SER GREAT BASIN SOCIETY FOR ECOLOGICAL RESTORATION

President's Message

Dear SER GB members,

The past spring has been a productive one for our SER Chapter. Earlier this month, we held our annual meeting. I am grateful for the presenters and audience that attended this virtual meeting, even at the end of a busy semester. The presentations were a terrific collection of cutting-edge research in the Great Basin and there were many useful and interesting questions from the audience. While this meeting was virtual, I am looking forward to our **next meeting, in-person in Boise in March 16th-17th 2022**, with workshops and field trips on March 15th and March 18th. I can't wait to see everyone in person once again! The theme of the in-person meeting will be "*Restoration at the Wildland-Urban Interface*." If you would like to be involved in organizing this meeting, please reach out to me.

This past spring, we have elected a new Treasurer. Thank you to Owen Baughman for stepping up to this position. Many of us know Owen from his leadership with The Nature Conservancy's sagebrush projects in Eastern Oregon, and I look forward to working with him over the next year. Our gratitude goes out towards to Stan Young, our previous Treasurer, for his lengthy and committed service to SER GB.

My favorite part of being SER GB President is handing out awards: this year we were able to award research funds for two graduate student projects as well as two career awards. Next year we anticipate giving research and travel awards to students, so please stay tuned for that announcement! We are also always on the lookout for outstanding restoration ecologists to recognize. If there is anyone you would like to nominate for a future award, please let me know.

During our annual meeting, several people recommended that SER GB work towards jump-starting student engagement by supporting student chapters. I agree that this is a great idea and we will likely be providing some resources to initiate and maintain student chapters in the fall. As we enter the summer, our region is facing a historic drought, including drought emergencies declared in several states, lower-than-normal snowpack, and lack of spring precipitation. I expect this drought will present challenges for restoration projects this summer. The drought also highlights the risks posed to ecological integrity by a changing climate. Across the Great Basin, our work in repairing degraded ecosystems will play a crucial role in storing carbon and promoting sustainability and resilience.

As always, please feel free to reach out to me with any comments, questions, or ideas for SER Great Basin: trevorcaughlin@boisestate.edu.

Sincerely,
Trevor Caughlin

In this issue:

SERGB Chapter Virtual Meeting Summary

Our 2020 meeting, titled "Emerging Research in the Sagebrush Steppe" took place on Monday, May 2nd.

Stella Copeland of USDA ARS presented ongoing work investigating why seedlings die during restoration projects. Her work represents an important step towards understanding demographic mechanisms of restoration success or failure in the Great Basin.

Ruth Griggs and **Tessa Bartz** of University Nevada-Reno described how the environment mother plants grow in can influence performance of their seeds: important work that will inform seed collection efforts for restoration

Andrew Kulmatiski convinced us all why belowground processes are important for Great Basin restoration with some experiments demonstrating the power of activated carbon to jumpstart seedling establishment, likely due to microbial activity. Seed viability is critical for restoration efforts that distribute seeds over large areas of land.

Travis Sowards demonstrated some promising results of an experimental fungicide treatment to enhance viability of bluebunch wheatgrass seeds, an important species across the region.

Alison Agneray of UNR combined evolutionary history and coexistence theory with restoration concepts by looking at experimental plantings of different restoration species. Considering taxonomic diversity in plantings yields interesting results that can improve restoration outcomes. Rabbitbrush provides valuable services for insect pollinators and primary succession after severe disturbance

Trevor Faske used range wide genetic data to demonstrate how environmental and geographic forces have shaped populations of this species in the west

Olga Kildisheva of The Nature Conservancy presented an overview of the precision restoration activities TNC is deploying in sagebrush steppe, including targeted techniques, species, and locations to improve outcomes

Cara Applestein of USGS FRESC demonstrated how fungal infections interact with post-fire conditions in cheatgrass, one of our most terrible species. understanding these fungus-plant interactions could lead to new insight on mass dieoffs of cheatgrass.

Finally, **Marie-Anne de Graaf** and **Sabrina Schuler** presented their research showing the power of biochar to improve sagebrush establishment after fire. Biochar is a relatively simple tool with wide-ranging benefits from soil moisture to plant growth to microbial communities.

Diversity, Equity, and Inclusion Award

As professor at the University of Nevada, Reno, Dr. Elizabeth Leger has formally and informally mentored many students. At the SER-GB meeting we presented Beth with the Diversity, Equity and Inclusion Award to show our appreciation for her dedication to being a role model and mentor to women studying topics relevant to restoration ecology in the Great Basin.

In addition to providing young women with opportunities for academic and professional development and community engagement, she also helps them to become confident, well-rounded scientists that contribute to improving our understanding of the unique restoration needs of the Great Basin region. Thank you, Beth!

https://phys.org/news/2017-12-great-basin-seed-rangeland.html

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Mule-ears - Wyethia amplexicaulis (WYAM), BLM Seeds of Success Smug Mug Photo, NV.

