek bed that enters the yard at the northwest corner and meanders to the southeast corner of the yard and pops up on the other side of the driveway. We did most of the labor ourselves and discovered how challenging it can be to dig a dry creek bed under an existing tree! Notice the excavated roots in the image with the yellow wheelbarrow. The soil left over from digging the dry creek bed was used to build berms on the edges to create even more visual interest and resulted in excellent places to plant the new woody plants.

We wanted to make sure that there was a lot of new visual interest because the landscape had always seemed so flat and two-dimensional to us. Therefore, there are several boulders spread throughout the dry creek bed for high visual impact. A new flagstone ►



Design © K. Dakin Design www.kdakindesign.com



Before and after photos of the front entryway.

◀ path sweeps in from the sidewalk to the front steps to invite guests on an alternate route to our door. In the dry creek bed, we reused the small cobble from the border garden. We decided to mulch with shredded bark rather than the more traditional native plant garden mulch that is pea gravel. Our garden turned out to look more like a woodland garden from the foothills than a prairie garden so the shredded bark was a better fit for the aesthetic. The final touch for hardscaping was a smattering of old stumps and weathered wood.

We asked Karla to focus on placement of the woody plants since they provide the most foundational structure to the garden. I added perennials in drifts after the woody plants were installed (see sidebar). I did not want to overplant this relatively small area—and it was hard to hold back—so this year I added just a few perennials. We plan to see how the woody plants fill in next year before we add too many new plants. We want this woodland oasis to remain looking planned rather than haphazard. My friend Irene Shonle first introduced me to the phrase “stealth native plant gardening” and I hope our garden fits that phrase perfectly!



Jennifer Bousset is an assistant professor in the department of horticulture and landscape architecture at Colorado State University. Jen is coauthor of the CoNPS-published third edition of *Common Southwestern Native Plants*. 🌀

Trees and Shrubs (and number of them) used in the design

- Rocky Mountain maple (*Acer glabrum*) 1*
- Manzanitas (*Arctostaphylos x coloradensis*) 5*
- Mountain alder (*Alnus incana* ssp. *tenuifolia*) 1*
- Serviceberry (*Amelanchier alnifolia*) 1*
- Leadplant (*Amorpha canescens*) 2*
- False indigobush (*Amorpha fruticosa*) 1*
- Mountain mahogany (*Cercocarpus montanus*) 1
- Fernbush (*Chamaebatiaria millefolium*) 5
- Dwarf blue rabbitbrush (*Ericameria nauseosus* var. *nauseosus*) 2*
- Red-osier dogwood (*Cornus sericea*) 3*
- Apache plume (*Fallugia paradoxa*) 2
- Common juniper (*Juniperus communis*) 1*
- Creeping mahonia (*Berberis repens*) 5*
- Ponderosa pine (*Pinus ponderosa*) 1 hanging over our yard from the neighbors
- Chokecherry (*Prunus virginiana*) 3*
- Common hoptree (*Ptelea angustifolia*) 1
- Smooth sumac (*Rhus glabra*) 1
- Three-leaf Sumac (*Rhus trilobata*)*
- Golden currant (*Ribes aureum*) 2*
- Boulder raspberry (*Rubus deliciosus*) 2*
- Snowberry (*Symphoricarpos albus*) 3*

Perennials and Grasses (only natives listed)

- Big bluestem (*Andropogon gerardii*) 6*
- Colorado desert blue star (*Amsonia jonesii*) 2
- Rocky Mountain columbine (*Aquilegia coerulea*) 3*
- Prairie sage (*Artemisia ludoviciana*) 2*
- Rose milkweed (*Asclepias incarnata*) 2
- Butterflyweed (*Asclepias tuberosa*) 3
- Chocolate flower (*Berlandiera lyrata*) 2
- Plains coreopsis (*Coreopsis tinctoria*) 3*
- Engelman daisy (*Engelmannia pinnatifida*) 2
- Sulphurflower buckwheat (*Eriogonum umbellatum*) 4
- Golden aster (*Heterotheca villosa*) 1*
- Dotted blazing star (*Liatris punctata*) 1
- Colorado four o'clock (*Mirabilis multiflora*) 2
- Tufted evening primrose (*Oenothera cespitosa*) 1
- Purple fringe (*Phacelia sericea*) 5*
- Beardlip penstemon (*Penstemon barbatus*) 1
- Silverton® bluemats penstemon (*Penstemon linarioides* ssp. *coloradoensis* 'P014S') 5*
- Waxleaf penstemon (*Penstemon nitidus*) 1
- Palmer's penstemon (*Penstemon palmeri*) 2
- Pineleaf penstemon (*Penstemon pinifolius* yellow, orange, red) many*
- Desert beardtongue (*Penstemon pseudospectabilis*) 5*
- Bridges penstemon (*Penstemon rostriflorus*) 5*
- Rocky Mountain beardtongue (*Penstemon strictus*) 4
- Whipple's penstemon (*Penstemon whippleanus*) 3
- Prairie coneflower (*Ratibida columnifera*) 2
- Little bluestem (*Schizachyrium scoparium*) 3
- Redbirds in a tree (*Scrophularia macrantha*) 6*
- Spiderwort (*Tradescantia occidentalis*) 6*

* newly added or some existing plus some new

Featured Story

Canyon Call

By Loraine Yeatts

After years of hiking, climbing, and backpacking with my husband Dick, family, and friends, I had the urge to share a wilderness experience with just women—emulating the experience that men have on all-male hunting and fishing trips. Trip participant and dear friend Louise Wildeman recently completed a manuscript *Canyon Call* from her trip journals celebrating 14 years of annual backpacks with our close women friends.

The remote canyons of the Utah Grand Gulch drainage (part of the recently demoted Bears Ears National Monument) is a treasure trove of prehistoric Native American archeology. It became the focus of our fascination with the adventure of discovery, archeology, and plants of the region. Louise was inspired to express her emotional connection to the prehistoric residents and the beauty of the landscape by writing a few poems on nearly every trip. Each trip chapter in her manuscript is accompanied by my slides that were scanned for the manuscript.

Our first trip in 1974 included five women, three of us living in Colorado School of Mines faculty housing and two who were Louise's friends, also eager for new experiences. With our husbands' blessings, we embarked on our adventure emerging from the cocoon of traditional womanhood as stay-at-home Moms into a world of adventure and self-reliance. All of us were college-educated in various disciplines

including science, arts, history, and philosophy. Only two of us had previously carried a backpack and one had never even camped before that first trip. The experience was transformative and a highlight of the next 13 years for all who participated.

These experiences formed the basis for Louise's 469-page manuscript that documents and memorializes fifty years of friendships, more than 14 annual backpacking adventures, and history, poetry, photographs, and musings on their uniquely personal journeys in and around southwestern Utah.

In the words of Louise "it was us in the sun, in the wind, on the rock, and in the silence. Feeling totally dependent on one another, totally alive in all we did, and totally committed to this captivating, challenging, canyon was joyful."

Indian apple (*Datura wrightii*), Louise says, "is an exotic flower of intrinsic beauty with magic powers, a survivor among ghosts of a prehistoric civilization." It was inspiration for the poem on the following page.

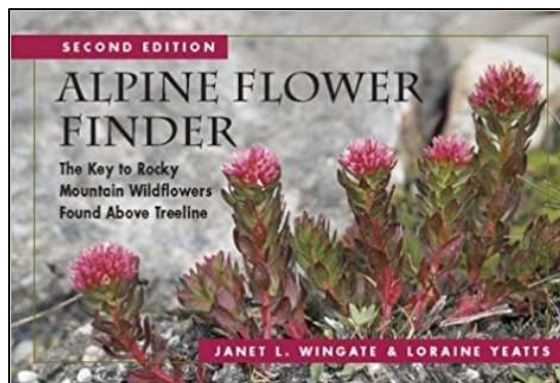
Loraine Yeatts has been a volunteer and, more recently, an adjunct associate researcher at the Denver Botanic Gardens herbarium for 52 years. She has explored western regions of our country from low deserts to alpine summits botanically and photographically and has shared her enthusiasm for plants and places of the west in slide presentations for plant societies, garden clubs, and other organizations. As a volunteer steward for the Gateway Palisade Natural Area, she has collected herbarium specimens to comprehensively document plants of that area.

Editor's note: Louise's manuscript includes 125 of Loraine's photos. The manuscript is private for now, unless a publisher is identified.

