Development and use of native seed in natural areas management

Biology, ecology, and use of forb species in post-fire restoration

Topic: Development and use of native seed in natural areas management

Corey Gucker
University of NV, Reno and Great Basin Fire Science Exchange

GÃ©nie MontBlanc
University of NV, Reno and Great Basin Fire Science Exchange

Coauthors: Nancy Shaw, USFS-RMRS; Anne Halford, BLM; Genie Montblanc, University of Nevada, Reno

Larger and more frequent fires fueled by nonnative species in the West, especially large portions of the Great Basin, have depleted native seedbanks. In these areas, active revegetation is necessary to restore native plant communities and historic fire regimes. Native forbs have long been overlooked in revegetation but are important to pollinators, wildlife, and ecosystem functioning. For the past 20 years, an extensive, multi-disciplinary research effort involving various institutions and agencies has improved our understanding of the biology and ecology of western forb species and provided guidance for their use in revegetation. Yet, the information and practical knowledge gathered has yet to be compiled and synthesized.

An online book, Western Forbs: Biology, Ecology, and Use in Restoration, is synthesizing published data and unpublished protocols necessary for seed collectors, growers, practitioners, and land managers to increase the supply and use of appropriate native forb seed sources for restoration of sagebrush steppe and other western ecosystems. The book is made up of chapters focusing on individual forb species including distribution, biological characteristics, ecosystem importance and function, and knowledge gained through seed harvesting, seed production in agricultural fields, and wildland planting.

Implications to the native seed market as we move towards local genetic sources and seed transfer zones

Topic: Development and use of native seed in natural areas management

Ed Kleiner
Comstock Seed

The seed industry is going through a radical change adapting to the growing demand for local genetic sources of plant materials and seed. This change is supported by genomic studies that are revealing nuances in our traditional understanding of species distribution. In response, the seed industry is expanding cultivation and local source collections of a wider variety of species within traditional geographic distributions. The BLM is simultaneously supporting this trend with 'Indefinite Delivery Indefinite Quantity (IDIQ)contracts to seed growers. This presentation will walk through a few successful local collection contracts and concludes that these options should be aggressively expanded with urgency due to the long-term process of developing new cultivars in the face of current exponential growth in demand.

Meeting the Need for Ecologically Appropriate Native Plant Materials in the Mojave Desert

Topic: Development and use of native seed in natural areas management

Judy Perkins
Bureau of Land Management

Lesley DeFalco
US Geological Survey

Judy Perkins*1, Lesley A. DeFalco2, Dan Shryock2, Nila Le3, Sarah De Groot3, Amy Vandergast4, and Elizabeth Milano4.
1Bureau of Land Management, 1201 Bird Center Drive, Palm Springs, CA 92256. jlperkins@blm.gov. 2U.S. Geological Survey, Western Ecological Research Center, 160 North Stephanie Street, Henderson, NV 89104. ldefalco@usgs.gov. dshryock@usgs.gov. 3Rancho Santa Ana Botanic Garden, 1500 North College Avenue, Claremont, CA 91711. nle@rsabg.org. sdegroot@rsabg.gov. 4U.S. Geological Survey, Western Ecological Research Center, 4165 Spruance Road, Suite 200, San Diego, CA 92101. avandergast@usgs.gov. emilano@usgs.gov.

Native plant restoration in the Mojave Desert depends heavily on wildland collection seed. This is partially due to the lack of Mojave appropriate cultivars and partially due to the challenges of commercially growing and harvesting seed for many of the species needed. The Mojave Desert Native Plant Program, working with partners, is improving the availability of appropriate native seed for restoration. The U.S. Geological Survey has completed provisional seed transfer zone development, and their associated Climate Distance Mapper tool, to improve seed sourcing relative to restoration sites, and is working with Rancho Santa Ana Botanic Garden to develop genetic seed transfer zones for select species. Priority restoration species have been identified to guide seed collections and increase grow-outs. Pilot seed increase projects include challenging annual forb species, valuable for Mojave desert tortoise habitat restoration, to develop growing and seed harvest techniques. The overall program goal is to increase ecologically appropriate seed availability for restoration across the Mojave Desert.