Paul Doescher Memorial Award Recipients

Summer research and travel funds for undergraduate and graduate students in the Great Basin

The Society for Ecological Restoration Great Basin Chapter recently awarded two students research and travel awards at the virtual meeting of the Society for Ecological Restoration Great Basin Chapter on Monday, May 3rd: https://chapter.ser.org/greatbasin/2021/03/05/sergb-virtual-conference-may-3rd-10-1-pm-mst/ The award covers up to $1000 to support registration for a summer conference (such as the SER2021 World Conference: http://www.ser2021.org/) or for summer research on restoration ecology. *The awardees are*;

Michaela Grossklaus. Michaela earned her B.S in biology with an emphasis in ecology from Boise State University in 2019. She spent the time between college and graduate school working for the Idaho Department of Fish and Game, where she learned the legal and practical foundations of conservation in Idaho and gained hands-on experience working on a variety of wildlife management projects, such as spawning salmon and completing mortality reports for harvested game. Currently, she is working as a teaching assistant for Anatomy and Physiology II as she progresses through her master's degree program in Dr. Ian Robertson's lab at BSU. As Michaela's first year as a biology graduate student comes to a close, she looks forward to beginning her research this summer.

Michaela's research, which will explore the effects of seed predation by harvester ants on native plants, seeks to provide insight to land managers about the relative threat of seed predation to the success of vegetation restoration efforts. In the Snake River Basin of Idaho, restoration of disturbed habitats is critical for slowing the spread of invasive annual grasses (e.g., cheatgrass) and maintaining the integrity of the sagebrush steppe; however, vegetation reestablishment efforts to date have yielded mixed results.

Factors that contribute to the variation in restoration outcomes – in particular, seed predation by harvester ants – have yet to be thoroughly investigated. Harvester ants are voracious consumers of seeds on the soil surface, and seed predation by harvester ants has been linked to declines in soil surface seed availability as well as abundance and species richness within plant communities. Thus, seed predation by harvester ants may contribute to the ineffectiveness of some restoration efforts. Specifically, ants may impede restoration efforts by consuming large quantities of seeds from the soil surface following aerial seeding as well as those produced by adult plants that managed to survive initial restoration.

To clarify the extent to which harvester ants contribute to seed loss, Michaela will examine the effects of three key variables relevant to ant foraging decisions: (1) seed species, (2) distribution of seeds within an ant colony's foraging range, and (3) time of year. As a secondary objective, she will also assess the contribution of birds and small mammals to seed predation. Taken together, this information

Rosemary Frederick. My name is Rosemary Frederick, and I am pursuing a Master's degree at the University of Nevada-Reno studying restoration science under Dr. Elizabeth Leger. I am originally from Gainesville, Florida where I developed a love for the natural world exploring the rivers and swamps of northern Florida. I completed my undergraduate studies at Whitman College in Walla Walla, Washington, where my interest in the natural world grew as I was introduced to the great American west. While attending college, I had a formative R.E.U. program internship that gave me the opportunity to study botany and restoration at the University of Nevada Reno. Since graduation, I have continued to pursue those interests, working in restoration and vegetation science in the Bay Area. I am excited and driven to continue this work in graduate school under Dr. Leger, asking questions that are central to the success of restoration efforts.

In the Great Basin, extensive ecological restoration efforts have been prompted by widespread high-intensity wildfires, invasion by introduced species, and the effects of climate change. The current practices for nursery production of native seeds for these efforts could give them detrimental maternal effects, negatively impacting restoration success. I ask how the competitive ability of *Elymus elymoides*, a common restoration grass, is affected by its maternal growing environment. I will do this by growing two populations of this species under varying maternal environments, and then trait testing their progeny in a field common garden and in a controlled greenhouse experiment. I expect to find lowered competitive ability and stress tolerance in individuals experiencing less stressful maternal environments. By quantifying these effects in restoration populations, we can provide direct recommendations to restoration growers to improve seed characteristics by optimizing maternal environmental conditions.

Annual Outstanding Restoration Practitioner Award

This year's award for *Outstanding Practitioner* goes to **Martha Brabec** Outstanding Practitioner. Martha, the City of Boise's first ecologist, exemplifies the practice of restoration ecology with a track record of successful projects, from invasive Russian olive removal to foothills rehabilitation. Martha is also charting a path for successful restoration in the midst of urban growth. She has developed innovative ways to engage with people in Boise, from initiating a community "Weed Warriors" program to incorporating local students in her projects. As urban expansion is expected to continue in our region, Martha's work demonstrates how we can adapt Great Basin restoration for people and plants in the city. Congratulations Martha!

