

Nevada Seed Strategy



Prepared by:
The Nevada Native Seed Partnership



MEMORANDUM

DATE: April 24, 2020

PREPARED BY: Nevada Native Seed Partnership

SUBJECT: Including the Nevada Seed Strategy as a supporting strategy to the Nevada Shared Stewardship Agreement

BACKGROUND

The Nevada Seed Strategy (Strategy), prepared by the Nevada Native Seed Partnership, aims to increase the availability and use of native seed for rehabilitation, reclamation, and restoration treatments. The Strategy identifies specific activities that address bottlenecks within the native seed system and attempts to clarify and coordinate the value each stakeholder can bring towards improving native seed use. By working together, the Strategy integrates the needs of state, federal, and private seed users with researchers developing new varieties, increasing our basic understanding of plant biology, and developing restoration technology with industry seed suppliers that produce native seed in quantities needed for large scale revegetation that uses the right seed in the right place at the right time.

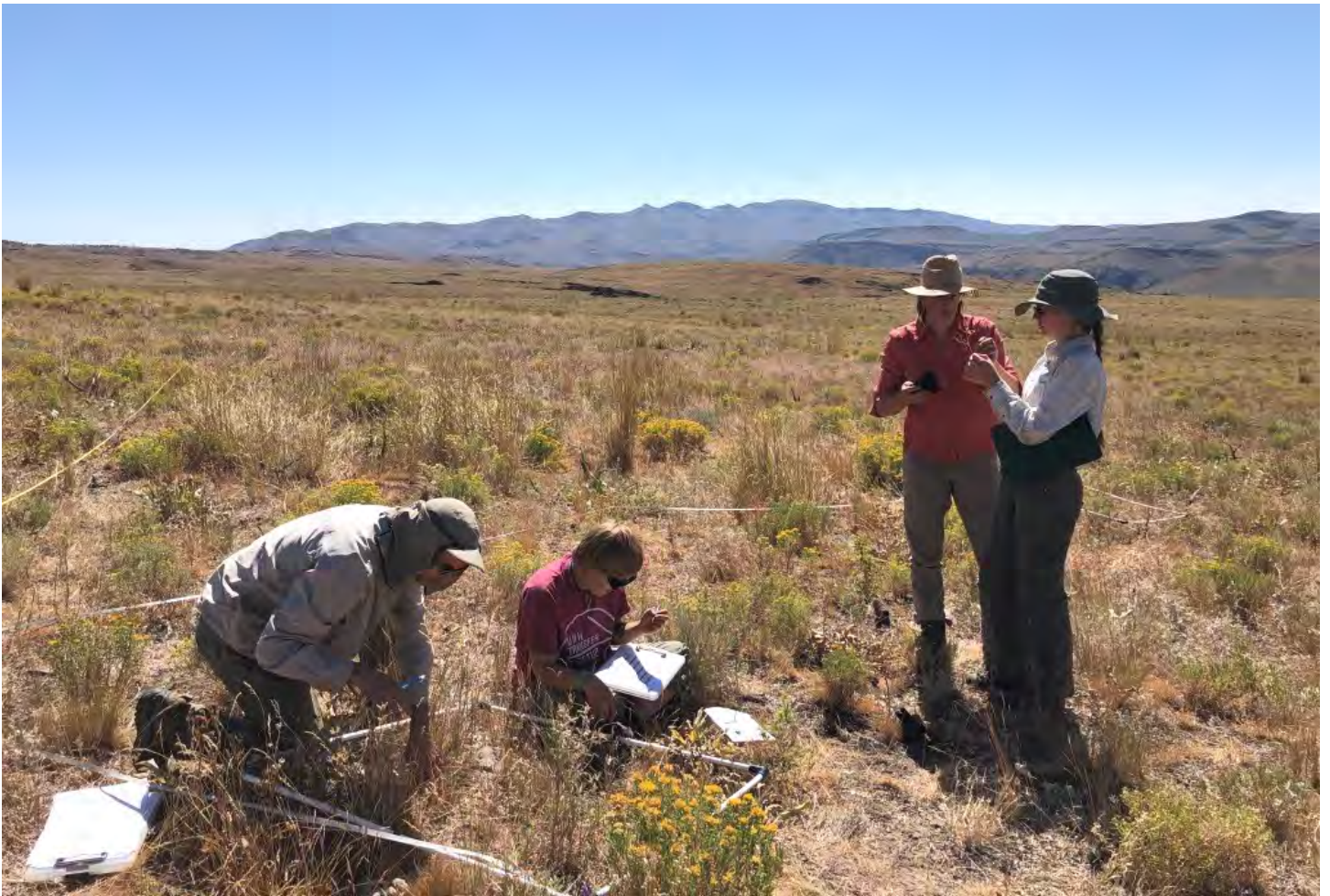
ACTION

On January 29, 2020, the Nevada Shared Stewardship Executive Committee unanimously agreed to include the Nevada Seed Strategy as one of the strategies and plans referred to in Shared Stewardship Agreement in recognition of its importance in conserving, protecting, and improving landscape health through ecological restoration, supporting agricultural and rural economies, and reducing the risk and mitigating the effects of wildfire.



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Introduction

Nevada's economic prosperity is dependent on healthy lands that support multiple human uses and diverse habitats, which enhance the rich natural heritage of this State. Resource-dependent activities include livestock grazing, mining, and outdoor recreation; such as hunting and fishing. Species of conservation concern, including the iconic Greater sage-grouse (*Centrocercus urophasianus*) that occurs across the northern part of the state and the threatened desert tortoise (*Gopherus agassizii*) in the southern regions of the state, are also dependent on healthy lands with diverse habitats.

Unfortunately, many factors are decreasing the diversity of Nevada's landscapes. The most important among these factors is the increasing size and frequency of historically uncharacteristic wildfires in Nevada, due in large part to the introduction of invasive annual grasses. Where invasive annual grasses are present, the landscape often does not recover from fire on its own, creating a cycle where fires burn the same areas again and again. These grass-fueled fires threaten human safety, destroy infrastructure, degrade wildlife habitat, reduce recreational opportunities, and decrease economic productivity.

Millions of pounds of seed are used every year in an effort to revegetate or enhance these burned lands, or lands that have experienced other forms of disturbance, such as mineral extraction, urbanization, or other human impacts. However, the majority of this seed is not genetically appropriate for the areas in which it is planted, but rather is adapted to cooler and wetter growing conditions. Additionally, only a small number of species are being seeded, but Nevada is home to over 3,000 native plant species (A. Tiehm, pers. comm. 2020). With Nevada's distinction as the driest state in the country, this non-local seed has little hope of returning the landscape to its pre-disturbance condition. As a result, a cycle of disturbance and

re-seeding is rapidly eliminating biodiversity from Nevada's landscapes. Our landscapes need the right seed for rehabilitation, reclamation, and restoration treatments so that they can successfully recover from disturbances and stressors.

Overlaying these challenges is a complex network of land jurisdictions, industry interests, researchers, local, state and federal agencies, tribes, and other stakeholders. How species are identified, collected, propagated, and utilized for restoration purposes has historically not been well-coordinated or communicated within Nevada leading to inefficiencies and unsuccessful results.