Loraine is also co-author with Janet Wingate of Alpine Flower Finder: The Key to Rocky Mountain Wildflowers Found Above Treeline, which has been reprinted and is again available in the CoNPS online bookstore. ☞



Caressing a datura flower. © Loraine Yeatts



Datura

By Louise Wildeman

The treasured seed from the special pot
Has been planted here in this hidden spot
by the dwelling.

Nourished at first by the precious drops
Carried up to the canyon tops
it flourished.

Behind the sage and the pinyon tree
In dappled shade it grew to be
exotic.

Deep green leaves stretched freshly free
On lengthening branches prominently
outreaching.

And then the bud tubes formed and grew
Paler green than the leaves when new...
a promise.

The white tube lengthened with pulsing life
The petals pushed out in the summer night...
datura!

The soft white mouth of the open cup
Sensuous depths which opened up
inviting.

More beauty than any canyon flower
Beauty mixed with the promise of power
for dreaming.

Then limp and spent it drooped to fade
Dropped downward under the branches' shade
in plainness.

From seductive white of lusty bloom
The seed has been created to soon
give visions.

Hidden within green spiny ball
It grows and waits to dry in fall
in ripeness.

Before the ball starts to break
the Puebloan comes the seeds to take
for dream food.

Datura,
Sensuous bloomer become dream-maker,
Grown by prehistoric delight-taker,
You outlasted your cultivator.

(Grand Gulch, 1986)



Colorado Gives Day is December 8, 2020! This is the day we contribute to the non-profit organizations that make a difference in our lives. Have you attended a chapter meeting, field trip, free training, webinar, virtual garden tour, the Landscaping with Colorado Native Plants Conference or another event? Have you received a CoNPS grant or a CoNPS Certified Native Garden designation? Do you read the quarterly publication *Aquilegia*?

Your donation means that we can continue bringing these member benefits to you regardless of the challenges we face in 2021!

Help us reach our goal of \$4,000!

- November 1: Scheduling donations begins
- December 1: #GivingTuesday
- December 8: Colorado Gives Day!

Here's how to schedule a donation for Colorado Gives Day:

1. Select "Colorado Native Plant Society" in the Search window at <https://www.coloradogives.org/organizations>
2. Click the "DONATE" button for Colorado Native Plant Society.
3. Enter or select your donation amount.
4. Under Donation Frequency, make sure "Colorado Gives Day" is selected. This option will schedule the donation to process on Dec. 8, 2020, on Colorado Gives Day.
5. Complete additional fields and click "ADD TO CART."
6. To keep giving, click "ADD MORE DONATIONS." To save your cart for checkout later, log into or create a donor account.
7. When all your scheduled donations are in the cart, click "PROCEED TO CHECKOUT." Log into or create a donor account and enter payment information.
8. Click "SUBMIT."

Thank you, in advance, for your generous contribution!

Ecological Services of Weeds

By John C. Vickery

Ecology is the study of the interactions between living things and their environment. Ecological services then, concern how “something” benefits or is used by (other)

living things, often with an emphasis on benefits to humans. A commonly encountered example is the multiple environmental benefits or services that wetlands offer. Often, the term ecosystem services is used instead. See, for example, the National Ecosystem Services Partnership webpage. Ecological and ecosystem service practitioners, policy experts, and academics have developed broad categories for these benefits, values, and services, such as those that are provisional, regulating, supporting, and cultural (Figure 1). In such contexts, some of the practical applications revolve around the development of economic (e.g., payment for services) schemes for the protection of nature.

Related here are attempts to quantify the negative impact—the opposite of services—of invasive species or, more broadly, species that have spread or naturalized outside of their native range. However, in most cases, these efforts or studies fail to take into account the positive effects or the “plus side,” of the balance sheet with respect to ecological services. Even if the balance is in the red with respect to an invasive plant species, for example, it is misleading to leave the positive contributions out of the equation. These positive contributions are the theme of this article.

Valuation & Compensation Schemes

Provisional

- Food, water, fiber, habitat (the primary ES of interest herein)

Regulating

- Carbon sequestration, waste decomposition, air purification
- Erosion and sedimentation control, temperature modulation

Supporting

- Nutrient dispersal and cycling, primary productivity

Cultural

- Religious, recreation

Figure 1. Categories and examples of ecosystem services. Adapted from Vickery, J. 2019.

The Benefit of Weeds to Wildlife

The term wildlife is used broadly here—invertebrates, vertebrates, aquatic, terrestrial, amphibian—in their natural setting and geographic range. Attention in this article is focused on weeds in urban or developed settings, as well as in native plant communities or natural habitats or settings, including open space settings that have been significantly altered and have lost much of their native plant complement.

As botanists and plant enthusiasts, we are always paying attention to plants. Thus, we've encountered many examples of animals using weeds, such as:

- Downy woodpeckers (*Picoides pubescens*) on late season mullein (*Verbascum thapsus*) inflorescences, likely going after some insect that's eating the seeds;
- Butterflies and other insects galore on thistles in bloom such as Canada (*Cirsium arvense*), bull (*C. vulgare*) (Figure 2), musk (*Carduus nutans*), and Scotch (*Onopordum acanthium*);
- Goldfinches (*Spinus* spp.) and scarab beetles feasting on musk thistle and other weed seeds (Figure 3);
- Birds of many species eating Russian olive (*Elaeagnus angustifolia*) fruit;
- Deer browsing the tops of pre-flowering prickly lettuce (*Lactuca serriola*) and other species; and
- Many more examples.

The above examples are mostly of Colorado-designated List B noxious weeds, except for mullein, which is List C and prickly lettuce, which is not a listed species.

To summarize, both native and non-native plants (noxious weeds or otherwise) can be important for native animals as:

- Food, both direct consumption and indirect (through the food chain);
- Shelter, cover, shade, insulation;
- Nesting and denning material and sites;
- Egg-laying or deposit sites (in plant tissues, on plant surfaces, at the base of plants); and
- Perch and roost sites.

In both aquatic and terrestrial settings, much of the primary production is funneled through insects before it ends up in other (predatory) insects or in vertebrates, along with decomposers, and more. We're also familiar with the closely-bound evolutionary histories of plants and insects. Thus, it is logical to expect that, on average, a native plant species in its natural setting or range will produce more insect biomass and host or be used by more insect species than similar, but non-native species. By similar, I incorporate both ►



Figure 2. *Bombus* sp. on bull thistle (*Cirsium vulgare*). © Kelly Ambler



Figure 3. American goldfinch (*Spinus tristis*) on common mullein (*Verbascum thapsus*). © Kelly Ambler

◀ taxonomic and ecological features: the same plant family, perhaps in the same genus, and with the same life cycle or longevity (such as biennials) and general form (herbaceous vs. woody).

In recent years, we've seen scientific studies verify this logical premise. I remember Doug Tallamy presenting at a conference years ago in downtown Denver. He showed for various pairs of woody plant congener pairs, that the native species of plants had more insects and more kinds of insects than closely-related ornamental species. In the intervening years, such knowledge has become widely disseminated. What then, is the import of all the preceding? If we can't replace weeds with native plants, it may be better to let the weeds be! Let's look at weeds in a couple of settings—in both developed areas and natural areas.

Weeds in Developed Areas

First, let's begin with the idea that, on average, native plants are better. Then, of course, any plants—be they turf, ornamentals, culinary or food crops, and even weeds—are better than no plants at all. Yes, it would be better for our alleyways, roadsides, and waste areas (like vacant city lots) to be overrun with weeds, than to have no plants at all. Likewise, it would be better for those weeds to be left alone rather than mowed, trimmed, pulled up, or treated with herbicides. Here we consider the value, or the ecological services, offered by weeds, but ignore the potential impacts of their spread to places where they are not desired. Their spread to places lacking or poorly populated by any plants—like alleyway cracks and fence lines, residential yards covered by gravel, or boulevard sections—would actually be an improvement in terms of ecological services. To many, these volunteer plants might be

unwanted; to some, they'd be unsightly—something to generally complain about or make a formal complaint about.

It is apt to note here that municipal codes typically don't deal with plant species, per se. Instead, they may require that plants in neglected or unkempt sites be kept below a certain height, six inches for example. All too often, this means that people who don't know much about plants are in charge of ensuring that certain plants are cut down. With respect to code enforcement and homeowner association (or special district) rules or covenants, we invite grief if our yards look anything like natural habitat or diverse and relatively unruly vegetation.