Native plant and pollinator gardens in the Big Empty: Demonstrating how less can be more on degraded agricultural fields

Topic: Development and use of native seed in natural areas management

Charlene Duncan
Great Basin Landscape Ecology Lab

Charlene Duncan
University of Nevada, Reno

The Walker River State Recreation Area on the East Fork Walker River is the site of rehabilitation and re-vegetation projects on agricultural land acquired by the National Fish and Wildlife Foundation and Walker Basin Conservancy to increase water flow to Walker Lake and for the Lahontan cutthroat trout. Pollinator health is recognized as an indicator of ecosystem health and can be a metric of restoration progress. At the Walker River State Recreation Area Visitors Center, native plant and pollinator demonstration gardens were installed as a collaborative effort between Walker Basin Conservancy, Nevada State Parks, the University of Nevada, Reno, and the Fish and Wildlife Service. This presentation will provide an overview of the restoration strategy we have undertaken to address legacies of long-term agricultural usage and surface irrigation practices that cause our demonstration sites to suffer soil compaction, heavy weed infestation, and counter-intuitively, increased nutrient load.
Most Great Basin native plants are stress-adapted species; many native perennial forbs have a survival strategy of 'less can be endured, more is too much'. Native plants are the soil engineers that helped us remove excess nitrogen, work through the plow horizon to connect to the water table, and sequester CO2. We utilize adaptive weed management techniques to decrease herbicide use near the gardens. Connections for native pollinator and wildlife movement to the riparian corridor are established as irrigation ditches are decommissioned and planted with larval host shrubs and forbs.
These gardens are an opportunity to demonstrate to the public how low-tech, low-cost techniques can enhance native pollinator habitat, increase native plant and pollinator functional diversity, and increase locally adapted native seed availability, all while using limited water. Pollinator gardens, like restoration, are not 'one and done' processes, rather they are steps in ongoing, ever-evolving projects. The impact they have on a degraded ecosystem belies their size.

The BLM Great Basin Plant Conservation and Restoration Program Connecting SOS with Large Scale Seed Delivery

Topic: Development and use of native seed in natural areas management

Fred Edwards
Bureau of Land Management

Fred Edwards, Peggy Olwell, Anne Halford, Tricia Roller, Sarah Kulpa, Francis Kilkenny, and Jess Kindred

Implementing post fire emergency stabilization and rehabilitation, sage grouse habitat restoration and range improvement on the scale needed preserve sustainable use and yield in the five Great Basin states depends on quantities of locally adapted native seed never produced before with a supply chain that can deliver it. This supply chain depends on steady access to locally adapted wildland seed, seed transfer guidance, established production practices, procurement strategies for seed increase, and an ordering and distribution system to deliver it. This talk summarizes BLM and Federal Partner efforts in the Great Basin to build a supply chain that delivers the right seed in the right place at the right time. The elements of this supply chain include the BLM Seeds of Success Program, the Great Basin Native Plant Project, Indefinite Quantity Indefinite Delivery Contracts, and the National Seed Warehouse System.

Timed Mowing in Combination with Broadcast Seeding Increases Native Plant Coverage in a California Grassland

