

18TH Annual Colorado Rare Plant Symposium Report

Globally Imperiled Plants Found in Southeastern Colorado

By Jessica Smith and the Botany Vegetation Ecology Team at the Colorado Natural Heritage Program

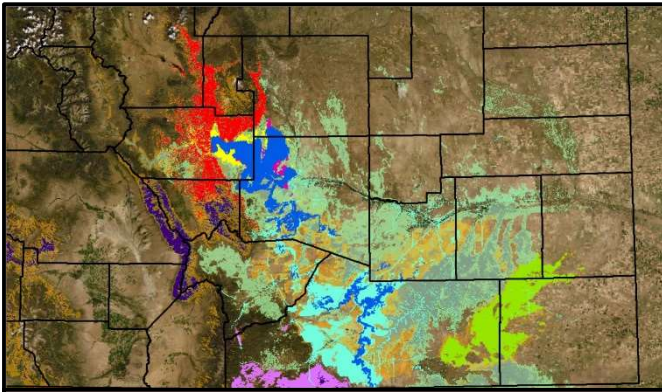
This year's symposium was kicked off by a photo review of rare plants of southeastern Colorado, including Fishers Peak State Park, by Susan Panjabi, botanist with the Colorado Natural Heritage Program (CNHP). Summary information was presented on each taxon listed in the table below, including a distribution map, photos of the plant and habitat, last observation date, population-size estimates, management concerns, and land-ownership patterns associated with the known distribution. The G rank refers to the global rarity of the species, and S refers to state rarity, with a 1 indicating critically imperiled, 2 indicating imperiled, 3 indicating vulnerable, and 4 indicating "apparently secure." For more information on ranks, see NatureServe's website (https://help.natureserve.org/biotics/content/record_management/Element_Files/Element_Tracking/ETRAK_Definitions_of_Heritage_Conservation_Status_Ranks.htm).

Additional data and photos are needed for all these taxa, and we welcome efforts from the Colorado Native Plant Society and others to help expand our

knowledge of these plants through targeted field surveys and observations. See the CNHP website for ways to submit data (<https://cnhp.colostate.edu/ourdata/contribute-data/>) or contact Susan at susan.panjabi@colostate.edu to contribute information on these species.

Following a short break, CNHP botanist Jessica Smith led the group in a presentation on species distribution modeling for the Plants of Greatest Conservation Need (PGCN; <https://cnhp.colostate.edu/download/documents/2021/CODEX-PGCN-Models-Report-Interim-20210831.pdf>) and a subsequent group review of nine models for species found in southeastern Colorado, displayed in ArcGIS (arc geographic information system). Her presentation introduced the Colorado State Wildlife Action Plan (<https://cpw.state.co.us/aboutus/Pages/StateWildlifeActionPlan.aspx>) listed in the modeling project funded by the Colorado Natural Areas Program (CNAP), which is a program within Colorado Parks and Wildlife, and discussed the model's intended uses and constraints. Models were produced to be included in the Colorado's Conservation ►

Scientific Name	Common Name	G Rank	S Rank
<i>Asclepias uncialis</i>	Dwarf milkweed	G2	S2
<i>Cleome (Peritoma) multicaulis</i>	Slender spiderflower	G2G3	S2S3
<i>Delphinium ramosum</i> var. <i>alpestre</i> (<i>D. alpestre</i>)	Colorado larkspur	G3	S2
<i>Delphinium robustum</i>	Wahatoya Creek larkspur	G2G3	S2?
<i>Draba exunguiculata</i>	Clawless draba	G2	S2
<i>Draba grayana</i>	Gray's Peak whitlow-grass	G3	S3
<i>Draba smithii</i>	Smith whitlow-grass	G2	S2
<i>Frasera coloradensis</i>	Colorado green gentian	G2G3	S2S3
<i>Herrickia horrida</i>	Canadian River spiny aster	G3	S1
<i>Nuttallia (Mentzelia) chrysantha</i>	Golden blazing star	G2	S2
<i>Nuttallia (Mentzelia) densa</i>	Arkansas Canyon stickleaf	G2	S2
<i>Oenothera harringtonii</i>	Arkansas Valley evening primrose	G3	S3
<i>Oenopsis foliosa</i> var. <i>monocephala</i>	Rayless goldenweed	G3G4T2	S2
<i>Oenopsis puebloensis</i>	Pueblo goldenweed	G2	S2
<i>Oxybaphus rotundifolius (Mirabilis rotundifolia)</i>	Round-leaf four-o'clock	G2	S2
<i>Penstemon degeneri</i>	Degener beardtongue	G2	S2
<i>Penstemon versicolor</i>	Variable-color beardtongue	G3?	S3?
<i>Physaria (Lesquerella) calcicola</i>	Rocky Mountain bladderpod	G3	S3
<i>Ptilagrostis porteri</i>	Porter feathergrass	G2	S2
<i>Solidago capulinensis</i>	Capulin goldenrod	G2	S1
<i>Telesonix jamesii</i>	James' telesonix	G3G4	S3