The Nevada Seed Strategy (Strategy), prepared by the Nevada Native Seed Partnership (NNSP; Figure 1), aims to increase the availability and use of native seed for rehabilitation, reclamation, and restoration treatments. The Strategy identifies specific activities that address bottlenecks within the native seed system and attempts to clarify and coordinate the value each stakeholder can bring towards improving native seed use. By working together, the Strategy integrates the needs of state, federal, tribal, and private seed users with researchers developing new varieties, increasing our basic understanding of plant biology, and developing restoration technology with industry seed suppliers that produce quantities of native seed needed for large scale revegetation that uses the right seed, in the right place, at the right time.

The NNSP believes that outlining our vision, mission, goals, and objectives in this state-specific Strategy will help all partners in Nevada focus on achieving our shared goals, and provide a framework for documenting the results of our efforts. Implementing this Strategy will require additional investments in infrastructure, research, decision support tools, and communication efforts. In addition, substantial investments are needed to

Figure 1: Coordinating Partners



The Nevada Native Seed Partnership includes federal and state agencies, nonprofits, conservation districts, and the University of Nevada Reno. The NNSP began in 2016 with informal meetings between the US Fish and Wildlife Service, the Bureau of Land Management, and the US Forest Service, with representatives meeting to discuss shared interests in Nevada native seed. The partnership quickly expanded to include additional partners, and began holding monthly meetings in the fall of 2017.

bring rehabilitation, reclamation, and restoration efforts to a scale that matches the pervasive problem of fire and invasive annual grasses regardless of techniques used. But most importantly, successful implementation will require the active participation of a diverse set of public and private partners. Increased coordination is vital to accelerate the pace and scale of restoration and provide native seed when and where it is needed.

This Strategy is a living document, and as we achieve goals, objectives and actions, we recognize that new issues may arise and will need to be addressed. This Strategy will also help us address future challenges so that we, as a State, are better prepared to respond to future disturbances and stressors that threaten the health of Nevada's native plant communities and the economic services they provide.



Scope



This Strategy is Nevada-specific and engages partners working toward restoration on Federal, state, local, tribal, and private land. Strategy goals and objectives will be reassessed periodically, and actions will affect Nevada landscapes and habitats far into the future. The plants of interest are native forbs (wildflowers), shrubs, and grasses that are used for ecological restoration, post-fire emergency stabilization, range management, and mine reclamation. This Strategy aims to increase the quantity and quality of seed available for large-scale rehabilitation, reclamation, and restoration (i.e. post-fire seeding) as well as for smaller-scale projects (i.e. wildlife corridors). This Strategy does not address federally or state-listed, rare, and endemic plant species, or commercial timber species. Products and collaborations developed through the Strategy will help land managers select appropriate seed to use in public and private ecological restoration efforts at all scales.

This Strategy aims to provide all public and private land managers the tools they need to increase biodiversity and resiliency in our Nevada landscapes. The Strategy seeks to develop seed and other plant materials (seedlings and container plants) that will meet long-term goals to maintain and improve the biological and physical conditions at a site or project.

This Strategy does not set agency policy. It recognizes that each entity has its own authorizing legislations or charters, missions, and policies. This Strategy strives to align them as much as possible while supporting the science and valuing the use of native seed and plant materials in land management activities. Nevada is a state diverse in landscapes, land use, and land ownership, and the aim of the Strategy is to be broadly inclusive while meeting Nevada's unique needs.

The Nevada Native Seed Partnership and their management endorsed this document as the unified approach to increase the availability and use of native seed for rehabilitation, reclamation, and restoration treatments.



THE FOUR GOALS

of the “Nevada Seed Strategy”



GOAL 1

Identify seed needs, and ensure reliable availability of genetically appropriate seed.



GOAL 2

Identify research needs and facilitate research to improve technology for native seed production and ecosystem restoration.



GOAL 3

Develop and implement tools that enable managers and producers to make decisions about collecting, increasing, and using genetically appropriate seed.



GOAL 4

Develop and implement strategies for internal and external communications.

Background and Development

Over the last 20 years, there has been an increased focus on using native seeds in rehabilitation, reclamation, and restoration, particularly among the federal land management agencies. The critical shortage of native plant materials available for seeding following the extensive wildfires of 1999 and 2000 led Congress to direct the Bureau of Land Management (BLM) and U.S. Forest Service (USFS) to facilitate the development of a long-term program to provide a stable and economical supply of native seed for restoration and rehabilitation efforts on public lands (USC HR 2000). BLM and USFS responded to this by establishing the Native Plant Materials Development Program and the Native Plant Restoration Program.

The fiscal year 2002 House report on appropriations for the Department of Interior (DOI) and related agencies reiterated Congress' order to "continue to implement the long-term program to manage and supply native plant materials for use in various Federal land management restoration and rehabilitation needs (USC HR 2001)." In April 2002, DOI and U.S. Department of Agriculture (USDA) issued a report to Congress, which called for a commitment to native plant materials research, production, and use that included a recommendation for financial and operational support from DOI and USDA (DOI and USDA 2002). In this report, the DOI and USDA also stated their intent to improve and expand partnerships in cooperation with the private seed industry, develop and enhance science delivery to practitioners, and expand outreach and education to the general public.

Since 2002, federal agencies have made significant advances in understanding plant biology, cultivation practices, and seed transfer guidance. For example,

multiple agencies are collaborating through ecoregional programs to provide native seed and plant materials suitable for restoration in specific ecoregions. Supporting the needs of the Great Basin portion of Nevada, the Great Basin Native Plant Project (GBNPP) was established in 2002, as a joint program established by the BLM Plant Conservation and Restoration Program and the Grassland, Shrubland, and Desert Ecosystem Research Program of the US Forest Service's Rocky Mountain Research Station (RMRS). This program was established "to improve the availability of native plant materials and to provide the knowledge and technology required for their use in restoring diverse native plant communities across the Great Basin" (www.greatbasinnpp.org). The GBNPP has worked with more than 308 native shrubs, grasses, and forbs, producing over 263 publications, on topics ranging from natural history to genetics to restoration. The GBNPP works with more than 30 major cooperators across nine states, including partnerships with cooperators in Nevada.

In 2015, the [National Seed Strategy for Rehabilitation and Restoration](#) (National Strategy) was developed by the Plant Conservation Alliance (PCA) to provide a framework and a more coordinated approach for rehabilitation and restoration while actively working with the private sector to build a seed industry (PCA 2015). The National Strategy will also help address future challenges so that the United States is better prepared to respond appropriately to large scale disturbances and stressors that threaten plant communities and ecosystem services they provide on Federal, state, local, tribal, and private lands.