New SERGB Chapter Treasurer Elect - Owen Baughman

Owen Baughman is currently the Precision Restoration Scientist for The Nature Conservancy in Oregon, where he works with a multi-partner Innovative Restoration team to test and refine new techniques and tools for improving seed-based restoration success across the sagebrush steppe. This work is focused not only on creating and experimenting with new seed enhancement technologies to improve their efficacy, but to do so in a way that keeps new tools simple enough that they can scale up to the true need of restoration in this region as efficiently as possible. Prior to this, he was research faculty and a graduate student (M.S., 2014; Natural Resources and Environmental Science, 2014) at the University of Nevada Reno in Dr. Elizabeth Leger's plant ecology lab, performing research related to understanding how native plants locally adapt within the Great Basin, how to use this and other information to improve the use of native species in restoration, and several topics related to cheatgrass epidemiology and invasion.

This work took him from Death Valley to northern Oregon and even to western China (Xinjiang province), where he helped look for ecological clues to questions of exotic species invasibility in the native ranges of Western North America's worst weeds. He attended the University of Idaho (B.S., 2010; Natural Resource Ecology and Conservation Biology) where he completed two published theses on questions related to cheatgrass die-offs in collaboration with Dr. Susan Meyer. His first job was for The Nature Conservancy of Nevada surveying rare edaphic-endemic plants in NV as well as monitoring the effects of burning, masticating, and cutting of pinyon and juniper woodlands on understory non-tree vegetation. Growing up in rural eastern Nevada (Ruby Lake NWR, Ely) gave him an immense appreciation for the Great Basin's profound but subtle diversity of plant and animal species and communities.

This appreciation manifests itself in a lifelong and seemingly endless pursuit to experience the hundreds of basins and ranges of the Great Basin, including scaling over two dozen of Nevada's highest peaks with his family, and even backpacking with his brother unsupported across Nevada (east to west) through the largest roadless portions of the state. Currently in Burns, OR with his wife (fisheries biologist) and their two dogs, he enjoys exploring all four seasons, gardening, beekeeping, hunting, and gathering.

Cooper's rubberweed - *Hymenoxys cooperi* var. *canescens* (HYCOC) - BLM Seeds of Success Smug Mug Photo, ID

Stories from the Sage and Wetlands

Soil Biological and Chemical Perspectives on Sagebrush Restoration Post-Fire and Prevention

Luci O'Hara Riggin Wilson, Francis Kilkenny and Marie-Anne de Graaff

In late summer 2019 the Pothole fire whipped through the sagebrush steppe in southwestern Idaho, burning around 70,000 ha of land. Fire changes soil biological and biochemical properties, such as soil microbial communities and nitrogen cycling. These changes tend to catalyze a positive plant-soil feedback loop favoring invasive plant species over native species, and progressively reduce the ability of native species to reestablish. We are interested in understanding how native species biodiversity and biochar application affect interactions between plants and soils after fire. Specifically, we aim to evaluate how biodiversity and biochar might change nitrogen cycling and microbial community structure, and how these changes in soil properties can be harnessed to restore native plants and resist cheatgrass invasion.

Restoring ecosystems to higher levels of plant species diversity may promote sustained success of restoration efforts. This is because plant biodiversity tends to improve ecosystem function and can increase resilience during environmental perturbations. Further, greater plant biodiversity may promote biodiversity of the soil microbial community. Since soil biota play an important role in regulating ecosystem processes, affecting resilience and adaptability, a more diverse soil community is likely to help sustain the native plant community and increase the sagebrush steppe ecosystem's resistance to exotic plant invasion.

To reduce the success of post-fire invasions, it is essential to interrupt the positive feedback loop between invasive plants and increased soil nitrogen cycling. Invasive species, including cheatgrass, can manipulate soil nitrogen cycles by engineering soil processes. Cheatgrass capitalizes on increased nitrogen availability after fires and perpetuates elevated levels of plant-available nitrogen, thereby exacerbating future risk of plant invasions. Applying woody biochar -a pyrolysis product that can be utilized as a soil amendment- to soils in semi-arid ecosystems may disrupt the positive plant-soil feedback loop, because low nitrogen in biochar will promote microbial uptake of nitrogen, rendering it unavailable for acquisition by invasive plant species.

To evaluate how native species biodiversity and biochar amendments impact soil biological and biochemical soil properties and native plant persistence, we installed a manipulative field experiment located in the Pothole fire. Three months after the fire, we set-up diversity plots (~10m x 9m in size) with random combinations of two, four, or eight plant species native to southwestern Idaho that are known to be successful in drill-seeded restorations. Each plot contained 50% grasses and 50% forbs, and each treatment was replicated 12 times. We also established crested wheatgrass plots. Crested wheatgrass is a non-native grass which establishes easily, and is commonly used in post-fire seedings to stabilize soils and compete with cheatgrass. This treatment enables us to evaluate how this species affects soil properties and feedbacks to native plants. Finally, we included control plots, which were not seeded. Biochar subplots (2m x 2m; 6.25lbs; 3 ton/ha) were nested within control plots, crested wheatgrass plots and 8 species diversity plots.