Species distribution models for selected southeastern Colorado Plants of Greatest Conservation Need (<https://cnhp.colostate.edu/download/documents/2021/CODEX-PGCN-Models-Report-Interim-20210831.pdf>)

◀ Data Explorer (CODEX), a web-based conservation mapping tool launched on November 1, 2021 by CNHP (<https://cnhp.colostate.edu/maps/codex/>). Forty-five models were completed in Phase I of the project, and CNHP is soliciting expert review on these models. The presentation included a list of available models, a link to the model review form, and a link to the publicly available report on the project (<https://cnhp.colostate.edu/download/documents/2021/CODEX-PGCN-Models-Report-Interim-20210831.pdf>). If you are interested in reviewing a species distribution model for CNHP, please contact Jessica at jp.smith@colostate.edu.

Following lunch, updates on ongoing conservation work by partner agencies were provided as follows: Gwen Kittel started the session with a presentation of updates on rare willows in Colorado. She discussed *Salix arizonica*, which previously had only one known population in Colorado. However, Kelly Garcia recently found two more populations of this species, which Gwen has confirmed. The species is still limited to Conejos County. The new sites are along La Manga Creek, a healthy population with more than 100 shrubs, and a population of about 35 shrubs near Cumbres. Gwen also discussed an observation of *Salix discolor*, a new county record in Boulder County, with one individual shrub found in Boulder Canyon. She also alerted the group to the need to look for *Salix cascadiensis* in Colorado. This is a small plant, with leaves only 3–5 mm in width, which can only be found by literally combing the tundra.

The next presentation was by Dr. Ross McCauley, professor of biology at Fort Lewis College, on the diversification and population genetics of rare *Astragalus* in the Four Corners region. The *Astragalus* genus has the second highest number of species in the state, with six species ranked as globally critically imperiled (G1) by CNHP. The broader Four Corners region has 60 taxa of *Astragalus*, 12 of which are endemic. This

presentation focused on *Astragalus schmolliae* and *A. deterior*. *A. schmolliae* is only known from the Mesa Verde National Park and the Ute Mountain Reservation.

Focused monitoring for *A. schmolliae* species began in 2001 by CNHP and the National Park Service. In 2002, 38 percent of the old-growth pinyon-juniper habitat for this species burned in the Long Mesa fire, and the species is showing signs of declining population sizes. To complement the ecological monitoring data, a project to assess genetic diversity in the species was begun in 2018. Ross presented results of this study, which showed good genetic diversity across the national park with no differences across burned and unburned habitat. The pattern of diversity appears to be maintained by the long-lived nature of the species, with recent research indicating plants live up to 50 years.

Ross also introduced a new project initiated this year investigating *A. deterior*. This species is also found only in Mesa Verde National Park, on ledges at the top of sandstone cliffs. Like *A. schmolliae*, its numbers are declining, and Ross is completing a population genetic survey to better understand the species and assist in potential reintroductions. Complicating the biology of *A. deterior* is a close relationship and possible conspecific classification with *A. naturitensis*, a G2 ranked species occurring in parts of western Colorado and New Mexico. While the results are still preliminary, it appears that *A. deterior* does represent a distinct taxon and *A. naturitensis* appears to exhibit regional segregation across its disjunct range.