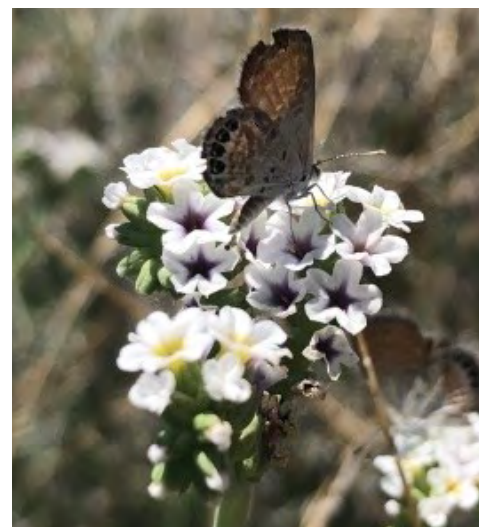
In 2017, the BLM established its Mojave Desert Native Plant Program (MDNPP) in Nevada. The

Mojave Desert encompasses a diverse range of habitats, including isolated mountain ranges, desert basins, sand dunes, and riparian areas around isolated springs and streams. Mojave restoration is challenging, and the goals of the program are to increase the availability of locally adapted and genetically appropriate native plant materials, and provide the knowledge and technology necessary for successful native plant community restoration. Through the years, the MDNPP has worked closely with U.S. Geological Survey (USGS), Rancho Santa Ana Botanic Garden, Natural Resources Conservation Service (NRCS) –Tucson Plant Materials Center, Colorado River Indian Tribes, Victor Valley College, University of Nevada, Las Vegas, Northern Arizona University, and The Living Desert Zoo and Gardens to collect and increase seed, develop Mojave-sourced germplasm releases for commercial seed increase, develop seed transfer guidance and seed menus, and grow container plants for restoration.

The National Strategy catalyzed conversations among Federal agencies in northern Nevada, including BLM, USFS, and U.S. Fish and Wildlife Service (USFWS). This dialogue began in early 2016, laying the foundation for what is now the NNSP. Initial meetings involved these federal partners coming together to better understand the roles and abilities of each agency, and the

opportunities that could be created by working together to increase the availability of Nevada native seed. The partnership quickly grew to include state agencies, several nonprofits, conservation districts, new state and federal partners, and the University of Nevada, Reno (UNR), and began holding monthly meetings starting in the fall of 2017. In the spring of 2017, the Nevada Department of Agriculture (NDA) and the NNSP hosted the first Nevada Native Seed Forum, with subsequent forums in 2018 and 2019.

In the fall of 2018, senior leaders from NNSP organizations met to discuss their vision, goals, objectives, and accomplishments in increasing the availability of native seed in Nevada. The 2018 leadership meeting provided a forum for agency and partner leaders and staff to initiate discussions on the development of a state-specific strategy, to step-down the National Strategy in a way that was relevant to the social, economic, and ecological context in Nevada. At that meeting, the NNSP was tasked with creating this document, a Nevada Seed Strategy, using the National Strategy as a model. The contents of this Strategy are the results of a coordinated effort involving input from all NNSP members, including a two-day facilitated retreat in May 2019.



STRATEGY

VISION AND MISSION

Vision



Keep Nevada lands diverse and functioning by using the right seed in the right place at the right time.

Mission



We are a partnership helping Nevada increase the availability of genetically appropriate seed to restore diverse plant communities and sustainable landscapes.





Guiding Values and Principles

- ◆ We value Nevada's native plant communities and the way of life that they provide for our people, communities, wildlife, and economies.
- ◆ Native plant communities are key to ecosystem integrity and resilience, and they provide essential habitat and food sources for wildlife, including pollinators.
- ◆ Native plant communities have intrinsic and irreplaceable biotic value that will become increasingly important in the future.
- ◆ Native, genetically appropriate seed sources are vital for restoration and management because they are adapted to a wide variety of conditions including the hottest and driest portions of the state.
- ◆ Strategic use of non-native species and non-local plant varieties have a role in achieving site stabilization, wildfire breaks, or invasive plant control with the goal of maintaining functioning resource values.
- ◆ Native plants, including crop and wild relatives, contain unique properties, and the full benefit of these may not yet be recognized, but should be preserved for future generations.
- ◆ Botanical, ecological, and genetic scientific expertise plays a role in providing information to support and guide ecological restoration.
- ◆ Building a viable native seed market will increase economic activity in Nevada, while also increasing the diversity and quantity of genetically appropriate seeds for restoration.
- ◆ The native seed bank that exists in the soil should be utilized as much as possible; not all disturbances require active reseeding to restore habitat.
- ◆ Partnering with a diverse group of stakeholders, including interagency collaboration and the inclusion of non-federal partners, enhances the quality and effectiveness of this Strategy.
- ◆ Strategy participants support opportunities to:
 - ◇ Maintain or increase the number of acres of native plant communities that provide ecosystem services;
 - ◇ Include Federal, tribal, state, and local governments; academic institutions; non-profits; and the private sector when addressing restoration issues;
 - ◇ Improve the availability of locally adapted and genetically appropriate seed required to restore healthy native plant communities;
 - ◇ Develop strategies and tools for conducting more effective restoration;
 - ◇ Promote research, science delivery, and education required to meet new restoration challenges imposed by increasing threats; and
 - ◇ Communicate the value of native plant communities and restoration to stakeholders and the general public.



GOAL 1 Summary Tables

Identify Seed Needs, and Ensure Reliable Availability of Genetically Appropriate Seed

Objective 1.1: Work collaboratively to plan for seed needs by seed zone

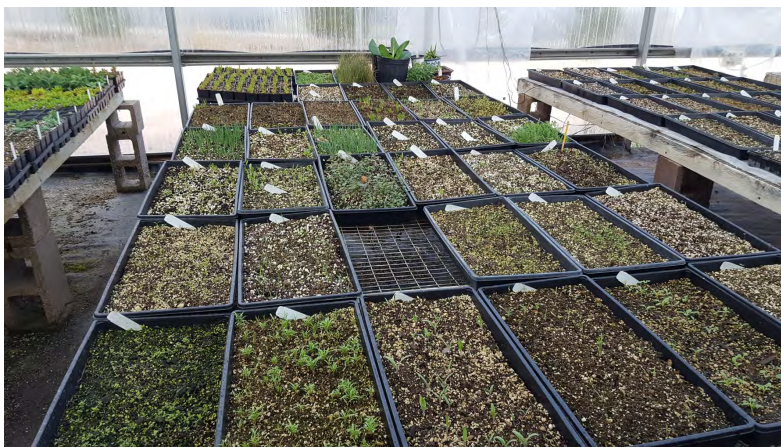
Action	Links to Other Actions	Coordinating Partners
1.1.1 Identify target species for seed collection and increase by assessing planned seeding projects, intersecting with empirical and/or provisional seed zones	1.1.2, 2.1.1	NNSP
1.1.2 Identify Nevada's workhorse species	1.1.1, 2.1.2	NNSP
1.1.3 Develop a working group to create seed menus	2.2.5, 3.1.3	NNSP

Objective 1.2: Expand seed storage capacity and create a foundation seed program

Action	Links to Other Actions	Coordinating Partners
1.2.1 Determine the need and feasibility of co-locating native plant material development activities	1.2.2, 1.2.3, 3.2.2, 3.2.3	BLM, NDA, NDF, NDOW, NRCS, UNR
1.2.2 Expand warehouse capacity and hire a dedicated seed warehouse manager	2.2.2	BLM, NDA, NDF, NDOW, UNR
1.2.3 Establish a Nevada Foundation Seed Program and hire a dedicated manager	1.2.2	NDA, NDF, UNR