Topic: Development and use of native seed in natural areas management

Esther Cole Adelsheim
Stanford University

California grasslands have been transformed through the introduction and spread of non-native, annual plant species. Restoration efforts typically seek to shift competitive dynamics between native and exotic species by restoring natural forms of disturbance (controlled burns, managed grazing, etc.), targeted control of invasive, non-native species (herbicide application, timed mowing, etc.), or promoting native species (planting, broadcast seeding, etc.). Proximity of developed areas with a high density of people and sympatric species of conservation concern with sensitivities to chemical application, can limit management alternatives. We evaluated the effect of timed mowing in combination with broadcast seeding of native species on the percent cover of native species in an annual Eurasian grassland at Stanford, California. Treatments were applied annually from 2016-2019. Mowing alone did not increase native plant coverage relative to controls. Timed mowing in combination with broadcast seeding significantly increased percent cover of native species. The increases in percent cover were found primarily in seeded, native species, although there was also an increase in the percent cover of non-native, perennial species. Repeated application of timed mowing and broadcast seeding over 4 years increased coverage of native species. We also found a significant effect of year and aspect. Percent cover of native species after the first year of treatment differed by year of application. East facing slopes had a higher percent cover of native species than west facing slopes. The results of our experiment suggest that timed mowing in combination with broadcast seeding is a viable management tool for increasing coverage of native grassland species, however repeated applications may be required to achieve target levels of native plant coverage.

Using patterns of genetic differentiation as the foundation for seed transfer guidelines

Topic: Development and use of native seed in natural areas management

Rob Massatti
U.S. Geological Survey

Authors: R. Massatti[1], M.R. Jones[1], F.F. Kilkenny[2], & D.E. Winkler[3]

[1]U.S. Geological Survey, Southwest Biological Science Center, Flagstaff, AZ 86001 USA
[2]U.S.D.A. Forest Service Rocky Mountain Research Station, Boise, ID 83702 USA
[3]U.S. Geological Survey, Southwest Biological Science Center, Moab, UT 84532 USA

Presenting author's email: rmassatti@usgs.gov

Abstract: As restoration needs for natural landscapes increase due to higher frequency and/or intensity disturbances, the establishment of invasive species, and impacts resulting from climate change, considerable time and resources are being invested to guide the development and deployment of native plant materials (NPMs) to improve restoration outcomes. For example, genetic sequence-based approaches are increasingly applied to restoration species to elucidate adaptation to environmental gradients, which can assist the development of seed transfer guidelines.

However, the underlying patterns of genetic diversity within such datasets may also provide important knowledge to guide the use and development of NPMs. For example, natural patterns of genetic differentiation (e.g., a species' genetically defined populations), which are increasingly recognized as an inherently valuable resource, would best be protected by explicitly using them to create regional seed transfer boundaries. In turn, such genetic differentiation- informed boundaries may help mitigate other issues that can impact restoration outcomes, such as outbreeding depression or the decay of interactions among species within a community and the subsequent loss of community resilience. Here, we detail a new method that utilizes species distribution models, landscape resistance analyses, and empirical patterns of genetic differentiation to estimate the geographic distribution of genetically defined populations for two species, Pseudoroegneria spicata (bluebunch wheatgrass) and Hilaria jamesii (James' galleta grass). Furthermore, we use these boundaries to regionally constrain estimations of adaptation inferred either from common gardens (in the case of P. spicata) or from genetic sequencing data (in the case of H. jamesii). As such, we develop guidelines that can be used to minimize both genetic and adaptive differentiation during seed transfer or when selecting seed sources from which to generate new NPMs

SYMPOSIUM: Linking Research and Management to Improve Native Plant Restoration in the Great Basin

(3) Restoration from seed in the Great Basin: What are we doing well, and is there room for improvement?

Topic: Development and use of native seed in natural areas management

Elizabeth Leger
University of Nevada, Reno

Co-authors: Sarah Barga, Alison Agneray, Owen Baughman, Robert Burton, Mark Williams

Restoring dryland ecosystems can be extremely challenging, due in part to environmental constraints that naturally limit recruitment. When highly competitive invasive annuals and modified disturbance regimes are added to the mix, restoration from seed in dryland systems can be very daunting. Despite these challenges, seeding in the Great Basin continues to be one of the world's biggest ongoing restoration efforts, and millions of pounds of seeds are applied to wildlands, especially post-fire, in an attempt to prevent the transition of these ecosystems to invasive annual plants. Some of our practices are at the forefront of restoration best practices, such as clearly identifying seed sources, detecting weed contamination, measuring seed viability, and conducting large-scale agricultural increases for the largest seeding projects. Still, other methods deviate from recommended practices (e.g. current seed sources emphasize only a few functional groups, species, and gene pools). Great Basin case studies and large-scale reviews indicate that there is room for improvement in restoration outcomes, and research suggests that changing seed sourcing could be a way to increase restoration success. In addition to presenting these case studies and reviews, I will highlight an ongoing collaborative effort to implement restoration best practices, in Winnemucca, NV. This collaboration has resulted in the large-scale agricultural increase of locally-collected, source identified, weed-free seeds for use in post-fire restoration projects. While environmental constraints and weed pressure are difficult to control, starting restoration with seeds most likely to survive in semi-arid, invaded sites may be a way to increase overall success in this wild but imperiled region.