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In July 2020 we analyzed the plant community composition, and quantified percent plant cover. We also collected soil samples (10cm depth) to evaluate impacts of our treatments on the soil microbial community composition and on soil nitrogen availability. We found that drill seeding with increasingly diverse seeding mixes successfully established plant communities that differ significantly in biodiversity, while percent cover was not affected by the diversity treatments. Soil nitrogen availability was similar for non-native and native species and equal across plant diversity treatments, but was higher in plots that were not seeded, suggesting a greater risk of invasion in those plots.

We will conduct analyses of plant community composition and cover, as well as soil biological and biochemical properties, two years and three years following seeding. We will also initiate a greenhouse study to tease out how differences in soil microbial communities across treatments impact sagebrush seedling success. Our study will inform us about the importance of native species biodiversity in restoration efforts, and will shed light on the efficacy of using biochar to reduce cheatgrass invasion and benefit native plant establishment.

Acknowledgements: United States Forest Service Agreement #: 18-JV-11221632-105, Boise State University department of Ecology Evolution and Behavior, All members of the de Graaff lab, Jessica Irwin, Jeff Ott, Marcelo Serpe, Gail Wilson, Trevor Caughlin

Drill Seeding Morley Nelson Snake River Birds of Prey NCA—2012.
Photo: Anne Halford

Blue Mountain prairie clover - *Dalea ornata* (DAOR2) - BLM Owyhee Field Office—Smug Mug Photo—also see https://greatbasinfirescience.org/wp-content/

Seeds Not Weeds: Research Informs Best Practices for the Revegetation of Native Plant Species in Wetlands

Rae Robinson, Emily Tarsa, and Dr. Karin M. Kettenring Department of Watershed Sciences and Ecology Center at Utah State University (Logan, UT)

Wetlands are known for their valuable ecosystem functions and services such as providing wildlife habitat, improving water quality, and mitigating the impacts of drought and flooding. Unfortunately, these functions and services, which are driven largely by native plants, have been reduced or eliminated due to invasive plant expansion. Invasive plant species replace native plant communities and alter the natural functioning of wetlands. Revegetation of native plant communities is critical to restoring wetland functions that have been impacted by invasive plants. In Great Salt Lake (Utah, USA) wetlands, the invasive, non-native grass *Phragmites australis* reduces the quality and quantity of habitat for wildlife; as well as recreation opportunities and other services for humans. Even when *P. australis* is greatly reduced following herbicide and mowing treatments, native plant communities slowly, or never, return. Seed-based revegetation (i.e., sowing native seeds) is a promising strategy for the restoration of native plant communities.

Unfortunately, seed-based revegetation efforts are notorious for unsatisfactory outcomes that fail to meet restoration goals. In wetlands, dynamic and variable conditions (e.g., flooding and drought; patchy seed banks) make restoration even more challenging. While there has been detailed research on seeding in upland systems, best practices for the selection of seed mix composition, seed sources, and sowing density to improve seeding outcomes in wetlands are underdeveloped. To address these knowledge gaps, graduate researchers in the Wetland Ecology and Restoration Lab at Utah State University, Rae Robinson and Emily Tarsa, have conducted experiments to evaluate the performance of several native wetland plant species (*Bolboschoenus maritimus*, *Bidens cernua*, *Distichlis spicata*, *Eleocharis palustris*, *Epilobium ciliatum*, *Juncus arcticus*, *Polygonum lapathifolium*, *Puccinellia nuttalliana*, *Rumex maritimus*, *Schoenoplectus acutus*, *S. americanus*), seed source populations, and seed mixes.

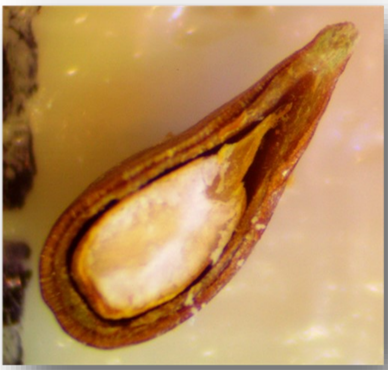
Seeding outcomes often fail due to high mortality during the early stages of recruitment (e.g., germination, establishment). Understanding how traits associated with early plant life stages influence plant establishment can allow managers to 1) select native species that have a high likelihood of establishment from seed, 2) source seeds from populations that have traits suitable for establishment, and 3) manipulate environmental conditions to provide an advantage to native plant establishment from seed. In a recent study, we collected seeds of several wetland plants (including *P. australis*) across the Intermountain West to characterize the variation in seed and seedling traits between and within species. We conducted a growth chamber and greenhouse experiment to track germination, seedling emergence, and survival across a temperature and water gradient. Fine-scale seed and seedling traits (e.g., seed mass, seed coat thickness, time to germination, root and shoot elongation rate) were collected on individual seedlings for each treatment. Preliminary results suggest there is a surprising amount of variation within species and that species that have competitive germination traits are likely ideal candidates to suppress invasive species reinvasion.