Weeds in Natural Areas or Other Open Spaces, Including Greenways and Wildlands

For most of us, the prevailing thought is that weeds should be managed in natural areas and open spaces. But, just as in agricultural and ornamental settings, we have to be concerned about detrimental effects on desirable plants. We reduce unwanted affects by choice of weed control method, along with the timing and intensity of the application or effort (mowing height or herbicide rate, for example). The same considerations might be applied with respect to the animals that could be affected by weed treatment, but this usually isn't an important matter. The animals that live in a treatment area have other plant choices onsite or nearby. Also, land management budgets usually limit the amount of land that can be treated or managed anyway.

The most important weeds to target are those that are invasive—that is, those that can invade and become ▶

◀ naturalized in an existing plant community. Then, among the invasives, the ones that most deserve our attention are those with the most detrimental ecological impacts, such as cheatgrass (locally, mostly *Bromus tectorum* and *Bromus japonicus*). Weed control activities typically have negative effects on wildlife, but usually these impacts are localized and short term in nature. The end result, ostensibly, justifies harm to animals.

Reporting unmanaged noxious weeds to a county government can have unwanted consequences. This is because a county can enforce the management of county- or state-listed noxious weeds, but it can't require the protection of native plants. Often, the cheapest way to address a large weed problem is broadcast spraying, rather than spot-spraying individual plants.

It is worth noting that much of the open space weed control effort is focused on forbs. However, some of our most damaging and widespread weeds are grasses, both annual and perennial. Many of the riparian areas, dry washes, and old canal and ditch systems—which constitute much of our open space and greenways—are dominated by or seriously infested with weeds, many of them grasses such as smooth brome (*Bromus inermis*) and reed canarygrass (*Phalaris arundinacea*) (Figure 4). But weed crews go through and spray thistles and other nonnative forbs—leaving less diversity in their wake. So, just like the weeds in the alley, if we're thinking about the ecological services provided by a particular place (and disregarding externalities), it might be better to *not* control those nonnative forbs—unless it is in preparation for a restoration project where nonnative grasses are also controlled in advance of planting natives.

To be sure, sometimes it is very important to consider the effects of planned weed control or vegetation management activity on wildlife. The larger and more varied a land management portfolio, the more likely

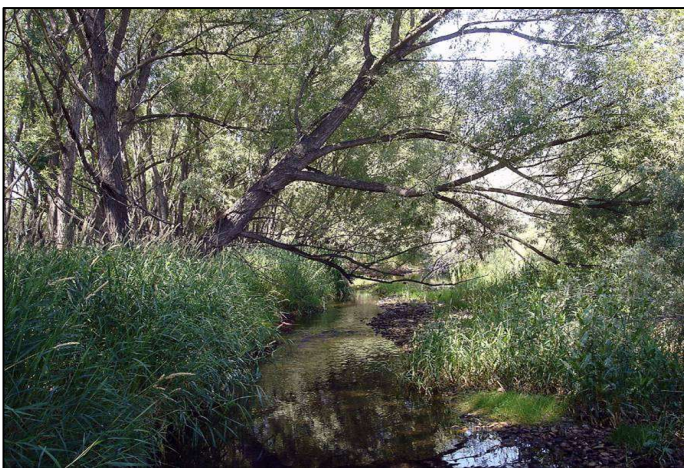


Figure 4. Weeds providing aquatic temperature regulation; riparian area dominated by *Salix fragilis* (crack willow) and *Phalaris arundinacea* (reed canary grass). © Stephanie Danyi. City of Boulder OSMP

that there are some areas in which weed control activities should either be minimized or modified to take into account wildlife uses. Other forms of vegetation management such as mowing, livestock grazing, and prescribed fire deserve the same attention with respect to native plants and animals.

For local examples of vegetation management with wildlife in mind, see *Vegetation Management With Wildlife in Mind. High Altitude Revegetation Conference. Central Rockies Chapter of the Society for Ecological Restoration and the HAR Committee (2017)*, available for public viewing on Researchgate (https://www.researchgate.net/publication/322865465_Vegetation_management_with_wildlife_in_mind).

Also, refer to the sidebar on page 24 for a primer on the situations in which weed control and other vegetation management activities should undergo additional scrutiny to protect or benefit wildlife. In particular, we should always be thinking about the many invertebrate species of limited mobility or dispersal ability such as some species of skipper butterflies (family HesperIIDae), particularly when found in isolated or disjunct habitats, as well as groups with low survivability in developed settings such as many species of amphibians and reptiles.

Rather than summarize, I'll point out that the foregoing brings some scrutiny to areas or issues that could use some help, attention, or action in the form of education, field research, policy, budgets, conservation, outreach, and restoration. In fact, it's starting to sound like the names of some of the CoNPS committees. If you're moved to get involved in one of these committees or to act under other auspices, that'd be great!

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In What Situations is it Most Important to Modify Vegetation Management Activities?

By John Vickery

Many day-to-day vegetation management or land stewardship activities will not have significant effects on wildlife. It isn't possible to avoid all negative effects and, sometimes, the effects are negligible or positive. Sometimes, the effects can be reduced by making modifications such as changing the timing. But, for example, it's not usually practical to do all the mowing in the winter. Also, most weed management work has to be carried out during the growing season. Thus, although Vegetative Management can often be expected to have some negative effect on some wildlife species, these negative effects are often of minor significance or are, at least, tolerable.

Because different wildlife species have different habitat preferences and resource needs, it is expected that some VM activities will benefit (or harm) some species more than others. Moreover, a VM activity could have a short-term negative effect, but a long-term positive effect. This would be the case, for example, when the VM activity is designed to help maintain or restore a native plant community. Examples include weed control, forest thinning, and prescribed fire, to name a few.

It is MORE important to implement modifications when:

- Uncommon, rare, isolated, or locally significant species or plant communities of conservation concern are involved;
- The site is inhabited or used by animal species with special status (endangered, threatened, rare, or conservation concern, for example) are of significant local interest;
- The area (scale or extent) is affected by the planned VM activity; and
- The planned VM activity would have a significant local negative impact for some wildlife species in terms of food or other resources.

Relevant to these important points are the mobility of the animals of concern and the availability of habitat corridors or the proximity of untreated areas.

It is MOST important to make modifications when the following combinations present:

- Rare or privileged status of a species, or a species of special interest, exists;
- Low or limited mobility or dispersibility exists; or
- Isolated populations or disjunct habitats exist.

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John has been an active member of CoNPS since moving to Colorado from Minnesota some 15 years ago. Nowadays he spends much of his spare time conducting plant surveys and documenting weed occurrences in protected areas and otherwise, largely in the greater Weld to Clear Creek to El Paso County area. ☺

Noxious Weeds or Plants out of Place?

Weeds, or plants out of place, are usually subject to the eye of the beholder. The Colorado Department of Agriculture website is a good place to learn about the noxious, invasive weeds and eradication methods—whether mechanical, biological, or chemical.

<https://www.colorado.gov/pacific/agconservation/noxious-weed-species>

For other common “weeds,” there are numerous options including eating them. The next issue of *Aquilegia* will feature an article about eating weeds, yet another method to manage both noxious and obnoxious weeds.

The Woody *Artemisias*: An Introduction to the Species

By Jim Borland

This is part one in a multi-part series of articles on the Artemisia species. Common names include sagebrush, wormwood, and mugworts. In the next two issues (Winter and Spring 2021), we'll feature Artemisias native to Colorado, including botanical features and their ecological associations.

How many of us in the northern states are able to describe the ecological niche that our landscape plants occupied in their original and native habitat or even feel a need to know this information? In a way, the question is irrelevant since most of our landscape plants are capable of coexisting with the one plant most familiar to us all - bluegrass, the great equalizer plant. With relatively few exceptions, only those plants which are able to thrive under the same conditions provided bluegrass are seen in the landscape, and thus, in the nursery.

Unfortunately, this current state of affairs relegates many excellent plants to obscure status, especially in the west where most horticultural practices are mere adaptations of what somebody else has already done somewhere else, usually in the east.

Landscapes in the west are usually concepts and projects forced upon the land by virtue of the availability of water, which is generally distributed evenly over every square foot of planted space. Unlike their eastern brethren, landscape managers in the west have the almost unique ability to control all the water that their landscape receives, thus potentially expanding the range of plants which can be successfully grown. This, however, has happened in only a few places to any significant degree.