Forb common garden research to inform seed transfer guidance for restoration

Topic: Development and use of native seed in natural areas management

Sarah Barga
U.S. Forest Service, Rocky Mountain Research Station

Co-authors: Francis Kilkenny, Fred Edwards

As landscape-scale disturbances increase across public lands, understanding how to restore plant communities is of critical importance. Part of incorporating native plants into restoration is understanding the level of flexibility they display when moved away from their location of origin. Some species may be more flexible to novel conditions than others, and many arid-land species display population-level variation in their performance. Common gardens are a tool for examining variation in performance across the range of a species, and the best way to develop seed transfer guidance for restoration. While past common garden work conducted by the Great Basin Native Plant Project (USFS – Rocky Mountain Research Station and BLM – Plant Conservation and Restoration Program) has focused on dominant perennial grasses, their current work focuses on native forbs. We selected three species of forbs common across the Great Basin and known to be of interest for restoration due to their value as forage and cover resources for wildlife. To allow for population genetics work to occur alongside the common garden study, both seeds and plant tissue were collected for some species. In this talk, I will focus on the technical aspects of carrying out a large-scale common garden project, ranging from locating potential sites and site selection to garden installation and trait measurement. I will also present preliminary results for the first year of plant performance. A project of this scale also requires many partners to coordinate resource acquisition, land use, and garden monitoring. The end product will be a spatially-explicit restoration tool for land managers that will inform the appropriate selection of seed for particular restoration projects, as well as multiple research publications. This work is a step toward the larger goal of creating a streamlined approach to seed transfer development for forbs, with the plan of adding three species this year and three more species over the next couple of years.

Getting the right seed: Seed collection collaboration in the Great Basin

Topic: Development and use of native seed in natural areas management

Fred Edwards

Bureau of Land Management

Co-authors: Jess Kindred, Sarah Kulpa, Dirk Netz, Russ Wilhelm, Eric Roussel

Wildland seed collections are the starting point for native seed research, development, and restoration. In Nevada, the Nevada Native Seed Partnership (NNSP) is strategically leveraging Seeds of Success collections of target native grasses and forbs across key seed zones, one of the many actions being implemented as part of the Nevada Seed Strategy. Finding common ground among NNSP members is key to our success; target species selected are beneficial to greater sage-grouse and pollinators, and have some cultivation research completed to show how they will perform in an agricultural setting. Our ultimate goal is to increase the availability of genetically, appropriate native seed to improve the health, diversity, and success of restoration efforts and plant communities in the Great Basin. Here, we discuss the steps taken and lessons learned from our coordinated seed collection efforts in Nevada.

Improving our chances: when and where can precision techniques and technology reduce variability in restoration outcomes