We also investigated the effects of seed mix composition and sowing density on plant community reassembly in greenhouse and field experiments. We found that compared to the unseeded control (0×) and a more commonly applied seeding rate of 1,938 pure live seed (PLS) m^{-2} (1×), higher sowing densities of 5,813 PLS m^{-2} and 9,690 PLS m^{-2} (3×, 5×) were associated with higher native plant cover and lower invasive, non-native plant cover. Seed mix composition affected native plant cover across our experiments, however, the effects differed by experimental venue. In the greenhouse, native broad-leaved forbs (*Bidens cernua, Rumex maritimus* and *Epilobium ciliatum*) performed well. These species quickly established cover and suppressed the native perennial graminoid species that were also sown in the mix. However, when sown in mixes in the field, performance of *Rumex maritimus* and *Epilobium ciliatum* were inconsistent. Two native species—the mat-forming grass, *Distichlis spicata*, and fast-growing forb, *Bidens cernua*—had consistently high performance across experiments. Incorporating these species into restoration seed mixes may be one way to optimize native plant revegetation. The native species that had low performance in our experiments likely require other restoration strategies to improve their recovery.

These strategies could include more intense dormancy-breaking treatments, seed-coating technologies that make wetland species more reliable for practitioner use, precision seed delivery to ensure seeds reach ideal microsites, and multi-year seeding of high priority species. Efforts to collect and screen other "restoration candidates", or native wetland plant species that may be able to quickly establish cover, are underway in the Wetland Ecology and Restoration Lab.

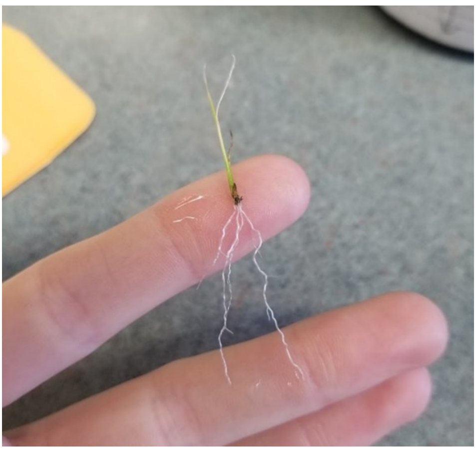
We have collaborated extensively with land managers and agencies working on Great Salt Lake wetlands to address relevant research questions and test promising revegetation techniques in the field. We have recently published an Extension document (*in press*) to share these best practices and provide guidance for managers working to improve the recovery of native plant communities. With the increasing landscape-level threat of wetland invaders, and the urgent need to maintain vital wetland habitat, this research is a critical component of improving restoration outcomes on the ground.

Mixes of native Great Salt Lake wetland plant species were assembled in preparation for a field experiment to test the effects of seed mix composition and sowing density.



Seed coat thickness is a seed trait that has implications for how long seeds can persist in the soil. Above is a cross-section of an alkali bulrush seed that was used to measure how thick the seed coat is.

A growth chamber experiment was conducted to capture seed and seedling traits across temperature and water potential gradients. Each cup contained a unique species ´ source population to measure the variation in these traits between and within species.



In our growth chamber experiment, germinated seeds were tracked, and individual seedlings were harvested 7- or 21-days after germination. Root and shoots of seedlings were analyzed to capture length, surface area, and mass (fresh & dry), which will be used to calculate important traits related to seedling growth (e.g., root and shoot elongation rate).

A greenhouse experiment was conducted using the same species and source populations as in the growth chamber, grown under the same environmental conditions, to assess life-stage transition probabilities and end-of-season survival.

A wetland mesocosm experiment was conducted to evaluate the performance of native plant species grown in monocultures and mixes under ideal conditions.

Great Salt Lake wetland field plots were sown with several native seed mix and sowing density treatment combinations in June 2020. This field plot has high cover of seeded native species.

Walker Basin Conservancy's Mission to Save Walker Lake

Amy Pennington—Walker Lake Community Engagement Manager

Walker Lake

Walker Basin is one of the many watersheds in Nevada and across the west that, together, make up the Great Basin. A large portion of northwest Nevada was once Lahontan Lake, a prehistoric lake which extended into Oregon and California, as well as Nevada. Climate change caused the lake to reduce in size gradually over about 4 thousand years from a peak of over 8,600 sq. mi., leaving behind Pyramid Lake and Walker Lake as its primary remnants 9 thousand years ago. The Lahontan cutthroat trout, Nevada's state fish and the largest subspecies of cutthroat trout, was native to Lahontan Lake and subsequently Walker Lake.

Today, Walker Lake is a natural lake located in the geographic low point of the Walker River Basin and is the terminus of the Walker River. Most of the water is supplied by the Sierra Nevada snowpack which then flows into the east and west branches of Walker River. The two branches then converge, forming the main Walker River which flows into Walker Lake. Walker Lake is a desert terminal lake, meaning the Walker River is the only inflow and there is no outflow.
Lahontan cutthroat trout continued to survive in Walker Lake until around 2009, however, decades of water diversions from the river have resulted in declining water levels and dramatic increases in Total Dissolved Solids (TDS). Today, the water quality of Walker Lake can no longer support native fish or many of the migratory waterfowl species that once used the lake as stopover on the Pacific Flyway.