Objective 1.3: Expand seed collection for conservation, restoration, increase, and foundation seed storage

Action	Links to Other Actions	Coordinating Partners
1.3.1 Expand seed collection and source identification efforts in Nevada	1.1.1	BLM, GBI, NDA, NDF, NDOW, USFS, USFWS
1.3.2 Maintain and expand the internal ArcGIS online database for seed collection tracking and reporting	1.3.1	BLM, GBI, USFS, USFWS
1.3.3 Improve interagency permitting for seed collection	1.3.1	NNSP
1.3.4 Develop Best Management Practices for seed collection in Nevada	1.3.3	NNSP
1.3.5 Develop and implement shrub seed orchards		NDF, NRCS, UNR, WBC



GOAL 2 Summary Tables

Identify Research Needs and Facilitate Research to Improve Technology for Native Seed Production and Ecosystem Restoration

Objective 2.1: Conduct research to identify target and workhorse species and populations for use in rehabilitation, reclamation, and restoration

Action	Links to Other Actions	Coordinating Partners
2.1.1 Develop lists of target native plant species	1.1.1, 1.1.2	NNSP
2.1.2 Assess collections and populations of target and workhorse native shrubs, grasses and forbs sourced from Nevada for their restoration utility	1.1.2	NNSP

Objective 2.2: Use targeted research to improve seed production, restoration outcomes, and plant establishment

Action	Links to Other Actions	Coordinating Partners
2.2.1 Create an integrated and streamlined implementation plan for research	1.3.2, 4.2.2	NNSP
2.2.2 Conduct research to improve seed cleaning and storage of target and workhorse species	1.2.2	BLM, NDF, NRCS, TNC, UNR, USFS, WBC
2.2.3 Develop species-specific protocols for seed and seedling production that maintain genetic diversity	2.3.1, 2.3.2	NNSP, GBNPP, MDNPP
2.2.4 Develop site preparation, seeding, and transplanting strategies that improve plant establishment and community diversity	3.1.1	NNSP, GBNPP, MDNPP
2.2.5 Identify the most effective seed mixes for rehabilitation, reclamation, and restoration	1.1.3	NNSP, GBNPP, MDNPP

Objective 2.3: Characterize genetic variation of restoration species to inform seed increase and seed transfer guidance

Action	Links to Other Actions	Coordinating Partners
2.3.1 Conduct common gardens and genetic analyses for workhorse species	2.2.3, 2.3.2	NNSP, GBNPP, MDNPP
2.3.2 Develop a genetic management plan for producers and land managers	1.1.1, 2.3.1	NNSP, GBNPP, MDNPP



GOAL 3 Summary Tables

Develop and implement tools that enable managers and producers to make decisions about collecting, increasing, and using genetically appropriate seed

Objective 3.1: Compile data on native seed source availability, production, and use, and create tools for accessing the data

Action	Links to Other Actions	Coordinating Partners
3.1.1 Identify, update, and develop guides, protocols, and factsheets for production and application of native seed in Nevada	1.3.4, 2.2.4	NNSP
3.1.2 Develop and maintain a website to provide access to resources about the collection, production, and application of native seed in Nevada	1.3.4, 2.2.3, 2.2.4, 2.2.5	NNSP
3.1.3 Develop trainings and resources to introduce and implement seed menus	1.1.3	BLM, NDA, NRCS, USFS, USFWS
3.1.4 Develop a seed inventory system and forecasting tool for Nevada	1.1.1	BLM, NDA, NDF, NDOW, USFS, USFWS

Objective 3.2: Develop tools to encourage market stability and develop coordinated approaches for procurement

Action	Links to Other Actions	Coordinating Partners
3.2.1 Identify or develop contracting methods that promote certainty and stability for producers and buyers	3.2.4	BLM, NCDP, NDF, NDOW, NRCS, USFS
3.2.2 Create a streamlined approach for procuring native seed	4.2.1	BLM, NDA, NDF, NDOW, NRCS, USFS, USFWS
3.2.3 Establish a Nevada Native Seed Cooperative	1.2.2, 1.2.3, 1.3.1, 1.3.4, 2.2.2, 3.2.1	NNSP, MDNPP
3.2.4 Develop trainings and materials for Federal and State contracting	3.2.1	NNSP



GOAL 4 Summary Tables

Develop and implement strategies for internal and external communications

Objective 4.1: Internal communications: Distribute and implement the Strategy across NNSP agencies and partners

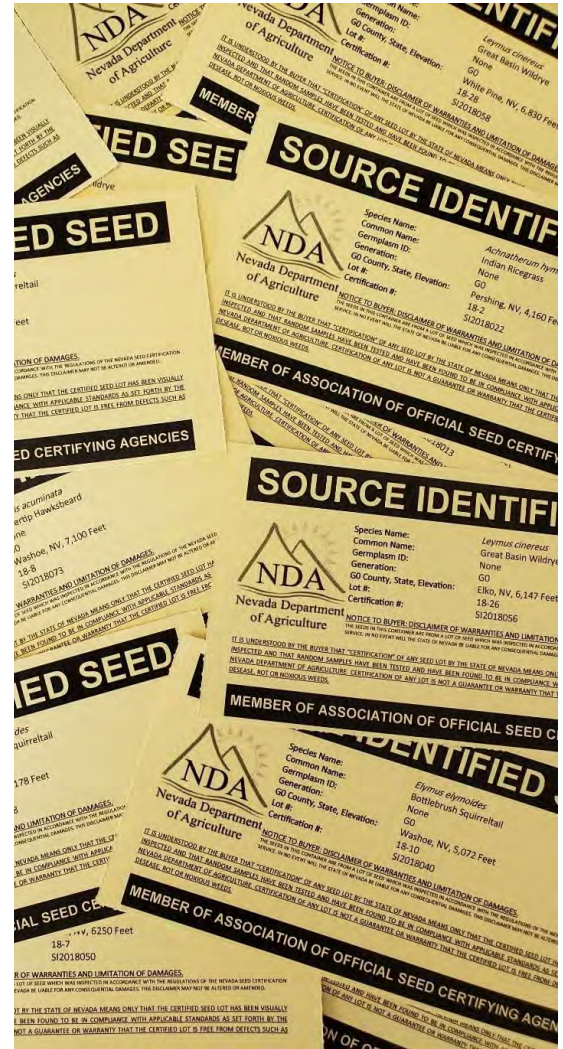
Action	Links to Other Actions	Coordinating Partners
4.1.1 Ensure staff support to continue coordination and communication among NNSP organizations	4.1.3, 4.2.1	NNSP leadership
4.1.2 Conduct monthly NNSP meetings	4.1.3, 4.2.1	NNSP
4.1.3 Communicate to NNSP leadership to report progress	4.1.1, 4.1.2	NNSP

Objective 4.2: External communications: Conduct education and outreach through the Nevada Native Seed Partnership

Action	Links to Other Actions	Coordinating Partners
4.2.1 Develop and implement a comprehensive external communications plan	3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.2.2, 3.2.3, 3.2.4	NNSP
4.2.2 Organize and implement the annual Nevada Native Seed Forum	3.1.1, 3.1.2, 3.1.3, 4.2.1	NNSP
4.2.3 Organize native seed-focused field visits and tours	1.2.2, 2.2.4, 2.2.5, 4.1.2	NNSP

Objective 4.3: Report progress, recognize achievements, and revise Strategy

Action	Links to Other Actions	Coordinating Partners
4.3.1 Establish a mechanism to report on the progress and achievements of the Strategy	4.1.2, 4.2.2	NNSP
4.3.2 Review and revise the Strategy	All	NNSP



Top Left: Needle and thread (*Hesperostipa comata*) site designated as “source identified” by NDA crews. Bottom Left: NDA personnel source identifying Basin wildrye (*Leymus cinereus*) for BLM/USFWS. Right: Tags are issued for each lot of collected material that has been designated as source identified.