Topic: Development and use of native seed in natural areas management

Jay Kerby
The Nature Conservancy

Owen Baughman
The Nature Conservancy

Co-authors:Stella Copeland, Owen Baughman, Chad Boyd, Kirk Davies, Tony Svejcar

Dryland ecosystems represent a significant portion of global land area, support billions of people, and suffer high rates of land degradation. Successfully restoring native vegetation to degraded drylands is a global priority and major challenge, and there is a need for more efficient and successful strategies. We introduce the concept of 'precision restoration' as any approach which addresses individual ecological barriers to restoration success with specific tools or actions that target the barrier. Using the Great Basin, USA as a case study, we present a novel dryland restoration strategy that involves: 1) identifying specific and critical barriers to restoration success at a particular site, 2) understanding the spatial and temporal variation of each barrier, and 3) applying the best available restoration strategies, precision or otherwise, based on the specific barriers identified in the first two steps. We summarize common known and emerging critical barriers to the success of seed-based restoration across the Great Basin, discuss methods for defining the spatial and temporal variability of barriers, and give examples of decision processes that utilize our proposed restoration strategy. The proper application of this strategy will rely upon assembling information generated by both research and management. By shifting the initial focus of restoration planning away from tool selection and toward defining barriers to success and their spatiotemporal variability, the eventual choice of tools and techniques to use, and where to use them, will improve restoration outcomes and efficiency.

No really, what is local? – A methodological approach to measuring patterns of local adaptation, evaluating alternative

Topic: Development and use of native seed in natural areas management

Francis Kilkenny
U.S. Forest Service, Rocky Mountain Research Station

As the need for ecological restoration increases, more seed will be required to meet global demands. The geographic source and evolutionary history of seeds used in restoration is important to the long-term success of restoration projects, especially in changing climates, but there is a vigorous international debate over the degree to which local adaptation should be considered in seed-sourcing decisions. While heated opinions exist across the spectrum, few studies have measured patterns of local adaptation with the scale and precision necessary to resolve these debates. This lack is due, in part, to the fact that common garden studies - the only way to directly measure local adaptation - tend to be costly and thus limited in scope. Due to the cost of developing high quality common garden datasets, several shortcut methods have been proposed to develop seed transfer guidelines, including the use of herbarium records and climate data to construct species-specific ecological niche models, and the use of outlier DNA markers to detect potential climate-adapted alleles. While these methods hold promise, their accuracy must be verified with high quality common garden data. Currently, too few integrative studies exist to have a generalized understanding of the effectiveness of these methods. In this talk, I will discuss how to develop common garden datasets that measure patterns of local adaptation at the scale and precision necessary to resolve seed-sourcing debates, and to provide the needed data to verify or discard shortcut methods for seed transfer guideline development, while remaining cost and time efficient. Examples will be used from a methodological approach that is being implemented in the Intermountain West and Great Basin of the United States to develop seed transfer guidelines for important restoration species. This approach uses smart common garden design and close integration with DNA sequencing studies to build high quality datasets, which allow for the evaluation of novel methods of seed transfer guideline development and the support of seed-sourcing decisions in an era of global change.

Strong patterns of intraspecific variation and local adaptation in plants of the Great Basin, USA, revealed through a r

Topic: Development and use of native seed in natural areas management

Owen Baughman
The Nature Conservancy

Co-authors: Alison Agneray, Matt Forister, Francis Kilkenny, Erin Espeland, Rob Fiegener, Matt Horning, RC Johnson, Tom Kaye, Jeff Ott, Brad St. Clair, Beth Leger

Variation in natural selection across heterogeneous landscapes often produces 1) among-population differences in phenotypic traits, 2) trait-by-environment associations, and 3) higher fitness of local populations. Using a broad literature review of common garden studies published between 1941 and 2017, we documented the commonness of these three signatures in plants native to North America's Great Basin, an area of extensive restoration and revegetation efforts, and asked which traits and environmental variables were involved. We also asked, independent of geographic distance, whether populations from more similar environments had more similar traits. From 327 experiments testing 121 taxa in 170 studies, we found 95.1% of 305 experiments reported among-population differences, and 81.4% of 161 experiments reported trait-by-environment associations. Locals showed greater survival in 67% of 24 reciprocal experiments that reported survival, and higher fitness in 90% of 10 reciprocal experiments that reported reproductive output. A meta-analysis on a subset of studies found that variation in eight commonly-measured traits was associated with mean annual precipitation and mean annual temperature at the source location, with notably strong relationships for flowering phenology, leaf size, and survival, among others. Although the Great Basin is sometimes perceived as a region of homogeneous ecosystems, our results demonstrate widespread habitat-related population differentiation and local adaptation. Locally-sourced plants likely harbor adaptations at rates and magnitudes that are immediately relevant to restoration success, and our results suggest that certain key traits and environmental variables should be prioritized in future assessments of plants in this region.