Action to Reverse the Course

In 2009, the Walker Basin Restoration Program was established by Public Law 111-85. The Program was administered by the National Fish and Wildlife Foundation with Desert Terminal Lake grant funds provided by the U.S. Bureau of Reclamation. In 2014, The Walker Basin Conservancy was created to assume responsibility for the program and continue the work of restoring Walker Lake and Walker Basin.

Today, working with in partnership with local communities, private landowners, water managers, and tribes, The Walker Basin Conservancy is leading the effort to restore and maintain Walker Lake while protecting agricultural, environmental and recreational interests in the Walker River Basin. The Conservancy works with willing sellers in the basin to acquire water rights and convey this water use to Walker Lake to benefit native wildlife. To date, the Conservancy has acquired an estimated 51% of the water needed to restore the lake.

Land Restoration and Stewardship

When the Conservancy acquires water rights, often land assets are also acquired. Walker Basin Conservancy is responsible for land stewardship activities on over 18,000 acres, roughly a third of which are retired agricultural fields where water use is being reduced for the benefit of Walker Lake. As water use is reduced on this retired agricultural land, there is a need to restore the land back to a state where vegetation communities stabilize the soils and require no supplemental irrigation.

Land Restoration and Stewardship Cont'd

The Conservancy's stewardship activities balance agricultural interests, cultural activities, wildlife habitat, and recreational use, while achieving mandated soil stabilization goals. Some of the projects include reducing instream sedimentation through restoration of riparian habitat, improving irrigation infrastructure, and reducing overall water usage through establishment of native plant communities adapted to our arid environment.

The Conservancy has been increasing capacity to propagate native seeds and plants for restoration work through an expanding nursery program. Restoring lands with native plants has several important benefits including wildfire resilience, reducing invasive species and providing appropriate habitat for local wildlife.

Recreation in the Basin

Increasing recreation opportunities throughout Walker Basin a key focus of the Conservancy. More than 12,000 acres of land and nearly 30 miles of the East Walker River were reconveyed to the State of Nevada to become the Walker River State Recreation Area (WRSRA). Nevada State Parks manages the property which was historically three large ranches: Pitchfork, Rafter 7, and Flying M. These properties have prime riparian habitat that supports a diversity of wildlife, including Bi-State Sage-Grouse in some areas. Walker Basin Conservancy Land stewardship staff continue to work closely with state agencies to manage the restoration activities on the WRSRA.

Also, nearly 1,600 acres of upland and riparian land just north of Yerington, including more than three miles of the Walker River, was reconveyed to the State of Nevada. The land is now part of the MVWMA managed by the Nevada Department of Wildlife and provides upland wildlife habitat in perpetuity as well as public access for hunting, fishing and general recreation.

This is article one of four. Stay tuned for a more in depth look into Walker Basin Conservancy's restoration programs.

Walker Lake—Walker Lake Conservancy Photo

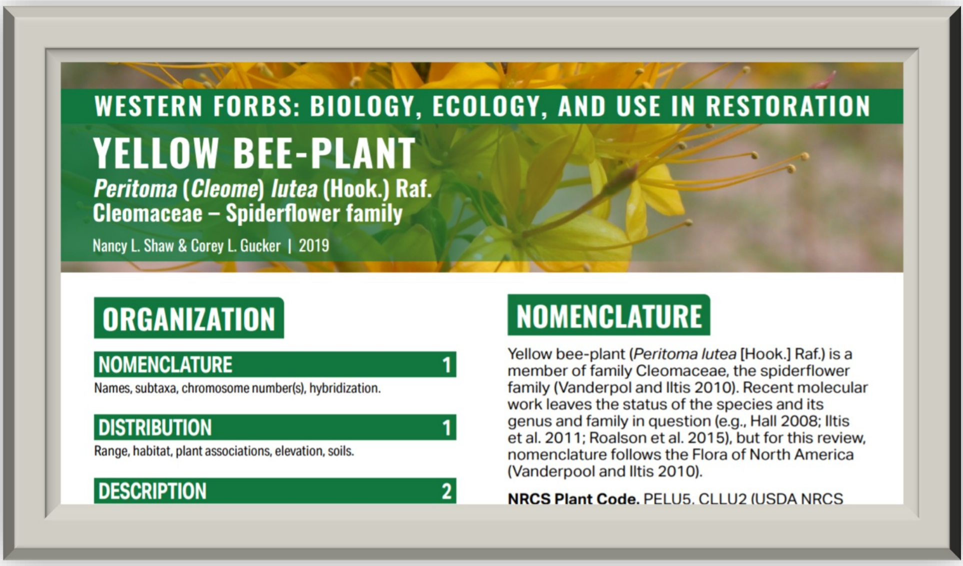
Name That Seed

A new feature in the Society for Ecological Restoration Great Basin Chapter newsletter. The photo of the mystery plant will be in the August newsletter edition.