Through the collaborative efforts of the NNSP, several grass, forb and shrub sites have been designated by NDA as “Source Identified” throughout the Great Basin and Mojave Desert in Nevada. Over the past three years, NDA has been working closely with SOS teams, managed by BLM, USFS, and USFWS, to inspect sites for species verification and ecological characteristics. These efforts assist in validating seed purity and create an element of traceability for seed stock. Yellow tags are issued based on the quantity of material collected that will be used to identify the seed as “source identified.”

From 2017 to 2019, NDA has designated 118 sites in the Great Basin as source identified for SOS-related collections. These collections are cleaned, stored, and can be used for seed increase with the ultimate goal of being put back on the landscape for reclamation, rehabilitation, or restoration projects. NDA has also worked with several other state-based organizations, including UNR, GBI, and WBI.

In total, since the establishment of this source identification program in 2017, NDA has inspected and certified over 420 sites for the industry. This includes private companies, government agencies, and non-governmental organizations.



GOAL 1

Identify seed needs, and ensure reliable availability of genetically appropriate seed.

Nevada lacks a reliable supply of genetically appropriate seed to use for rehabilitation, reclamation, and restoration activities. Actions under this goal will assess seed needs and fulfillment capacities, increase coordinated wildland seed collection and field production efforts, and expand cooperation and partnerships.

Assess seed needs across agency jurisdictions, using wildfire data, priority wildlife habitat data, and other planned treatments such as fuel breaks, mine reclamation, or transportation needs. We will identify overlap in seed needs and rank species by quantity needed and seed zone. The NNSP will curate this information, connecting project and seed needs. Information will be shared with producers to support decisions about seed production and wildland collection.

Objective 1.1



Work collaboratively to plan for seed needs by seed zone

Improving planning and coordination by the NNSP and external partners in collecting, propagating, procuring, and sharing native seed by seed zones is vital to increasing the use of genetically appropriate seed in both emergency (reactive) rehabilitation and planned (proactive) restoration.

Seed need projections will be conducted for one, three, and five-year time frames, based on annual discussions within the NNSP, the best available science, and input from other interested parties.

Action 1.1.1 Identify target species for seed collection and increase by assessing planned seeding projects, intersecting with empirical and/or provisional seed zones.

LINKS TO OTHER ACTIONS: 1.1.2 Identify Nevada’s Workhorse Species, 2.1.1 Develop lists of target native plant species

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: NNSP staff

Action 1.1.2 Identify Nevada’s workhorse species

Identify species that are abundant across a wide range of ecological settings and meet the many needs of rehabilitation, reclamation, and restoration. Species will be identified in each seed zone using criteria developed by the NNSP that include elements related to demand, cost, storage, increase, and restoration performance.

LINKS TO OTHER ACTIONS: 1.1.1 Identify target species for seed collection and increase, 2.1.2 Assess collections and populations of workhorse species

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: NNSP staff

Action 1.1.3 Develop a working group to create seed menus

Develop easy-to-use seed menus, giving seed users the best available information on which species and sources have the best chance for success and/or meet project objectives at any given site.

Interdisciplinary teams will use tools including seed zones, disturbance response groups, ecological site descriptions, and land resource units to create seed menus at different scales (i.e., BLM district (landscape level) vs a wildland fire (project level)).

LINKS TO OTHER ACTIONS: 2.2.5 Identify the most effective seed mixes for rehabilitation, reclamation, and restoration, 3.1.3 Develop trainings and resources to introduce and implement seed menus

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: Provisional and empirical seed zones, NRCS ecological site descriptions and land resource units, UNR/NRCS disturbance response groups

Objective

1.2



Expand seed storage capacity and create a foundation seed program

Additional seed storage facilities are needed in Nevada to provide sufficient quantities of suitable native seed when and where they are needed. Storage facilities will house seed for restoration and research, and provide a reliable source of foundation seed for Nevada producers. Increasing seed storage would also stabilize markets for Nevada seed producers and end users

Action 1.2.1 Determine the need and feasibility of co-locating native plant material development activities

Conduct an assessment to determine the need and feasibility of co-locating native plant material activities in Nevada, including recommended next

steps and plan implementation. Co-location could promote research and development collaboration and avoid duplication of efforts, and could facilitate the distribution of seeds and agronomic best-practice information directly to Nevada producers.

LINKS TO OTHER ACTIONS: 1.2.2 Expand warehouse capacity and hire a dedicated seed warehouse manager, 1.2.3 Establish a Nevada Foundation Seed Program and hire a dedicated manager, 3.2.2 Create a streamlined approach for procuring native seed, 3.2.3 Establish a Nevada Native Seed Cooperative

COORDINATING PARTNERS: BLM, NDA, NDF, NDOW, NRCS, UNR

EXISTING RESOURCES: NNSP staff

Action 1.2.2 Expand warehouse capacity and hire a dedicated seed warehouse manager

Conduct an assessment to determine the best option for increasing warehouse capacity in Nevada, including recommended next steps and plan implementation. Expansion of existing warehouse capacity, seed cleaning and mixing services, and refrigerated storage is necessary for Nevada to increase in-state seed availability. A warehouse manager is crucial for managing shipping and receiving, as well as inventory management.

LINKS TO OTHER ACTIONS: 2.2.2 Conduct research to improve seed cleaning and storage

COORDINATING PARTNERS: BLM, NDA, NDF, NDOW, UNR

EXISTING RESOURCES: BLM Ely Regional Seed Warehouse, NDF seedbank, UNR seedbank

Action 1.2.3 Establish a Nevada Foundation Seed Program and hire a dedicated manager

Conduct an assessment to determine the best option for creating and sustaining a foundation seed program in Nevada, including recommended next steps and plan implementation. A foundation seed program will provide a reliable source of foundation seed (for cultivars) or G1 and beyond seed (for pre-

varietal germplasm) to be used for propagation purposes by producers in Nevada and surrounding states. This will minimize transaction costs associated with producers procuring foundation seed and support the supply of certified seed produced via seed increase for restoration projects in Nevada. The manager is crucial for overseeing foundation seed program operations and interfacing with producers.

