

Mindy Wheeler

USU, UDWR - Ben Gibbons, Meghan McCormick, Zach Coury, Kenzie Anderson-Bell, Bailey Spears

Updates from the Utah Rare Plant Program

The Utah Rare Plant Program continues to do our best to keep tabs on all of the state's rare species (our heritage program roots) while making ends meet doing other projects that can use botanical expertise. We continue to conduct conservation rankings (after reconciling taxonomy!), surveying for target species, monitoring Conservation Agreement Species (and others), maintaining our database, and ****still**** working through backlogged data. All the while, engaging in other projects to assure botanical expertise is extended where needed and wanted. 2025 activities will be highlighted while 2026 targeted activities will be presented.

Ashley Egan

UVU, Lexi Olson

A synopsis on the rare plant *Pediomelum pariense*, the Paria breadroot.

Pediomelum pariense, the Paria Breadroot, is known from 12 populations in four geographic clusters in Kane and Garfield counties, Utah. Here we present a synopsis of the species, including information on distribution, ecological site analyses, soils and habitat characteristics, associated species, threats, and insights from genetic work.

Bruce Pavlik

Lisbeth Louderback, NHMU

Ancient Translocation Leads to Domestication of the Four Corners Potato (*Solanum jamesii*)

Indigenous people have been translocating plant propagules for millennia and thus modifying the genetic composition and distribution of many species. New populations established in novel locations are subjected to founder effect and selection and are thus transformed if they persist. One such species, *Solanum jamesii* Torr., was put on a path to domestication nearly 11,000 years ago in its unique anthropogenic distribution across the Four Corners region. Herein we examine genetic, demographic and archaeological evidence developed over the last 12 years that is establishing *S. jamesii* as the only known example of plant domestication from western North America.

J. Hope Hornbeck

Manzanita Botanical Consulting

Ongoing disturbance compounds climate change impacts to Utah's threatened and Endangered cactus species

Threats to Utah's federally listed cactus species (livestock grazing, habitat fragmentation, climate change) are interacting synergistically in ways that rapidly and negatively impact populations. Recent cycles of dry and wet years have become more punctuated, with drought and deluge events occurring at increasing intensity compared to historic patterns. Extreme weather events are interacting with long-term, pervasive livestock grazing in unpredictable ways: 1) degraded range conditions (loss of soil crusts, reduced infiltration, and reduced soil-stabilizing vegetation cover) contribute to rapid soil erosion during high precipitation events; 2) stressed native vegetation does not adequately recover between drought events whereby there is reduced vegetation cover, seed outputs, soil seed banks, and recruitment following each drought event; 3) existing vegetation communities do not possess the forage diversity or mass to support plant predator populations; 4) ongoing management to maximize game and livestock means there is increasing competition for shrinking range resources by both native animals and domestic and feral livestock; and 5) these impacts are occurring in a negative feedback loop, with increasing pressure on habitats of decreasing extent and quality with each drought-deluge-drought event. The result of the current negative feedback loop of impacts across the ranges of *Sclerocactus* and *Pediocactus* species in Utah is that, in many cases, these cacti are the best or perhaps only forage resource available to small mammal and insect predators. Current trends in habitat and population decline can be expected to continue without active management and conservation efforts.

Matthew Wang

Red Butte Gardens

Utah Sclerocactus seed morphology

Utah has many species of *Sclerocactus*. That number varies depending on who you ask. There is a large amount of taxonomic uncertainty in the genus. This study uses Z-stacking technology to image and measure trait differentiation of Utah native *Sclerocactus* seeds. These data will help in identification and taxonomical questions with several characters standing out as different between species.

Autumn Gillard

Nuwu-Insitu

The Southern Paiute plant connection

The Southern Paiute are a group of southern Numic Uto-Aztecan-speaking indigenous people who call the Colorado Plateau home. The Nuwu have been here on the Colorado Plateau for time immemorial. The connection to native plants serves a sacred theological connection to their natural environment. The plant connection to species will be covered to show the connection to food, fiber, and medicine as an indigenous group. Ethnobotany is the study of plants and the connection that it has to any culture. For the Nuwu, commonly known as the Southern Paiute, the cultural connection to plant life establishes a personhood relationship between native plants and native people. This presentation will cover cultural connections and uses, as well as understanding the connection to the landscape. And the importance of holistic land conservation through native plant knowledge and proper land management on federal and state lands.

Kipp Lee

UNPS, Blake Wellard, Zach Coury

The Cactus Flora of Utah

Utah is world-renowned for its uniquely varied landscapes, and is home to dramatic mountain ranges and expansive deserts. The state is also a hotspot for plant diversity and plant endemism, and the cactus family makes no exception; six of our species can only be found in Utah. These unique plants are permanent and iconic symbols of the American West, occupying nearly every habitat type across the state.

The Cactus Flora of Utah is the state's first comprehensive treatment of this charismatic group, and has been rigorously prepared for over a decade. Countless hours and off-road miles were necessary to gather data to produce detailed descriptions as well as beautiful photographs of every species in flower. All 44 taxa (species and varieties) are thoroughly treated, accompanied by detailed maps and more than 350 images depicting the plants in their native habitat.