Too often utilized in western landscapes are only those plants first selected in the east and, of these, those which have gone through an additional selection process that tests their suitability to dry air, high intensity sunlight, infertile soils with a high pH and a dynamically changing climate. This culling process leaves significantly fewer plants than are described in most landscape plant texts and results in landscapes almost monochromatic in appearance and diversity.

Now, with the additional imposition of water shortages and the increasing difficulty in gaining the necessary approvals to build more water storage facilities, the high, dry and cold west has the potential of becoming a separate horticultural region not unlike that of the subtropical southeast and the warm desert southwest.

We may actually be witnessing the birth of a "gentler and kinder" horticulture as well.

We are about to learn that when we precisely match the right plant to the right place, there is no longer a need to continually beat the landscape into submission through constant attention to irrigation, fertilizer application, pruning and mowing. Yes, Virginia, there is a better way.

We will find, however, that we cannot conduct our horticultural business in the same manner as is currently the practice. No longer will we be able to put any plant in any place, regarding as we do now only that it grows so big and requires either sun or shade. Those wishing to restrict or deny the use of water in the landscape will find it necessary to reject most of ►



Big sagebrush (*Artemisia tridentata*) inflorescence, Dominguez Canyon, CO © Jim Pisarowicz

◀ the currently available plant materials and make their selections based on at least some information regarding the plant's native habitat. Fortunately, the native regions of the high, dry cold west are full of fine potential candidates.

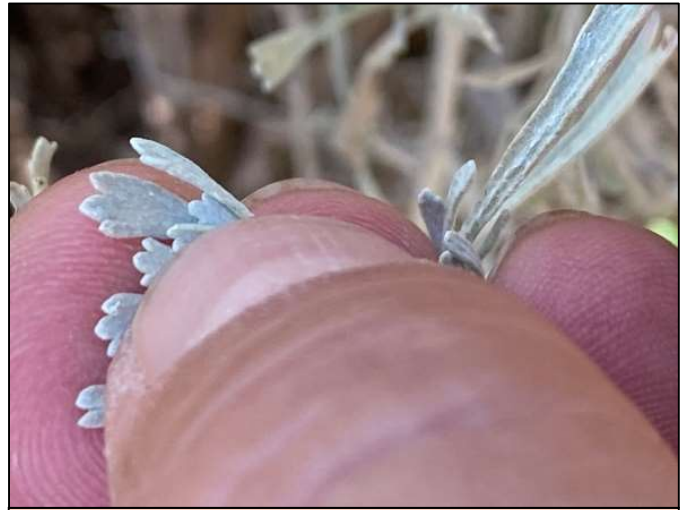
One of the plant groups from this area gaining use today are the woody sagebrushes or *Artemisias*. Members of the Asteraceae, or sunflower family, they are the most widely distributed shrubs in the western United States, covering nearly 270 million acres from sea level to 11,500 feet in elevation and occupying soils receiving as little as 8 inches of annual precipitation. Here the woody members are nearly 100% endemic, growing nowhere else in the world, but represented as an herbaceous genus in nearly 300 combinations throughout the dry steppes of the United States and Eurasia, as well as north Africa and other more southern but mountainous regions.

The genus name was applied in honor to Artemisia, sister and wife of Mausolus who was king of Halicarnassus during the 4TH century B.C. A tomb erected in his honor became what it is known in modern times as the 7TH wonder of the ancient world. Queen Artemisia was undoubtedly named after Artemis, a Greek goddess of the moon, hunting and wild animals.

Members of the genus have a long-standing reputation in the home remedy and cooking arena where concoctions are prepared as teas, antiseptics, and tonics. Herbalists should be aware, however, that one of the common names applied to the group “sage” does not refer to the cooking sage, which is a member of the unrelated mint family. *A. absinthium* and *A. barrelieri* are still used in the distillation of the alcoholic beverage Absinthe.

Except for a handful of skilled and knowledgeable professional researchers dedicated to the management and research of western US shrubs, identification of the numerous species, subspecies, varieties, and forms of this shrub group can be frustratingly difficult. Speculations on the genetic origins of the species cover the field and are partially responsible for the multitude of nomenclature changes seen in the genus, changes that continue at this writing. Synonymy within the genus is rampant, resulting in one finding almost every taxonomic name variously assigned to species, subspecies, variety, or forma status. In addition to this confusion, some experts are now using very old names for the genus and aligning one species, *A. spinescens*, with its Asian counterpart *Picrothamnus desertorum*.

Most of the woody *Artemisia* species can be characterized as possessing small, dentate leaves covered with a lanate or wooly pubescence. The tips



Close-up of big sage small dentate leaf. © Mary Menz

of the often-bundled leaves commonly are variously lobed or divided into three portions or into fine, threadlike divisions. All have characteristic aromatic odors that fill the air after a rainstorm and when crushed, such that a good nose can tell the species apart by this character alone. Many have ephemeral leaves usually mixed with evergreen leaves and a few are deciduous in response to either drought conditions or the coming of winter. All are full sun plants.

Jim has been fooling around with native plants for more than 40 years in private, commercial, and public venues. His home garden contains 1000s of native plants, most grown from seed at home and now not supplementally watered for 20 years. Jim has written hundreds of articles, given talks too numerous to count, and continues to grow and plant the two or three native plants not yet in his garden. ☯

More About Artemisias in 2021 Issues

Jim Borland will share more of his knowledge about the *Artemisia* genus and species in the next two issues of *Aquilegia*. In Part 2 of this series of articles (to be featured in Winter 2021), Jim describes the inflorescences and leaf morphology of the woody *Artemisia* species. In Part 3 (to be featured in Spring 2021), Jim describes a few of the common species and subspecies, propagation techniques, landscape uses, and provides detailed references for readers wanting to delve further into the study of *Artemisias*.

Restoration Roundup

Transforming an Existing Growing Space into an Ethnobotany Garden

By Mary Menz

In 2017, a small group of volunteers at the Ute Indian Museum in Montrose dreamed of transforming an existing quarter-acre garden space into an ethnobotany garden.

“I wanted a place where we could show, not just talk about native plants specifically used by the Ute People,” said docent Barbara Hodge. Hodge and others were adamant that the existing garden be completely restored to include native plants that were traditionally used by the Utes for cultural, medicinal, and ceremonial purposes.

The museum is situated on property that was once part of Chief Ouray’s homestead in Montrose. Its grounds include the crypt of Ouray’s wife Chipeta and a monument to Chief Ouray. Teepees and seating areas abound for visitors to take in the views while reflecting on the exhibits and artifacts seen in the museum. They likely sit and ponder the lives of the Ute People who traveled to this region to follow game and blooming native plants critical to their needs.

An ornamental garden was originally established on the grounds in the 1990s. While no history exists regarding its original creation or purpose, it’s likely that native plants were not available in the nursery trade at that time. That explained the abundance of Chinese willow and tuberous European geranium species in the garden. It also explained the beautiful and

bountiful displays of Shasta daisies and dominant stands of other nonnative flowering plants like ornamental elderberry, bellflower, and yarrow cultivars. While the garden was kept manicured, many weedy species invaded the space as well.

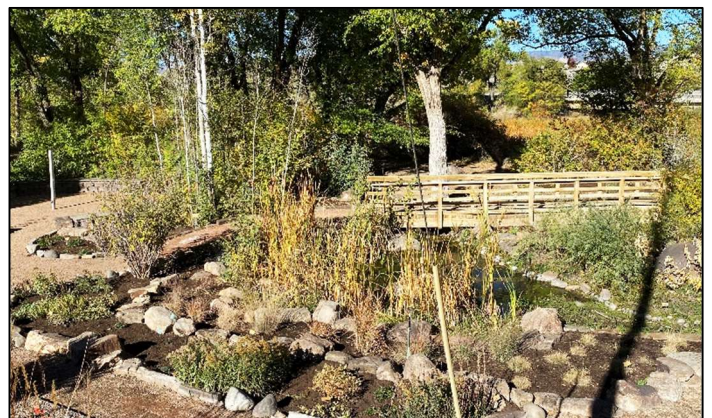
Starting with Good Structure

Fortunately, there was no need to create a garden plan from scratch and no need to redesign the garden’s layout at all. The existing space had great bones—with gravel paths, areas of shade and sun, and other architectural interest including a seating area encircling a peace pole and big boulders. There was also a short bridge spanning a space between a very small pond and its outflow leading to the Uncompahgre River a couple of hundred yards away.