LINKS TO OTHER ACTIONS: 1.2.2 Expand warehouse capacity and hire a dedicated seed warehouse manager

COORDINATING PARTNERS: NDA, NDF, UNR

EXISTING RESOURCES: NDF seed bank, UNR seed bank, NDA seed certification program

Cooperation and partnerships within and among public and private sectors will expand to achieve these actions, which will advance the conservation, assessment, and distribution of genetically appropriate seed for research, conservation, and restoration.

Action 1.3.1 Expand seed collection and source identification efforts in Nevada

Establish target goals and increase field collection and source identification of native seed for use in seed zone development, seed production, restoration, research, breeding, and conservation. This action will include training seed collection teams in the Seeds of Success (SOS) program (a national native seed collection effort; BLM 2018) and the Great Basin and/or Mojave SOS protocol to increase seed collection capacity and research opportunities (Table 1). We will coordinate collection and source identification efforts with the MDNPP and NNSP. Target species for collection will be identified under Action 1.1.1.

LINKS TO OTHER ACTIONS: 1.1.1 Identify target species for seed collection and increase

COORDINATING PARTNERS: BLM, GBI, NDA, NDF, NDOW, USFS, USFWS

EXISTING RESOURCES: BLM SOS Great Basin Coordinator, SOS technicians, NDA source identification, NDF Conservation Crews, ArcGIS online and apps, herbarium collections



Objective 1.3 Expand seed collection for conservation, restoration, increase, and foundation seed storage

This objective expands and coordinates collection, increase, and conservation of workhorse and target species identified under Objectives 1.1 and 1.2., and will ensure availability of native plant resources in Nevada for use now and into the future.

Table 1. Types of Seed collections made in Nevada

Type of Collection	Description	Number of Pure Live Seeds (PLS) estimated	Collection Partners
Research	Research collections for empirical seed zone development	2,000 – 3,000 (min. 1,000)	SOS team
Standard SOS	Conservation collections following national SOS protocols	2,500 – 10,000 (min. 2,500, but ideally 10,000 ¹)	SOS team
Operational or Restoration SOS	Restoration collections to be used for commercial increase	70,000 or greater. Approx. 1.0 lbs or greater for forbs and	SOS team, NDF Conservation Crews, and NDA Source Id

¹: In the Mojave, research collections are typically full SOS collections with >10,000 seeds and this is used as both an SOS collection and a research collection.

Action 1.3.2 Maintain and expand the internal ArcGIS online database for seed collection tracking and reporting

Maintain and expand the ArcGIS online database used for tracking and reporting seed collections. Mobile apps (e.g. ArcCollector and Survey123) will allow seed collection teams to collect and update seed collection information and the NNSP will receive real-time tracking to inform collection prioritization and coordination. ArcGIS online will be maintained by Federal agencies and updated as new technologies and apps are developed. Annual reports on seed collection efforts will be generated from this data.

LINKS TO OTHER ACTIONS: 1.3.1 Expand seed collection and source identification efforts in Nevada

COORDINATING PARTNERS: BLM, GBI, USFS, USFWS

EXISTING RESOURCES: ArcGIS online and apps, iPads

Action 1.3.3 Improve interagency permitting for seed collection

Improve Federal and State agency permitting for seed collection in Nevada. We will develop Programmatic National Environmental Policy Act (NEPA) documents to streamline the permit process. Factsheets that outline agency contacts and the permitting process will also be developed. This effort also aims to gain a better understanding of how much and where wildland seed collection is occurring in the Great Basin and Mojave.

LINKS TO OTHER ACTIONS: 1.3.1 Expand seed collection and source identification efforts in Nevada

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: NNSP staff

Action 1.3.4 Develop Best Management Practices for seed collection in Nevada

Develop Best Management Practices (BMPs) for seed collection. BMPs will identify and address topics such as: Optimal collection site location for different types of seed collection (e.g. SOS, commercial, research), recommended frequency of operational or restoration sized collections, species not appropriate for collection (e.g. rare species, poor seed set), plant phenology, collection quantity, collection quality, collection techniques, collection vessels, and storage.

LINKS TO OTHER ACTIONS: 1.3.3 Improve interagency permitting for seed collection

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: NNSP staff

Action 1.3.5 Develop and implement shrub seed orchards

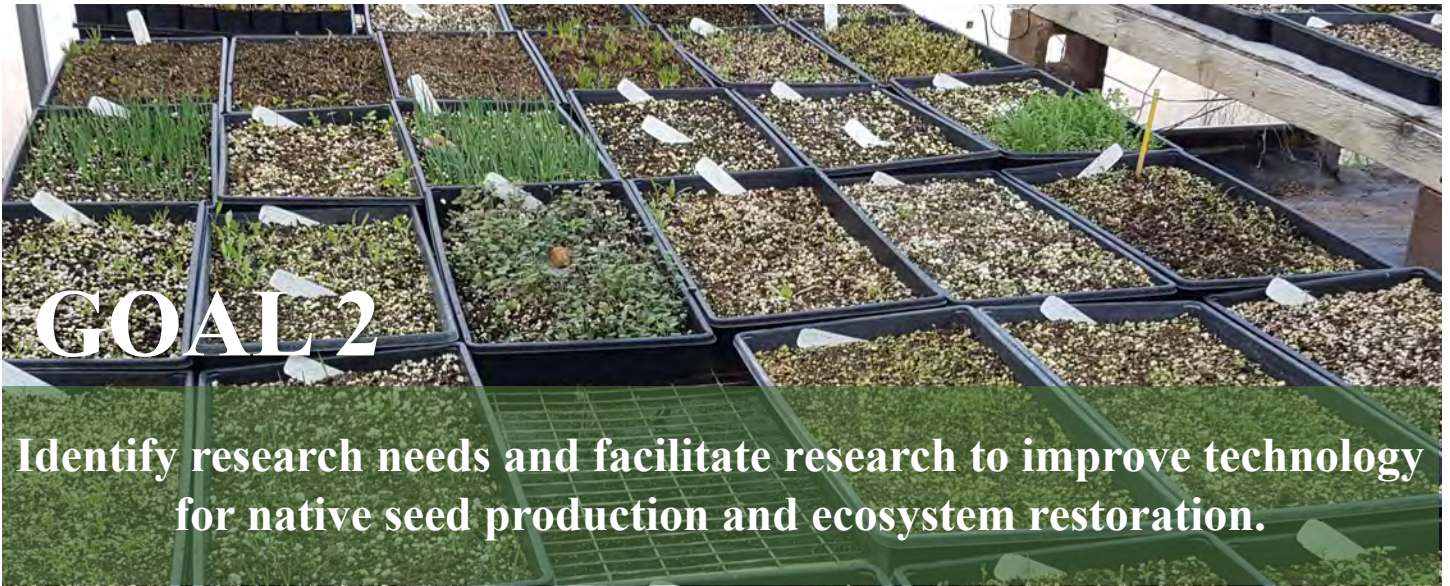
Increase the reliable supply of genetically appropriate native seed through the creation of shrub orchards (e.g. sagebrush, bitterbrush, white bursage, creosote) for commercial seed harvesting. Orchards can be established on public, tribal, and private lands and will be maintained for annual seed collection.