Three talks by researchers from Denver Botanic Gardens followed. Michelle DePrenger-Levin discussed the soil seed bank dynamics, dispersal, and distribution of *Sclerocactus glaucus*. This study focused on determining the risk of extinction of the species by projecting changes in population size and range, considering exposure and sensitivity to climate change. Michelle tested distance sampling as a method for determining population size and ▶



Chapin Mesa milkvetch (*Astragalus schmolliae*).
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◀ discussed using species-distribution models to inform changes in the species range. To improve upon species-distribution models, information on movement of the species is needed. To gather this information, she investigated the soil seed-bank, seed dispersal, and vegetation community, employing several techniques to monitor seed dispersal by ants. Future work will include a seedling-emergence study, seed-bank persistence, quantification of ant dispersal and incorporation of these additional data into a process-based species-distribution model.

Alex Seglias introduced the group to her newly established research project using open top chambers to understand how two rare alpine plants, *Physaria alpina* (Avery Peak twinpod) and *Saussurea weberi* (Weber's saw-wort), will respond to increased warming. Four control plots and four warming plots were established for each target species (16 plots total), with the chambers increasing the temperature by approximately 1.5°F. Data collected include the number of flowers and fruits, plant height and width, and percent cover of associated species. Seeds will also be collected in the plots at the end of the season for follow-up experiments to determine optimal germination conditions.

Jennifer Neale, director of Research and Conservation at Denver Botanic Gardens, presented the North American Botanic Garden Strategy for Alpine Plant Conservation to the group. The strategy, created in partnership with Betty Ford Alpine Gardens (<https://bettyfordalpinegardens.org/>), is a smaller version of a global strategy and focuses on treeless regions above 11,000 feet in elevation. Within Colorado, alpine environments are effectively conserved, but threats include climate change, with more aridity and higher temperatures. The strategy calls attention to the need for basic research in alpine areas and the need to build capacity, train scientists, and engage with others. They hope to promote awareness for the conservation of these areas. Jennifer showed a slide of a beautiful exhibit at the



Colorado hookless cactus (*Sclerocactus glaucus*).
© Gina Glenne, courtesy of CNHP.

Betty Ford Alpine Gardens dedicated to education about alpine areas and encouraged the group to visit the Denver Botanic Gardens Science Pyramid to learn more. The completed strategy is available online at <https://www.botanicgardens.org/sites/default/files/file/2021-05/2020AlpineStrategy.pdf>, and you can read about other research projects being completed at the gardens on the Denver Botanic Gardens Biodiversity Research page (<https://www.botanicgardens.org/science-research/biodiversity-research>).

Finally, Jill Handwerk, Botany Team leader at CNHP, gave an overview of three years of research using unmanned aerial systems (UAS, or drones) to conduct surveys for *Penstemon debilis* on the Roan Plateau. *P. debilis* is a federally listed threatened plant species that is a Colorado endemic with a narrow geographic range. On-the-ground survey and monitoring efforts for *P. debilis* are hindered by the extremely steep and fragile shale habitat, making the capture of imagery using drones an attractive alternative. Multiple cameras and flying altitudes were tested with this research. The captured images were processed into orthomosaics, which were then manually reviewed for the presence of *P. debilis*. Results indicated a flying altitude of 4–7 meters is necessary to capture fine enough resolution images to detect *P. debilis* with a RGB (red-green-blue) camera. The multispectral (5 band color) camera did not provide fine enough resolution at these heights. Utilizing drone filming, CNHP detected 1,604 newly documented *P. debilis* plants within seven areas. Upcoming work will continue to investigate the potential for identifying a unique spectral signature that can be used in machine learning to automate plant identification in the orthomosaic images, as well as continued surveys to find additional populations.

All of the presentations from this meeting, as well as previous symposia, are available online at the CNHP website (<https://cnhp.colostate.edu/projects/colorado-rare-plant-symposia/>). 🌀



Weber's saw-wort (*Saussurea weberi*).
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