The water feature, fed largely by a natural spring on the other side of the road, provided even more interest and habitat variety. The lovely babbling brook is the spring water channeled into a culvert that flows into the garden’s pond. Unfortunately, the water is contaminated with upstream runoff. The annual agricultural runoff created perfect conditions for nonnative watercress (*Nasturtium officinale*) to establish and flourish with enough nonpoint source nutrient load (nitrogen and phosphorus) to make eradication nearly impossible. That, and an annual algae bloom, were just two of the challenges facing the team in 2017. ►



Before: Early in the growing season, one year after planting several hundred native plants from 4-inch and 1-gallon pots. © Mary Menz



After: Three years after planting, native cattail and coyote willow surround the water feature, flowering species had profuse blooms, and native grasses sideoats grama (*Bouteloua curtipendula*), blue grama (*Bouteloua gracilis*), and Indian ricegrass (*Achnatherum hymenoides*) provide height and year-round interest to the garden. © Mary Menz

◀ Removing All Nonnative Plants

How does a garden undergo a restoration? This plan wasn't perfect, but working with more than 40 volunteers—including museum volunteers, local scouting organizations, and interested Montrose residents—all nonnative species were dug up and ripped out in a day. There were some challenges, however, and some of those remain today.

- A sloped section of overgrown wild roses was removed to make way for native grasses, scarlet gilia, tufted evening primrose, and tall goldenrod. Wild roses like to regenerate underground from their hardy rhizomatous roots and they continue to pop up still—two years after they were originally dug up and removed.
- Shasta daisies also spread via rhizomes. They can be prolific and long-lived in areas like Montrose that have fairly mild winters.
- The watercress. Ugh. It's aggressive. With the water flow leading directly to the nearby Uncompaghere River, the watercress can never be treated with herbicides. Instead, it's treated mechanically. It's cut, it's pulled, it's dug up. Future efforts may include smothering it, and if funds ever become available, perhaps a lined culvert and pond liner will be installed. Until then, efforts will continue to manage it mechanically.
- Annual weeds continue to make themselves at home in the Ethnobotany Garden. At least two decades of seed bank contributes to the nuisance. Immigrants and pioneers brought plants like watercress, dandelion (*Taraxacum officinale*), chicory (*Cichorium intybus*), prickly lettuce (*Lactuca serriola*), burdock (*Arctium minus*), and more to the US as edible and medicinal plants familiar to them in their home countries. They shared this information with indigenous people like the Utes and other native tribes—many of whom widely used them post-colonial settlement of the US. Today, many native histories do not identify them as nonnative plants, and oral tradition is slowly being lost. Museum volunteers and docents have lightly embraced them, in small quantities only, as a teaching opportunity to educate visitors to the garden.

Docents receive training and information about all of the native plants and the handful of nonnative weeds so that they can adequately share knowledge with visitors to the Ethnobotany Garden. Volunteers meet regularly to weed and perform other garden maintenance tasks.

Planting for the Future

The volunteer team that initiated the garden restoration process spent many hours researching plants used by the Utes in Western Colorado. They



The entry to the garden features a profusion of native wildflowers including Rocky Mountain penstemon (*Penstemon strictus*), firecracker penstemon (*P. eatonii*), and spreading fleabane (*Erigeron divergens*). © Mary Menz

read published papers and consulted with subject matter experts, including University of Kansas ethnobotanist Dr. Kelly Kindscher. They also studied numerous books and native plant resources and interviewed members of the Ute tribes. Finally, they narrowed the list of plants to ensure they identified those native to Montrose County where the museum is located and where the Utes traveled when following the seasonal plant blooms.

Knowing that some plants might not fare well after the first year, the team resigned itself to accepting failure beyond its control. Indeed, some plants did not survive the first winter. Yet they were surprised and heartened to see some plants that have come back in all three years since planting and even rediscovered a few species they thought had disappeared from the garden.

The team's plan is to continue to spread seed in late Fall or early Winter and install more plants each Spring as financial contributions allow. This year, the team will spread seed in established areas for coyote tobacco (*Nicotiana attenuata*), curlycup gumweed (*Grindelia squarrosa*), and arrowleaf balsamroot ▶

◀ (*Balsamorhiza sagittata*), as it's difficult to find these plants for sale in the nursery trade.

They will also overseed beds of blue flax (*Linum lewisii*), and blanket flower (*Gaillardia aristata*) to increase the mass and population size of established native plants and to also add plants that provide color and year-round interest.

Funding a Restoration Project

In 2018, a \$5000 grant from the Colorado Garden Foundation provided the kick-start for this project. It was used primarily to purchase potted, nursery-grown native plants from Chelsea Gardens (Clifton) and High Plains Environmental Center (Loveland). Plants included those native to Montrose County and even included native plants not known to have specific uses to the Utes, like Rocky Mountain columbine (*Aquilegia coerulea*).

Concurrent to the first grant, CoNPS awarded a \$750 mission grant to pay for individual plant signage.

CoNPS Members Help Out in the Ute Ethnobotany Garden

On August 20, Mary Menz led a group of CoNPS members on a tour of the Ute Indian Museum's Ethnobotany Garden. They learned about the plants in the garden and along the adjacent riparian boardwalk. Afterward, they weeded a "dry" section of the garden that was going to be rocked-in the following week.

Many thanks to the following CoNPS members who joined in the fun that day: Lynn Cudlip (Gunnison), Sandra Dick (Ridgway), Joan Schmidt (Montrose), Carolyn Spahr (Boulder), Mike Spangler (Grand Junction), and Sara Ungrodt (Montrose). There were also nonmembers who joined the tour. Attendees received a list of native plants that are currently found in the Ute Ethnobotany Garden.



Custom bamboo plant stakes were purchased to label the various species that appear in the garden.

Soon after receiving notice of the CoNPS grant, the project was funded by a \$38,000 National Science Foundation STEM Grant through History Colorado, which paid for hiring a crew from the Western Colorado Conservation Corps to work the very dense, clay soil and install 400 native plants that spring. The 12-person crew worked a full five days to complete this labor-intensive task.

The NSF/History Colorado grant also provided funding for designing, manufacturing, and installing interpretive signage (currently in progress); tribal consultation and review of the proposed interpretive signage; and developing K-12 curriculum related to the Ethnobotany Garden.

Learning About the Past and Inspiring Future Generations

Curriculum is being developed to create grade K-12 learning objectives and programming for local students as well as Ute students who visit the garden. The emphasis is on science, though Ute culture and traditions will also be addressed in interdisciplinary ways. Other planned curriculum activities include, but are not limited to:

- Learning about native plants and how they reproduce;
- Reinforcing the conservation ethics practiced by previous generations of Utes;
- Collecting plants and creating herbarium samples for Ute history files;
- Using plant materials hands-on to learn how the Utes used them, though much of the plants collected for these activities will be on Ute lands and not from the Ethnobotany Garden;
- Learning the Ute vocabulary for plant parts; and
- Interviewing Ute elders to glean plant knowledge from them and documenting that knowledge in literacy activities.

All of these activities are being developed to inspire young scientists, especially young botanists!

Mary Menz is a career writer and editor and an amateur botanist. She is a Colorado Native Plant Master® and co-presents NPM programs on the Western Slope. She has been a volunteer at the Ute Indian Museum since 2017 and leads the all-volunteer efforts to maintain the museum's Ethnobotany Garden, to develop curriculum related to the garden, and to train docents to provide tours of it to the public. Want a complete list of the native flora in the Ethnobotany Garden? Contact Mary at mary.t.menz@gmail.com to receive the list. ☺

Lichens and Spruce Beetle Disturbance: Maybe it Isn't so Bad After All?

By Anna Freundlich and Emily A Holt

Throughout Colorado, it is now common to see forests with large areas populated by stands of dead trees. In the higher elevation spruce-fir forests of northwestern Colorado, this has been largely a result of spruce beetles killing Engelmann spruce trees. Research has shown that spruce beetle disturbance can result in forests with different forest structure such as more open canopies and larger amounts of coarse woody material. These structural changes then impact which plants and animals live in beetle-impacted areas.

However, science has largely ignored one important component of our ecosystems—lichens!

Lichens, which are symbionts between fungi and at least one photosynthetic partner, are important colonizers of forests after disturbance. They are a food source for forest animals, they are used as nesting materials for birds and small mammals, and they can be used as ecological indicators due to their sensitivity to air pollution. Lichens are also extremely sensitive to the microhabitat conditions around them, so we hypothesized that we would see differences in our lichen communities if our forests experienced any structural changes due to spruce beetle.