LINKS TO OTHER ACTIONS:

COORDINATING PARTNERS: NDF, NRCS, UNR, WBC

EXISTING RESOURCES: UNR land, WBC land, NRCS Great Basin Plant Materials Center, NRCS Tucson Plant Materials Center, NDF nurseries, tribal, state, and federal lands





The use of native plants to restore disturbed communities is essential to increase diversity, improve ecosystem function, and create resilient landscapes to meet management objectives. To ensure adapted plant materials are available, additional research is needed. Research needs include: (1) Identifying target species and populations that will be the most successful across Nevada’s diverse habitats, (2) Utilizing targeted research to improve production, restoration outcomes and plant establishment, and (3) Characterizing genetic variation of restoration species to develop and inform seed transfer guidance.

them more desirable (i.e. competitive with cheatgrass, drought tolerant, or easier to grow and produce seed in an agronomic setting).

Action 2.1.1 Develop lists of target native plant species

Develop and prioritize species for seed production and restoration. The NNSP will first determine criteria for identifying target species, and then review existing scientific literature and datasets, conduct interviews with experts, and have discussions with restoration practitioners to gather the relevant information. This action will result in a suite of target species for various habitats, which can then be prioritized for production, research, and restoration.

LINKS TO OTHER ACTIONS: 1.1.1 Identify target species for seed collection and increase, 1.1.2 Identify Nevada’s workhorse species

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: NNSP staff, herbarium collections, Western Forbs: Biology, Ecology, and Use in Restoration Manual, GBNPP annual reports, NRCS Plant Materials Program manuals and guides, USGS Land Treatments Digital Library

Objective 2.1



Conduct research to identify target and workhorse species and populations for use in rehabilitation, reclamation, and restoration

Managing species diversity is key to maintaining and restoring ecosystems, with each species being a tool that land managers can use to maintain or build ecosystem structure and function. Seed source selection is not one size fits all; some species and populations may have unique attributes that make



Action 2.1.2 Assess collections and populations of target and workhorse native shrubs, grasses and forbs sourced from Nevada for their restoration utility

Because of local adaptation, species and populations differ in many characteristics, and screening trials can identify which seed sources are the best at establishing under realistic field scenarios. Testing may include management-scale seedings, genetic analysis, laboratory, greenhouse and small-plot field tests. Assessment will ideally cover plant performance during all stages of a plant life cycle and testing the most effective methods for establishment, including testing new agricultural technology in rangeland restoration settings.

LINKS TO OTHER ACTIONS: 1.1.2 Identify Nevada’s workhorse species

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: UNR faculty, students, and facilities, WBC land, NDF nurseries, federal and state lands, common garden network (some sites established), GBNPP, MDNPP

Action 2.2.1 Create an integrated and streamlined implementation plan for research

Quantitatively evaluating the effectiveness of native seeds and their application in real-world restoration settings against business-as-usual approaches is critical to understanding ongoing research needs and market scalability. Managers are challenged to incorporate such experiments into planning for a number of reasons. For example, Emergency Stabilization and Rehabilitation (ES&R) and/or Burned Area Emergency Response (BAER) plans are ideal for integrating research, however, time constraints for submitting plans can hinder experimentation.

The NNSP will establish cooperative agreements and policies to facilitate experiment implementation and data collection to answer research questions. This pre-planning exercise will also allow us to conduct multiple trials and experiments in a coordinated fashion. Annual meetings will be held to coordinate research priorities and identify synergies.

LINKS TO OTHER ACTIONS: 1.3.2 Maintain and expand the internal ArcGIS online database, 4.2.2 Organize and implement the annual Nevada Native Seed Forum

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: NNSP staff

Action 2.2.2 Conduct research to improve seed cleaning and storage of target and workhorse species

Maintaining availability of viable seed is crucial for successful restoration, and correct cleaning and storage protocols can improve viability and extend the life of seeds, stabilizing availability.

Development of reliable species-specific protocols for maintaining seed quality and viability during seed cleaning and storage are required to ensure that seed reserves are available when needed.

LINKS TO OTHER ACTIONS: 1.2.2 Expand warehouse capacity and hire a dedicated seed warehouse manager



Use targeted research to improve seed production, restoration outcomes, and plant establishment

Increasing the use of native species requires greater knowledge of requirements for seed production, seedling establishment, species interactions, and more effective strategies for conducting restoration in Nevada. Restoration research will be long-term, collaborative among all the involved parties, and interdisciplinary. Research outcomes will be reported through publications and transmitted to users via tools described in Goal 3.

COORDINATING PARTNERS: BLM, NDF, NRCS, TNC, UNR, USFS, WBC

EXISTING RESOURCES: Western Forbs: Biology, Ecology, and Use in Restoration Manual, GBNPP annual reports, NRCS Plant Materials Program manuals and guides, USFS Bend Seed Extractory protocols, U.S. Department of Agriculture (USDA) Woody Plant Seed Manual

Action 2.2.3 Develop species-specific protocols for seed and seedling production that maintain genetic diversity

Research is needed to aid producers in propagating seed and nursery seedlings efficiently and economically while maintaining genetic diversity. An assessment of target species, current research, and production practices will be conducted to identify knowledge gaps for individual species. Combining research with agricultural technology will help fill these knowledge gaps to develop production practices for Nevada's target and workhorse rehabilitation, reclamation, and restoration species.

LINKS TO OTHER ACTIONS: 2.3.1 Conduct common gardens and genetic analyses for target and workhorse species, 2.3.2 Develop a genetic management plan for producers and land managers

COORDINATING PARTNERS: NNSP, GBNPP, MDNPP

EXISTING RESOURCES: Provisional and empirical seed zones, peer-reviewed models and research describing best practices for maintaining diversity, Seeds of Success collection protocol, Western Forbs: Biology, Ecology, and Use in Restoration Manual, Association of Official Seed Certifying Agencies (AOSCA) guidelines, NRCS Plant Materials Program manuals and guides, USDA Woody Plant Seed Manual



Action 2.2.4 Develop site preparation, seeding, and transplanting strategies that improve plant establishment and community diversity

There is a need to identify issues limiting successful restoration from seed or transplants and prioritize needed research activities to overcome these barriers. Broad research topics will include: factors limiting plant establishment, seed technologies, species interactions (among natives and between natives and nonnatives), and strategies for meeting challenging restoration situations such as wildland fire, annual invasive monocultures, and over utilization by livestock or wild horses and burros.

LINKS TO OTHER ACTIONS: 3.1.1 Identify, update, and develop guides, protocols, and factsheets for production and application of native seed in Nevada

COORDINATING PARTNERS: NNSP, GBNPP, MDNPP

EXISTING RESOURCES: Peer-reviewed scientific papers, USGS Land Treatments Digital Library, Western Forbs: Biology, Ecology, and Use in Restoration Manual, GBNPP annual reports, MDNPP, USDA Woody Plant Seed Manual

Action 2.2.5 Identify the most effective seed mixes for rehabilitation, reclamation, and restoration

Optimizing seed mixes by including species and populations that are complementary in resource use could improve restoration by promoting facilitative, rather than competitive interactions, and ultimately increase site productivity and restoration success. Researchers will examine available retrospective data to evaluate short- and long-term responses of seed mixes and environmental conditions to characterize establishment and longevity of species at treatment sites and develop BMPs and guidelines for developing seed mixes.