Surviving in the invaded desert: A climate- and trait-based approach to restoration in the Great Basin

Topic: Development and use of native seed in natural areas management

Alison Agneray
University of Nevada, Reno

Co-authors: Thomas L. Parchman and Elizabeth A. Leger.

In the Great Basin, there have been enormous efforts from both land managers and scientists to select genetically and environmentally appropriate seed materials for restoration projects. While most of these efforts focus on matching the climates of both seed source and planting site, plants coming from similar abiotic conditions can vary in phenotypic traits. Matching environments is not always sufficient for guaranteeing success, particularly in the most disturbed sites. Here, we asked if we could find excellent seed sources for restoration by describing plant traits that are adaptive in invaded environments. Focusing on three species of grasses, two shrubs, and two forbs common to the region, we collected seeds of each from 16 locations with similar abiotic conditions. We then planted them in four common gardens in highly invaded systems. Using these seven species from the same sites allowed us to ask whether environmental pressures were selecting for favorable traits across multiple species and functional groups at the same locations, which has not been previously studied. We also measured seed and seedling characteristics for each species and population, including seed size, emergence timing, and root length, among others. We asked: 1) whether seed sources differed in survival across gardens; 2) whether any collection locations were highly successful for all species; 3) which potentially adaptive traits were predictive of survival.

Populations differed in survival across the gardens in six of the seven species and differed in nearly every seed and seedling trait. The strength of these effects varied among our seven species. For example, Elymus elymoides showed the most variation in survival, and Poa secunda showed the least. No single source location was superior for all species, but several sites had either above or below average survival for many species. Generally, traits associated with root investment and phenology best predicted survival. In grasses, the populations with earlier emergence and greater root mass ratio were more likely to have increased survival in competitive environments. In the shrubs and forbs, slightly different traits were favored, likely due to their dissimilar growth forms and life-history strategies. These results provide a trait-based approach for selecting seed sources for restoration projects and demonstrated that some locations might contain populations of above-average performance for multiple species. Choosing native plants sources with the most adaptive traits, along with matching climates, will likely be more successful at restoring the most invaded communities.

The sagebrush field of dreams project

Topic: Development and use of native seed in natural areas management

Valda Lockie
Bureau of Land Management

Co-author: Amanda Gearhart

Wildfire is a major threat to sage-grouse, a sagebrush-obligate that was considered for listing by the U.S. Fish and Wildlife Service. In 2012, a 315,000-acre wildfire burned approximately one-third of the BLM Eagle Lake Field Office, much in sage-grouse 'Priority Habitat' in northeastern California and northwestern Nevada. Within the burned perimeter, approximately 5,000 acres were drill seeded and 20,000 acres were aerial broadcast seeded with sagebrush (Artemisia tridentata), bitterbrush (Purshia tridentata), and various native perennial grasses. In addition, several areas were hand planted with bare-root and containerized sagebrush and bitterbrush seedlings. Subsequent monitoring revealed that re-seeding efforts were largely unsuccessful, including the hand planted areas which had less than a 3% survival rate. Many factors contributed to low survival rate including drought and non-local seed sources. Due to this seeding failure, in 2015, local sagebrush seed was collected and sent to Northern Nevada Correctional Center for propagation. In the fall of 2016, 2,000 sagebrush seedlings were planted on BLM land in partnership with the USGS with a goal to create sagebrush islands to improve sage-grouse habitat. In 2017, this process was repeated with more than 50,000 seedlings distributed among five study sites, three sites on BLM Eagle Lake Field Office lands in California and two sites on the BLM Sierra Front Field Office lands in Nevada. Line point intercept and shrub density monitoring began in the fall of 2018 and is planned to continue through the 2020 field season. Preliminary monitoring results suggest that hand planting local sagebrush seedlings may increase mean annual survival rates.