While little work has been done to determine how lichens respond to bark beetle disturbance, scientists have studied how lichens respond to other canopy-clearing disturbances. When we began this work in the Summer of 2018, there had been only one research study investigating the impact of bark beetle disturbance on lichen communities. This study, conducted in the Norway spruce (*Picea abies*) forests of central Germany, found that lichen communities, as a whole, increased in abundance as fallen branches and woody debris increased in beetle-affected areas.

Ground-dwelling lichens such as pixie cups (*Cladonia* spp.) typically respond well to logging and fire disturbance. Pixie cups have higher biomass and higher growth rates in cleared areas compared to controls. Other ground-dwelling lichens such as dog lichens (*Peltigera* spp.) are often absent in opened areas, because they specialize in old-growth forests.

Lichen response to disturbance not only varies among different species, but also to growing location—such as growing on the ground or on tree branches. Some epiphytic (branch-dwelling) species experience higher growth rates in open, logged areas compared to crowded, untreated forests. Other epiphytic lichens have lower growth rates and biomass in disturbed areas than in unaffected areas. We predicted that if spruce beetle activity altered forest structure, lichen communities would respond positively (via increased diversity and higher abundance) to spruce beetle disturbance.

We conducted our study within the spruce-fir forests of the Roosevelt and Routt National Forests in northwestern Colorado. Parts of these forests were affected by spruce beetles between 1996 and

2017. During the summer of 2018, we visited 44 plots and recorded the forest structural characteristics as well as lichen community composition. What we found when we analyzed our data (882 collections of 83 unique species from 26 genera) took us by surprise. Forest structural traits (canopy openings, amounts of woody debris, and more) did not vary significantly within our study area, despite infestations of spruce beetle over the past two decades! As a result, we saw very little differences between lichen communities in impacted and unaffected forests. In fact, only the most recently affected areas had different lichen communities. ►



Anna Freundlich conducting research in the field. © Emily Holt

◀ Unexpected Patterns Emerge

As the spruce beetle preferentially attacks mature spruce trees, the surviving subalpine fir of these mixed-dominant forests could compensate for the loss in spruce canopy and grow into the new openings. Then, the overall forest structure would be similar enough that the lichen communities would remain intact. Further, other studies that record differences in forest structure sampled within areas clearly impacted by bark beetle and only included the tree gap. Because our study used larger plots, and plot locations were randomized and not targeted, we might have missed some subtle differences. Overall, we found that spruce beetles do not appear to alter the structure of our forest; therefore, our lichen communities are unsurprisingly unaffected by spruce beetle disturbance.

Next time you travel through a high-elevation forest, take a look around and notice the lichens growing on the ground, rocks, and wood around you. They may be small, but they are tougher than you think!

Resources

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Zouaoui S, Boudreault C, Drapeau P, and Bergeron Y. (2014) Influence of time since fire and micro-habitat availability on terricolous lichen communities in black spruce (*Picea mariana*) boreal forests. *Forests.* 5:2793-2809.

Anna Freundlich completed this research as part of her master's thesis. She is now working as an adjunct professor at AIMS community college and she has been conducting botanical surveys for the Colorado Forest Restoration Institute.

Emily Holt is an associate professor in the school of biological sciences at the University of Northern Colorado. She studies the ecology of lichens and the teaching and learning of biology undergraduates.

Editor's note: In an email exchange with co-author Emily Holt, she shared that it's likely many of the Colorado sites where field work was conducted for this research may have burned in 2020's many wildfires. She says that lichens are excellent kindling and don't stand a chance with these fires. Her research in Alaska and Oregon on lichen response to fire indicates that recovery generally occurs in unburned patches only, because they are highly flammable.

For more information about how lichens do or don't survive areas burned by wildfires, consider the following sources.

Lichen is Losing to Wildfire, Years after Flames are Gone: Wildfire is Reshaping Forests and Lichen Communities <https://www.sciencedaily.com/releases/2018/08/180809093445.htm>
Fire-Spawned Forest Fungi Hide Out in Other Organisms, Study Finds <https://news.illinois.edu/view/6367/803853> 🌀



Cladonia sp. (cup lichen, top) and *Usnea* sp. (beard lichen, bottom). *Cladonia* sp. grow from squamules (small leaf-like scales). *Usnea* lichen is a branch dweller. © Emily Holt.

News, Events, and Announcements

Please check the **Calendar of Events** online at <https://conps.org/mfm-event-calendar/#!calendar> for chapter meetings, garden tours, and other events. With the evolving COVID-19 situation, CoNPS is not hosting any in-person events. The status of future CoNPS events might also change.

CoNPS may offer some chapter meetings, workshops, and lectures as webinars or other online meetings. Others might be postponed or canceled. These will be posted online and will be promoted via the CoNPS eNews.

Horticultural Committee Report

Project Budburst: How CoNPS Members Can Help

By Ann Grant

CoNPS has started a new initiative to provide an important way for our society to contribute to ongoing national and regional scientific efforts. These contributions help scientists better understand and conserve native plant species and their habitats. CoNPS has been using the Budburst website in a very limited way to track species in gardens. This is a NEW concept.

Recent modifications to the BudBurst website allow users to enter their own data on their own plants—including native plants—at any locations. Keeping careful records on the timing of when flowers, fruits, and leaves emerge (called phenology) provides important data for scientists to track environmental changes in our area. Information like early flower, ripened seed or fruit, and leaf out are among the many phenological observations that can be made. This data is easy for us to collect when we are on field trips looking at native plants or out in our gardens.

We will use the BudBurst website to track phenology of common Colorado species. This makes it as easy as possible to submit local observations. When our data is on the BudBurst website, it is freely available for the benefit of scientists, educators, and other citizen scientists for analysis and to promote general interest and knowledge of our plant species.

We are very fortunate to have the participation of Dr. Paul Alaback. He was involved in the original concept and design of the Budburst website while a member of CoNPS. He recently co-led a webinar on July 11 about Citizen Science and Phenology. We think this is an ideal opportunity for field trips, plant hikes, and bioblitzes, as many members already take detailed

notes of plants and locations along trails. Many members also visit the same trails, parks, and open spaces multiple times during the season. We think we can capitalize on these activities to gather valuable phenological information. Paul is willing to conduct online meetings with participants to teach phenology in detail.

We want to develop a list of Colorado natives that are common and even iconic in the various regions and statewide to monitor them. This is where members are most valuable to this effort. We are assembling a

group of knowledgeable individuals who would help construct such a list. By limiting observations to a set list of native plants, we feel we will have better continuity of data collected across the state. We feel it is better to have many and widespread data points on just a few species, than little data on many species.



If you would like to help with this important project, please contact to me by email. We anticipate semi-monthly meetings for about four months to formalize a plant list. We would like to launch the project in early winter to document evergreens and early bloomers. Meetings will take place via an online platform to engage members from all over the state. If you know of someone qualified to help develop a list of natives to monitor, please share that info with me.

Ann Grant, a retired chemist, is on the board of the Colorado Native Plant Society and is chair of the horticulture committee. She is a Native Plant Master® instructor and enjoys leading plant hikes along the Front Range. Ann can be reached at (970) 663-5953 or by email at odygrant@gmail.com. 🌿

CoNPS Chapter Events

Boulder Chapter

Wild Patagonia

December 10, 7:00-8:30 PM

Presenter: Anyll Markevich

Virtual meeting

Boulder County Audubon teen naturalist Anyll and his family spent four-and-a-half-weeks in Patagonia, Chile, including close-up visits with penguins and four days of backpacking in Torres del Paine National Park. Hear success stories of people who are protecting beautiful places for generations to come, including the Tompkins Foundation's spectacular "Parque Patagonia." Whether you are an environmentalist, a hiker, or a wildlife watcher, you will enjoy the photos and the stories.

Anyll Markevich is a student in Boulder County. His interests include wildlife habitat conservation and small-scale sustainable agriculture. He recently conducted research in the foothills near Boulder looking into the potential effects of cheatgrass prevalence on the presence and abundance of birds. Anyll participates in the local Audubon teen naturalist program.

Metro Denver Chapter

Chapter president Lenore Mitchell is resigning as of December 2020. A leadership team with five members is forming. Additional volunteers are welcome! Contact Lenore at zap979sar@icloud.com or Rahman Minhas rrrman@msn.com to volunteer. Metro chapter members please note: To change your email or other contact information, you are the only one who can go to your online profile at conps.org to enter changes.

There will be free virtual chapter meetings via ZOOM starting in November.