Michael T. Stevens

Utah Valley University

Sydney O. H. McGovern, Laine S. Smith, Hailey E. Sermersheim, Joseph S. Fife, Xander W. Hulse, Tyler R. Shaver

Reducing extinction risk for clay phacelia (*Phacelia argillacea*)

Clay phacelia (*Phacelia argillacea*) is an endangered member of the waterleaf family (Hydrophyllaceae). It has showy purple flowers that produce an abundance of seeds that create a persistent seed bank. As a narrow endemic, it only grows in Spanish Fork Canyon, Utah, USA, where it is restricted to steep hillsides of the Green River Formation. Currently, clay phacelia is found in only two natural populations. To reduce the risk of extinction, we augmented the seed bank and expanded the current range of clay phacelia onto U.S. Forest Service land by experimentally sowing greenhouse-produced seeds in Spanish Fork Canyon in 2020 and 2021. We sowed 32,400 seeds in 2020 and 13,500 in 2021. To understand the factors that lead to successful establishment of clay phacelia, germinants were counted and monitored in the spring, summer, and fall each year for five years in a row (2021-2025) and assessed for reproduction in subsequent springs. The number of germinants per year ranged from 10 to 110 and the number of reproductive individuals per year ranged from 0 to 6. Even though emergence across the five years varied by as much as 11-fold, the number of plants that survived to reproduce was consistently low or zero. Surprisingly, the worst year for germination was the best year for survival and reproduction. Twenty percent of the seedlings that survived to produce seeds were fall germinants. It is likely that monsoonal rains that occur in the late summer and fall make clay phacelia seedling survival and subsequent reproduction more probable. Augmenting clay phacelia's persistent seed bank and expanding its range increases the probability that it will survive long-term. Additionally, our project yields information about population augmentation and range expansion efforts that can be applied to the management of other endangered plants.

Zach Coury

Utah Rare Plant Program, University of Utah, University of British Columbia
Leila Shultz & Tim Lowrey

***Townsendia* diversity in Utah**

Townsendia is a charismatic genus in the sunflower family, with a distribution across western North America, stretching from Alaska to Mexico. Although the genus is suspected to have originated in northern Mexico, the current center of species diversity is in Utah where we enjoy more species than any other state or province. The diversity of our many taxa will be discussed, as well as some guidelines for general identification. I will also discuss the taxonomic history and other details of the recently published *Townsendia raptora* (Courthouse Rock ground-daisy), which I co-authored with Leila Shultz and Tim Lowrey. Finally, a preview of my ongoing research in *Townsendia* as a part of a master's program at the U.

Will Pearce

Science Research Initiative (SRI), University of Utah

Systematics of the 'desert gooseberries' (*Ribes* section *Lobbia*)

The 'desert gooseberries' (*Ribes* section *Lobbia*) are a group of 6 species of spiny fruiting shrubs distributed across drylands of western North America. The systematics of this clade have yet to be studied in depth, despite the unclear boundaries between many of its species, necessitating a closer look at the group. This study combines morphological, geographic, and phylogenetic data to provide a modern, comprehensive look at the species circumscription and evolutionary relationships between the desert gooseberries. Yellow-flowered desert gooseberries are revealed to display significant morphological overlap between species, but occupy distinct habitats and flower at different times. Phylogenetic reconstruction using the *yfc1-a*, *matK*, and *ITS-2* markers reveals that the desert gooseberries may not be a true evolutionary clade, but rather consists of species from at least 2 distinct lineages that have converged to a similar morphological form and habitat preference. Yellow-flowered desert gooseberries show little sequence divergence, implying a recent radiation and potential hybridization in zones of range overlap. These results highlight how current classification schemes may not accurately reflect the complex evolutionary history of *Ribes*, and emphasize the need for further study of this clade.

Mark Darrach

Burke Museum - University of Washington, Donald Mansfield

Phylogenetic Reassessment of the PENA Clade: Apiaceae Subfamily Apioideae

The PENA clade of Apiaceae subfamily Apioideae - *Lomatium* and *Cymopterus* et al. - has presented significant taxonomic challenges for over 150-years. A new next-generation phylogeny of nearly the entire ~220 species clade reveals the need for major genera realignments, sets the stage for lineage age analysis and insights that unravel many of the salient mysteries of this vexing group. Application of the recently-developed 353 Angiosperm Baits Kit methodology to the PENA clade, utilizing a maximum likelihood bioinformatics approach reveals a highly-supported tree with both numerous new, often monotypic, genera and undescribed species scattered through the tree. These new insights have major biodiversity conservation implications for this ecologically important group in the western U.S.

Mikel R. Stevens

Emeritus Professor of Plant Science BYU & President of the American Penstemon Society

The Rare and Unusual *Penstemon* of Utah

Center of diversity is the geographical area wherein the greatest diversity can be found for plants within a genus. *Penstemon*'s center of diversity is found in Utah and the surrounding states. According to the USDA Plants Database, 89% of the *Penstemon* species are in the states west of the Great Plains. Utah is in the heart of *Penstemon* diversity with 78 *Penstemon* species recorded within the state. By way of comparison, there are less than 80 native *Penstemon* species present in Washington, Oregon, Idaho, and Montana combined with the surrounding states holding approximately 63 in Colorado, 61 in California, 54 in Nevada, 51 in Arizona, 45 in New Mexico, and 45 in Wyoming.

The 78 *Penstemon* species that have been found in Utah represent approximately 26% of the total genus. Of these 78 species, 13 have two or more described varieties in the state, resulting in 95 *Penstemon* taxa. Moreover, 20 of the 78 species are endemic to Utah and nowhere else. Of these 78 documented species, we have reconfirmed the existence of 77. We have yet to relocate a natural population of *P. pseudospectabilis* within the state. Twenty of these species are endemic only to Utah. The other 58 species have regional presence, with some found in most western states. However, 24 of these 58 species are rather rare narrow endemics with their populations straddling the Utah border and adjacent state.

In general, there is more penstemon diversity, as measured by total number of species, in the central and southern two-thirds of Utah than in the northern third of the state. Yet in one species-rich area in the northern tier, the Uinta Basin and the surrounding mountains, there are at least 17 *Penstemon* species found. Six of those 17 are narrow endemics.