The Sagebrush in Prisons Project: Restoring lands and lives

Topic: Development and use of native seed in natural areas management

Shannon Swim
Institute for Applied Ecology

Co-Authors: Stacy Moore, Tom Kaye

The purpose of the 'Sagebrush in Prisons Project' is to improve habitat for greater sage-grouse by engaging state and federal prison systems in the production of sagebrush for habitat restoration. Greater sage-grouse was considered for listing by the U.S. Fish and Wildlife Service but was not warranted due to extraordinary conservation efforts by many federal, state, and local entities. However, conservation efforts must continue to maintain the integrity of these populations. Loss of sagebrush habitat is the primary driver of the decline of this species in the western United States. Production of sagebrush within state and federal prison systems represents a unique opportunity to provide urgently needed plant materials as well as providing information to incarcerated men and women concerning sagebrush conservation. Institute for Applied Ecology (IAE), a nonprofit organization based in Oregon, runs the 'Sagebrush in Prisons Project,' and works closely with Bureau of Land Management (BLM) and correctional center partners across the country to employ the National Seed Strategy and produce genetically appropriate native plant material for restoration projects. IAE is currently working with nine prisons in five different states. Locally, the program works with three prisons in the state of Nevada; Northern Nevada Correctional Center, Warm Springs Correctional Center and Lovelock Correctional Center, and a Federal Correctional Institution in Herlong, California to propagate hundreds of thousands of sagebrush plugs for restoration projects on BLM lands. IAE staff oversees plant production at the prison facilities, from seed germination through growth and delivery. Since the projects inception in 2014, over 1.5 million genetically appropriate native plant plugs have been produced for habitat restoration, while also allowing this underserved population the chance to be a part of something positive and changing their perspective on the importance of the sagebrush ecosystem.

Using the right seed: Improving native plant restoration in the Great Basin

Topic: Development and use of native seed in natural areas management

Sarah Kulpa
U.S. Fish and Wildlife Service

Co-authors: Elizabeth Leger, Owen Baughman, Robert Burton, Fred Edwards

The Great Basin is home to some of the US's largest expanses of wild landscapes, supporting a wide range of plant and animal diversity. However, our native plant communities are threatened by the accelerated invasion of non-native annual grasses, altered fire regimes, drought, and climate change. Slowing and reversing this large-scale conversion will require coordinated efforts between researchers and land managers, working together to identify the most promising seed sources for restoring disturbed and invaded sites. Working with Seeds of Success teams, we collected seeds of native grass species sourced from within an area of Northern Nevada that experiences frequent fire and increased these seeds through a commercial seed producer. These locally-collected and seed-zone matched sources were sown in post-fire locations similar to the original collection locations, in experiments designed to test the long-term performance of locally sourced and increased seeds compared to the partially native seed mixes made from the best available standard cultivars and releases. We will present the experimental design and preliminary data from these seedings, highlighting the successful partnerships working to determine the best ways to restore and preserve our most impacted native plant communities.

Vegetation succession following post-fire seeding with conventional and native seed mixes in the Great Basin

Topic: Development and use of native seed in natural areas management

Jeff Ott
U.S. Forest Service, Rocky Mountain Research Station

Co-authors: Francis F. Kilkenny, Daniel D. Summers, Tyler T. Thompson

following vegetation succession at two sites in Tintic Valley, Utah, where a seeding experiment had been installed following wildfire in 1999. Vegetation of seeded treatments and unseeded controls was monitored during post-fire years 1-3 and 16-18. All of the tested seed mixes became established and influenced successional trajectories during this timeframe. Conventional seed mixes with introduced species most effectively suppressed exotic annuals, but did not follow a successional trajectory toward reference conditions from prior to the fire, while native seed mixes generally became more similar to reference vegetation over time. These results underscore the importance of identifying desired long-term outcomes of post-fire seeding and formulating seed mixes accordingly.