December 8; 6:00-8:30 PM

Members' Botany-Related Summer Projects

Presenter: Tom Schweich

Virtual meeting

Tom Schweich will moderate an encore presentation of summer projects as shown at the virtual social of this year's Annual Conference. Monthly in-person meetings are planned to resume early in 2021 at Denver Botanic Gardens Freyer-Newman Center Auditorium. Event information will be posted on the CoNPS website.

Northern Chapter

Covid-19 restrictions required us to cancel our plant hikes this season. Small, socially distanced groups

still went out informally in search of blooms and their favorite plants. We also hosted some virtual events, including:

- Hugh MacKay went on several hikes to the newly opened Young's Gulch Trail and gave a Virtual Plant Hike online showing pictures from his trips; and
- Rob Picket took a three-day backpacking trip up the Dunraven Trail all the way to timberline. He showed his plant pictures via a Zoom session. They included the elusive wood lily (*Lilium philadelphicum*). During the online session, we were able to use our flora resources and have online discussions on some of the plant IDs.

We will be holding more of these types of virtual events this winter. Check the Event Calendar on the CoNPS website for more information about upcoming events. These are often "pop-up" events and may not happen on our regular (former) first Tuesday meeting night. Contact me at odygrant@gmail.com if you would like to share one of your favorite hikes with us online over the winter. All it takes is a little organization and we can help set you up.

The native plant gardens at River's Edge Natural Area in Loveland were tended by weed warriors over the summer. The gardens were installed last summer under the guiding hand of Kathy Maher and with donated supplies and sweat equity from CoNPS Northern Chapter volunteers. This September, some new plants were installed that were donated by High Plains Environmental Center in Loveland. Kudos also go to Loveland Parks and Recreation department that donated funds and helped with recruiting volunteers, equipment, tools, and water stations so volunteers could tend the new plants during our hot and dry late summer and fall.

We joined with other conservation partners to hold a Trick or Treat Seed Swap at Sugar Beet Park in North Fort Collins on October 24. Donated native seeds were collected, cleaned, and packaged by volunteers. About 60 people attended the physically-distanced event wearing masks (and costumes!) and timed entry slots. Sustainability was a theme of the event, with participants encouraged to attend using all modes of transportation, including bicycles and the City bus. Paper handouts were kept to a minimum, with plant descriptions and sowing and growing directions

provided in formats that could be photographed via cell phone. Participating organizations were CoNPS, Wildlands Restoration Volunteers Fort Collins Office, Front Range WildOnes, People and Pollinators Network, and Fort Collins Nature in the City. ►

◀ Plateau Chapter

There are no plans for chapter meetings or events in the next several months due to COVID-19 restrictions; however, there are plans in the works for several

virtual or in-person spring field trips! Refer to the Winter 2021 edition of *Aquilegia* and the Events Calendar on the CoNPS website for news on those upcoming events.

Other CoNPS Events

**November 19, 6:00-7:30 PM
Live Webinar**

An Evening with Peter Raven: Saving Plants, Saving Ourselves

World-renowned botanist, evolutionary biologist, and conservation advocate Peter Raven presents a live webinar for CoNPS members. He will highlight some of Colorado's native plants that adorn our plains, foothills, mountains, and western slope. He will also address the importance of the ecosystems they inhabit and of ecosystems worldwide in the functioning and quality of air, water, and soil and will talk about the food, medicines, and other products they produce. Dr. Raven will also spotlight the plight of some rare, threatened, and endangered plant species locally and worldwide, and what we can do to overcome these threats to help create a more sustainable world for ourselves and all living things.

Peter H. Raven is one of the world's leading botanists and advocates of conservation and biodiversity. For four decades, Dr. Raven headed the Missouri Botanical Garden, an institution he nurtured to become a world-class center for botanical research, education, and horticultural display.

Described by *Time Magazine* as a "Hero for the Planet," Raven championed research around the world to preserve endangered plants. In recognition of his work in science and conservation, Raven has received numerous prizes and awards including the

National Medal of Science, the highest award for scientific accomplishment in the United States. The American Society of Plant Taxonomists also established the Peter Raven Award to be conferred to authors with outstanding contributions to plant taxonomy and for exceptional efforts at outreach to non-scientists.

Dr. Raven has served as President of the American Association for the Advancement of Science, Sigma Xi, the American Institute of Biological Sciences, and several other organizations. He served for 12 years as Home Secretary of the National Academy of Sciences and is a member of the Academies of Science in several other countries, including China, Russia, the UK, Brazil, and Australia.

For 25 years, Dr. Raven was co-editor of the *Flora of China* project, a joint Chinese-American international project that created a 49-volume account of 31,500 known plant species of China. He has also published more than 700 articles, books, and monographs; both popular and scientific, including *Biology of Plants*, the internationally best-selling textbook in botany, and *Environment*, a leading textbook on the environment.

Dr. Raven received his PhD from the University of California, Los Angeles, in 1960 after completing his undergraduate studies at the University of California, Berkeley. He has held both Guggenheim and MacArthur Fellowships.

Thanks to Webinar Presenters and Participants

By Kathleen Okon

This year was the first in CoNPS history to launch webinars in lieu of the in-person workshops and field seminars normally offered. CoNPS members throughout the state had equal opportunities to attend all 15 webinars on a variety of topics from the comfort of their own homes. Webinars also provided options to invite speakers from around the country to give talks, thus creating our Special Speaker Series. As a result of these endeavors, we reached more than 700 participants (250% more than previous years), including nationwide participants. What's more, we offered these programs at reduced program rates, thus saving money for participants while increasing

revenues for CoNPS. We also spread the word about the importance of native plants and native ecosystems across the state and throughout the nation.

Thanks to all webinar presenters who generously gave their time and expertise to share with others. They helped educate participants on a wide variety of topics, including: three webinars on plant families; two re-vegetation webinars; four native plant garden webinars; programs on topics such as the science of defining species, the biology of pollination, phenology, prairie ecosystems, and citizen science; and two special speaker webinars on the importance and conservation of native plants & native ecosystems. ►



Some of our webinar presenters include Jennifer Ackerfield, Peter Raven, and Doug Tallamy.

◀ Specifically, thanks to these presenters who conducted top-notch webinars: Jennifer Ackerfield, PhD, Paul Alaback, PhD, Christina Alba, PhD, David Buckner, PhD, Carla DeMasters, MA, MS, Carol English, MS, Mo Ewing, MS, Maggie Gaddis, PhD, John Giordanengo, MS, CERP, Beth Hanson, Kate Hogan, MS, Stephanie Mayer, PhD, Lenore Mitchell, Jean Reeder, PhD, Irene Shonle, PhD.

A big thanks to our special speakers: Peter Raven, PhD; and Doug Tallamy, PhD.

Thanks, also, to all webinar participants for joining us. We hope these educational opportunities have increased

your knowledge and appreciation of native plants and have inspired you to protect/plant native plants for native pollinators, and ultimately, native ecosystems.

Kathleen Okon, CoNPS workshop coordinator, has more than 25 years' experience developing, coordinating, and presenting award-winning natural resources programs and events for participants of all ages. She has a master's degree in environmental policy and management, a bachelor's degree and teaching certificate in natural resources and environmental education, a certificate in sustainable practices management, and certificates in CSU's Native Plant Master®, master composter, and energy master programs.

Cross-Pollination Events

Free Online Symposium

Here Today, Gone Forever: Plant Extinction Now and Conservation Strategies for Tomorrow

This online symposium hosted by the New York Botanical Gardens is free to registrants. This symposium will be held on two Tuesdays: November 17 and 24, 11:00 am–12:30 pm EST.

See the agenda with information about the speakers and presentations at the following link.

https://www.nybg.org/event/here-today-gone-forever-plant-extinction-now-and-conservation-strategies-for-tomorrow/?fbclid=IwAR2Kdle-Ni52J8w_C_AnL9eN3CnDDui5LWK-ZWZPAHIGqzR17xVXw8ulkQ

Wesley Knapp, mountains field biologist and botanist at North Carolina Natural Heritage Program and one of the featured speakers, is the lead author of "Vascular Plant Extinction in the Continental United States and Canada." The stylized and proofed version of it is available for early view at the Society for Conservation Biology's website. It is a free Open Access PDF. It provides an excellent preview of his scheduled presentation at this symposium.

<https://conbio.onlinelibrary.wiley.com/doi/full/10.1111/cobi.13621>

Help Set a World Record for Every Plant Species

Read about this new citizen science effort at <https://storymaps.arcgis.com/stories/29c6ac1c2f4e4f93beabba73a42ac7b1>.