Hint: You'll be seeing this plant in flower soon if not already.

Also, don't forget to check out new species chapters about western forb ecology and use in restoration here:

https://greatbasinfirescience.org/western-forbs-restoration/



WESTERN FORBS: BIOLOGY, ECOLOGY, AND USE IN RESTORATION

YELLOW BEE-PLANT

Peritoma (*Cleome*) *lutea* (Hook.) Raf.
Cleomaceae – Spiderflower family

Nancy L. Shaw & Corey L. Gucker | 2019

ORGANIZATION

NOMENCLATURE 1
Names, subtaxa, chromosome number(s), hybridization.

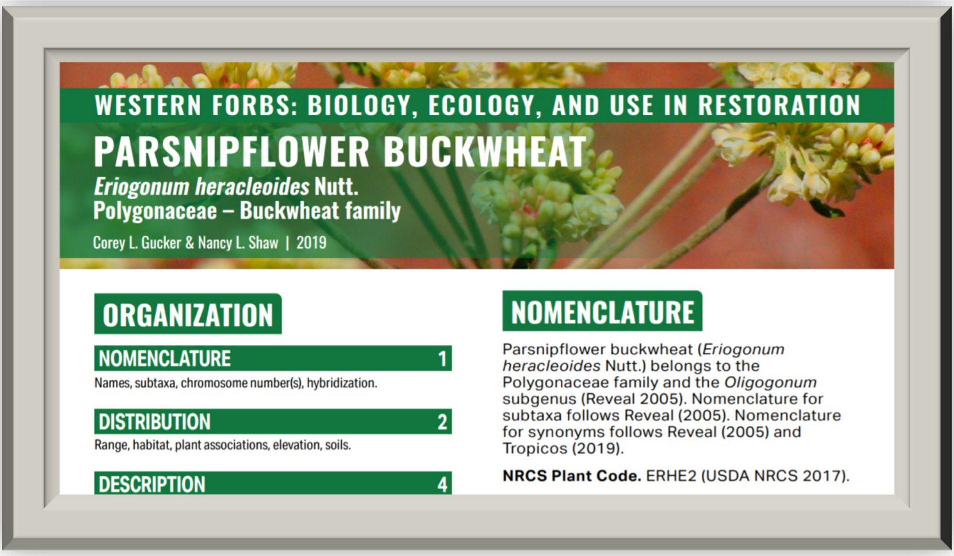
DISTRIBUTION 1
Range, habitat, plant associations, elevation, soils.

DESCRIPTION 2

NOMENCLATURE

Yellow bee-plant (*Peritoma lutea* [Hook.] Raf.) is a member of family Cleomaceae, the spiderflower family (Vanderpol and Iltis 2010). Recent molecular work leaves the status of the species and its genus and family in question (e.g., Hall 2008; Iltis et al. 2011; Roalson et al. 2015), but for this review, nomenclature follows the Flora of North America (Vanderpool and Iltis 2010).

NRCS Plant Code. PELU5, CLLU2 (USDA NRCS



WESTERN FORBS: BIOLOGY, ECOLOGY, AND USE IN RESTORATION

PARSNIPFLOWER BUCKWHEAT

Eriogonum heracleoides Nutt.
Polygonaceae – Buckwheat family

Corey L. Gucker & Nancy L. Shaw | 2019

ORGANIZATION

NOMENCLATURE 1
Names, subtaxa, chromosome number(s), hybridization.

DISTRIBUTION 2
Range, habitat, plant associations, elevation, soils.

DESCRIPTION 4

NOMENCLATURE

Parsnipflower buckwheat (*Eriogonum heracleoides* Nutt.) belongs to the Polygonaceae family and the *Oligogonum* subgenus (Reveal 2005). Nomenclature for subtaxa follows Reveal (2005). Nomenclature for synonyms follows Reveal (2005) and Tropicos (2019).

NRCS Plant Code. ERHE2 (USDA NRCS 2017).

Article Review

Wetland restoration: A guide to seed-based approaches for establishing resilient communities

by Nancy Shaw

Restoring native wetland vegetation presents challenges, guidelines are often limited, and numerous research gaps exist. Yet there is growing recognition of the role healthy, resilient coastal and inland wetlands play in mitigating the impacts of severe weather events, sequestering carbon, enhancing biodiversity, providing clean water, and protecting livelihoods and economies. The critical need to restore wetlands highlights the requirement for effective approaches for re-establishing native vegetation to support the vital functions of these systems.