Dr. Brian Bruma at the University of Colorado is promoting the effort, saying "the species of the world are on the move due to climate change, migrating as their environment changes around them. But how fast and how well is this happening? This is a global question, and one that needs everybody's attention."

He encourages people to help set global records in your backyard and all across the continent—efforts that will inform science and conservation. Bruma invites people to "help identify species nearby and those pushing their ranges. Get out there and start exploring!"

This opportunity is a combined effort of iNaturalist, National Geographic, and ESRI.



Southern Rockies Seed Network Conference

Ecotypes: Research, Policy & Practice
December 8–9, 9:00–11:30 am

Topics for this virtual conference include

- Can alpine species “bank” on conservation;
- Lessons from twenty years of native seed collection;
- Ecotypic site restoration for the White River National Forest;
- Starting small: an inside to a growing native plant materials program at Jefferson County Open Space; and
- Plant community responses to post-fire plant restoration after the High Park fire.

The keynote address “Whither provenance? The science of restoration seed-sourcing in a changing world” features Francis Kilkenny, PhD, research biologist with the USFS.

Save the date!

Mark your calendar for February 27, 2021, to attend the Landscaping with Colorado Native Plants Conference. Registration for this virtual event will be open early December. Check the website and Facebook page for updates. For more information visit <https://landscapingwithcoloradonativeplants.wordpress.com>



Other Events

November 12-13

Society for Ecological Restoration-Southwest Annual Meeting (virtual)

<https://www.ser.org/events/eventdetails.aspx?id=1432502>

November 12, 12:00 PM

SER Webinar: Contributions of Indigenous Peoples and local communities to ecological restoration

<https://www.ser.org/events/eventdetails.aspx?id=1410770>

November 14, 17 and 19

Ecosystem Summit Webinars

CU Center for Sustainable Landscapes and Communities (CSLC)

- Webinar 1: Climate & Soil Health, November 14, 10:00-11:30 AM
- Webinar 2: Watershed health & air quality, November 17, 11:30-1:00 PM
- Webinar 3: Biodiversity & urban land cover, November 19, 4:00-5:30 PM

<https://cslc.colorado.edu/events-blog/summit>

December 5

World Soil Day

December 8-10

Colorado Weed Management Association

Virtual Winter Training

<http://cwmaco.memberzone.com/events/details/2020-cwma-virtual-winter-training-8>

December 17, 11:00 AM

Xerces Webinar

Building Pollinator Habitat in Towns and Cities: Southwest Region

<https://xerces.org/events/new-mexico/building-pollinator-habitat-in-towns-and-cities-southwest-region>

January 11, 2021 – grant deadline

City of Boulder Open Space and Mountain Parks Funded Research Program

<https://bouldercolorado.gov/osmp/funded-research-program>

January 31, 2021 – grant deadline

Denver Audubon 2021 Grants

Research, Education, and Conservation Projects Supporting Colorado Non-Game Wildlife

<https://denveraudubon.org/lois-webster-fund/>

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Membership dues cover a 12-month period.

- New Renewal
- Student \$17 Senior (65+) \$17 Individual \$25
 Family \$35 Plant Lover \$50 Supporting \$100
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CHAPTERS: Boulder, Metro-Denver, Northern (Ft. Collins-Greeley), Plateau (Grand Junction & West Slope), Southeast (Colorado Springs-Pueblo), Southwest (Durango) or Unaffiliated

Printed Color Copy of the newsletter, *Aquilegia*, \$20

CONTRIBUTIONS to CoNPS are tax deductible:

John Marr fund for research on the biology and natural history of Colorado native plants \$ _____

Myrna P. Steinkamp Memorial fund for research and other activities to benefit the rare plants of Colorado \$ _____

Total included: \$ _____

If this is a change in address, please write your old address here.

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Check box to receive information on volunteer opportunities

Please make check payable to:
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DUES include the electronic version of the *Aquilegia* newsletter, published quarterly.

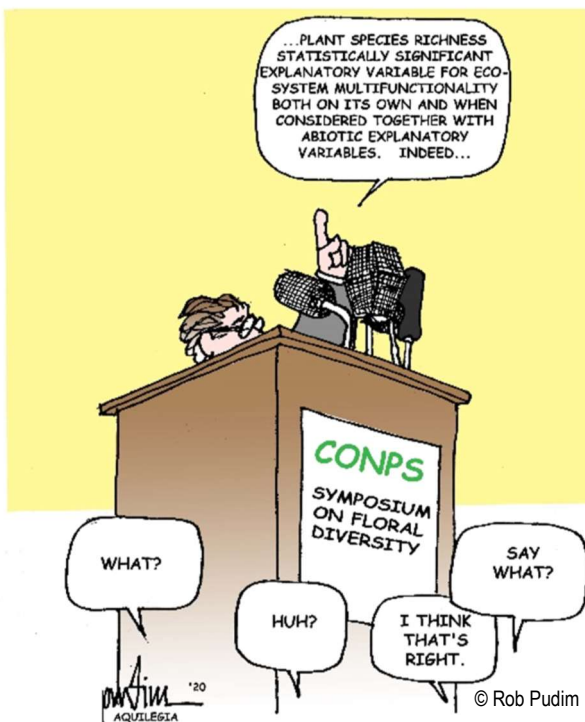
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The 36-page, full color electronic publication arrives by PDF in member email boxes in February, May, August, and December. For those members without email addresses, please apply for a scholarship to receive print copies.

You may also join online at <https://conps.org/about-us/committees/join-us/>



Botanicum absurdum by Rob Pudim



Sponsor for the 2020 CoNPS Annual Conference.

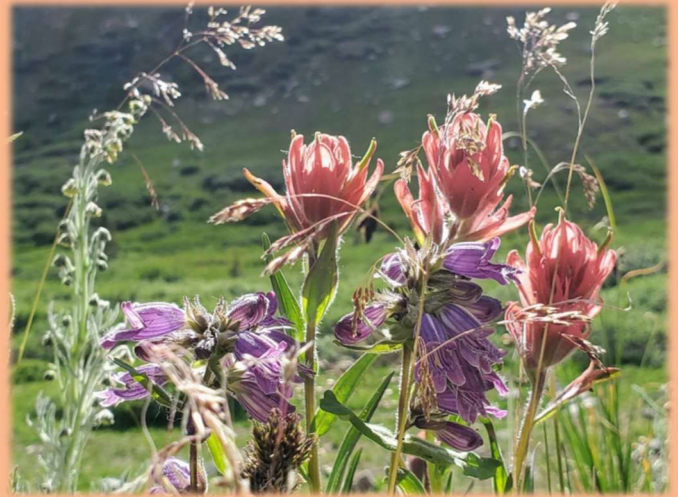
Thank you for your support and for the native plant stock that you provide!



More Photo Contest Winners

2020 Photo Contest (continued)

Third place winners start on this page and finish on the next. Clockwise from top right. **Artistic** (2-way tie) Anna Wilson, wildflowers gone wild, paintbrush (*Castilleja* sp.) and Whipple's penstemon (*Penstemon whippleanus*) and Kelly Ambler, deadfall with moss eye. **Landscape** (3-way tie) Linda Smith, winter in the moraine at RMNP; ponderosa pine (*Pinus ponderosa*), Dan Kunz, bristle cone pine snag (*Pinus aristata*) on Mount Goliath; and Dina Baker, Summit Lake landscape, bistort (*Bistorta bistortoides*) and alpine avens (*Geum rossii*). Next page, clockwise from top left. **Wildlife** Tom Lebsack, curlyhead goldenweed (*Pyrrocoma crocea*) and little leafcutter bee. **Garden** (4-way tie) Haley Stratton, Lewis flax (*Linum lewisii*); Carol McGowan, blazing star (*Mentzelia* sp.) in her garden; Dina Baker, *Penstemon* sp. in home garden; and Anna Wilson, pasqueflowers (*Anemone patens*). **Plants** (2-way tie). Marlene Borneman, rare white fairy slipper (*Calypso bulbosa*) and Ed Ogle, wood lily (*Lilium philadelphicum*).



More Photo Contest Winners



Colorado Native Plant Society



P.O. Box 200
Fort Collins, Colorado 80522
<http://www.conps.org>

Show your appreciation and support of local nonprofit organizations by making a donation. See page 20 for more information about how Colorado Gives Day benefits CoNPS.