Although vegetative plant materials are widely used for wetland restoration, a new publication, “Need to seed? Ecological, genetic, and evolutionary keys to seed-based wetland restoration,” by Karin Kettenring and Emily Tarsa, Utah State University, lays out guidance for seed-based approaches as being more rapid, economical, and technically feasible, particularly for larger areas, even though seedling establishment is often low. They suggest that seeding offers the advantage of including of more species and genotypes to fill niches and pre-empt weed invasion, deliver ecosystem services and functions, and provide adaptation to variable site conditions and potential future environmental conditions.

The authors synthesize guidance from the scattered available literature and advocate application of an ecological, genetic, and evolutionary framework for planning and implementing seed-based restoration, beginning with a determination of whether and how rapidly a site might recover without intervention. If seeding is deemed essential, subsequent steps somewhat parallel those followed for upland seedings and incorporate consideration of the unique and complex characteristics of wetlands, with examination of site conditions, reference areas, the native seed bank, nutrient enrichment and its potential for enhancing establishment of invasives key to selecting species for seeding.

Guidance for seed procurement emphasizes wildland collection for the many species that are not commercially available. The broad gene flow of many wetland species compared to upland seedings is considered in collection both for current and future site conditions with collection from multiple populations and numerous individuals generally encouraged. For many wetland species, aspects of collection, seed cleaning, testing, storage, and seed pretreatments or enhancements have received little or no research and practical experience or modifications of successful treatments for related wetland or upland species are used. The authors provide an excellent summary of common procedures used, their functions, advantages, and cautions.

Following site manipulation to restore hydrologic functioning, control invasives, and ameliorate soil conditions, site preparation for seeding involves creation of safe sites for germination and establishment of the seeded species. The authors focus on alleviation of negative legacies of invasive species (e.g. litter, salinity, altered microbial communities), hydraulic conditions required for seed and seedlings of each species and their potential manipulation to enhance establishment, and creation of microtopography to provide safe sites for individual species to produce diverse plant communities.

Sowing approaches are discussed relative to timing, obtaining target densities, uniform seed distribution, light requirements, and stability to preclude loss of buoyant seeds in dynamic water conditions. Commonly used equipment and techniques are described along with their advantages and disadvantages are described. Long-term monitoring to evaluate vegetation establishment and identified needed interventions is advised as exotic invasions, adverse hydrologic conditions, and other factors frequently result in setbacks. Monitoring results can provide valuable feedback that informs future restorations and can be shared with other practitioners or to identify research priorities.

Kettenring, Karin M.; Tarsa, Emily E. 2020. Need to seed? Ecological, genetic, and evolutionary keys to seed-based wetland restoration. Frontiers in Environmental Science. 8:109. 30 p. https://doi.org/10.3389/fenvs.2020.00109

Figure 1. The early seed and seedling life stages of plants. Germination is defined as the radicle emerging from the seed (first panel) whereas seedling emergence occurs when the cotyledon(s) of the seedling penetrate the soil surface (second panel). Establishment occurs when a seedling becomes autotrophic (third panel). Survival occurs if the plant is still alive by the end of the growing season (fourth panel). Modified from Kettenring and Tarsa (2020). Watercolor by Corey Labrie.

Wasatch Front Regional Council Photo

Upcoming Events of Interest

https://ser-insr.org/new-events

With the upcoming SER2021 World Conference going virtual due to the pandemic, Make a Difference Day has become Make a Difference Week! SER is extending the traditional day-long activities to a week to give everyone, everywhere a chance to positively impact their communities and engage in hands-on restoration projects.

The Make a Difference Week is scheduled to run from 5–13 June 2021, beginning on World Environment Day, and the official launch of the UN Decade on Ecosystem Restoration.

Local Great Basin SER Making a Difference Week Events

BYU SER Student Chapter will be hosting a restoration project on June 8th during SERs Make a Difference week. We will be working with the Rock Canyon Preservation Alliance and removing exotic weeds from Rock Canyon in Provo, UT. For more information contact Travis Sowards (travis.sowards@gmail.com).

The BLM Plant Conservation & Restoration Program is cooperating with the Idaho Botanical Garden in Boise, ID to host the following event. The plan is to meet at the Idaho Botanic Garden and help pull invasive weeds from the natural area surrounding the Garden. Garden staff will provide light snacks and beverages, as well as most tools (though folks are encouraged to bring their own buckets and shovels if they have them).

The event will be on Friday June 11th, 9 am - 12 pm MDT. Details, including registration information, is available here: https://www.ser-rrc.org/mad_project/make-a-difference-at-the-idaho-botanical-garden/. Please note that participation is limited to 50 individuals, so if you're interested, you may want to register sooner rather than later. If you have any questions, please email Anna Lindquist (alindquist@blm.gov).

The University of Nevada Reno will host an event at Truckee Meadows Parks Foundation (TMPF) Rosewood Nature Study Area (previously the Rosewood golf course) on June 5 from 10:00AM - 1:00PM. We'll have about a mile loop with various stations set up around to space folks out. We're planning on a birding station, native plant ID station, invasives and weed pull station, bees & butterfly station. Contact Leah Prescott (ljprescott@gmail.com) for more information.