LINKS TO OTHER ACTIONS: 1.1.3 Develop a working group to create seed menus

COORDINATING PARTNERS: NNSP, GBNPP, MDNPP

EXISTING RESOURCES: USGS Land Treatments Digital Library, ES&R and BAER plans, provisional and empirical seed zones, Science Framework for Conservation and Restoration of the Sagebrush Biome (Part 2), Western Forbs: Biology, Ecology, and Use in Restoration Manual, GBNPP annual reports, MDNPP, NRCS ecological site descriptions and land resource units, UNR/NRCS disturbance response groups

Objective

2.3

Characterize genetic variation of restoration species to inform seed increase and seed transfer guidance

Seed transfer guidance is the best available science for making decisions about which native seed sources will perform the best at any particular location. Seed zones allow land managers to use locally adapted seed sources while developing economies of scale to lower seed costs. Seed transfer guidance is available for most dominant grasses in the Great Basin and for a few shrub and

forb species in the Mojave, but this information is lacking for many other species commonly found in Nevada. Actions within this objective will foster the research needed to further refine and develop seed zones, and inform where and how to best use these species in restoration.

Action 2.3.1 Conduct common gardens and genetic analyses for target and workhorse species

Common gardens and genetic analyses are complementary efforts that help practitioners understand the distribution of adaptive genetic diversity. To complement and expand on existing common garden collaborations, we will identify a series of locations across Nevada's diverse habitats where common gardens can be implemented for multiple target species. A coordinated network would have the benefit of streamlining site preparation and maintenance, permitting and environmental clearance, data collection, and comparability among studies.

LINKS TO OTHER ACTIONS: 2.2.3 Develop species-specific protocols for seed and seedling production that maintains genetic diversity, 2.3.2 Develop a genetic management plan for producers and land managers

COORDINATING PARTNERS: NNSP, GBNPP, MDNPP

EXISTING RESOURCES: Common garden network (some sites established), plant tissue collection by SOS teams using USFS collection protocols, herbarium collections, protocols for creating seed zones from common garden experiment data, provisional and empirical seed zones, information on genetic diversity and distribution for a small number of species, Western Forbs: Biology, Ecology, and Use in Restoration Manual



Action Item 2.3.2 Develop a genetic management plan for producers and land managers

Genetic diversity can be altered at multiple phases of the restoration process, including the initial seed collection, seed production and increase, and project level seed use. We will develop a genetic management plan for workhorse and target plants, reflecting the unique biology and seed transfer guidance of each species, for each of these phases, with the goal of leveraging genetic diversity for restoration needs.

LINKS TO OTHER ACTIONS: 1.1.1 Identify target species for seed collection and increase, 2.3.1 Conduct common gardens and genetic analyses for target and workhorse species

COORDINATING PARTNERS: NNSP, GBNPP, MDNPP

EXISTING RESOURCES: Common garden network (some sites established), plant tissue collection by SOS teams using FS collection protocols, herbarium collections, protocols for creating seed zones from common garden experiment data, provisional seed zones, empirical seed zones for many common species, information on genetic diversity and distribution for a small number of species, Western Forbs: Biology, Ecology, and Use in Restoration Manual, NRCS Plant Materials Program manuals and guides, Association of Official Seed Certifying Agencies (AOSCA) guidelines



Left: BLM, TNC, and USFWS personnel seeding plots with grass mixes on the Martin Fire, December 2018. Right: USFWS and UNR monitoring emerged seedlings, June 2019.

The NNSP helped implement an historic post-fire seeding trial, testing multiple seed mixes at the 2018 Martin Fire, Humboldt County, Nevada.

Local seeds of native grasses were collected by an SOS team based in the Winnemucca BLM field office, and source-identified by NDA. Seeds were tested for favorable characteristics at UNR, and optimal populations were identified. Seeds were then increased by BFI Natives, resulting in a delivery of 12,000 pounds

of locally-collected, source-identified seeds returning to Nevada in 2018, which were securely stored by NDF.

Our field trial is testing the performance of these genetically appropriate, local seeds alongside a standard drill mix led by USFWS, and an herbicide resistance experiment implemented by TNC. First-year seedling establishment data collection by USFWS and UNR showed excellent performance of the genetically appropriate, local seed mix.



GOAL 3

Develop and implement tools that enable managers and producers to make decisions about collecting, increasing, and using genetically appropriate seed.

Land managers are often faced with uncertainty when it comes to making informed decisions on native seed, and producers face uncertainty about what species to increase. New tools are needed to help land managers understand the availability of appropriate seed and predict the efficacy of restoration treatments, and producers to decide which species to increase. Additionally, as the native seed industry in Nevada grows, tools that allow for greater interconnectedness between land managers and producers will be necessary to best utilize Nevada-produced native seed. Tools that centralize locations for information and develop economic support structures will aid in the entry into the native seed industry, facilitate decision making on the use of native seed, and increase the availability of genetically appropriate seed for rehabilitation, reclamation, and restoration work in Nevada.

compile comprehensive resources and develop databases and websites that provide information on seed needs and seed availability, including the identification and use of seed zones and seed menus. These resources will outline techniques for the seeding and increase of genetically appropriate native seed. Cooperation and partnerships within and among public and private sectors will achieve these actions.

Action 3.1.1 Identify, update, and develop guides, protocols, and factsheets for production and application of native seed in Nevada

Identify existing and needed restoration guides, protocols, and factsheets about seed collection, production, and application of native seed. The NNSP will compile existing materials, revise outdated ones, and develop new ones to create a restoration portfolio that can be used by the NNSP and other partners.

LINKS TO OTHER ACTIONS: 1.3.4 Develop Best Management Practices for seed collection in Nevada, 2.2.4 Develop site preparation, seeding, and transplanting strategies that improve plant establishment and community diversity

COORDINATING PARTNERS: NNSP

Objective

3.1



Compile data on native seed source availability, production, and use, and create tools for accessing the data

To increase the development and use of genetically appropriate native seed by managers, practitioners, producers, and stakeholders, it will be necessary to

EXISTING RESOURCES: Western Forbs: Biology, Ecology, and Use in Restoration Manual, NRCS Plant Materials Program manuals and guides, NDA and UNR Cooperative Extension outreach materials, AOSCA guidelines, GBNPP annual reports, MDNPP, USDA Woody Plant Seed Manual

Action 3.1.2 Develop and maintain a website to provide access to resources about the collection, production, and application of native seed in Nevada

Develop and maintain a NNSP website that will provide public access to a wide array of resources, guides, protocols, and factsheets on the collection, production, and application of native seed. The website will also feature links to provisional and empirical seed zone maps and scientific publications on native seed, and incorporate a seed-needs function that allows users to identify target species for collections, production, and/or restoration.

LINKS TO OTHER ACTIONS: 1.3.4 Develop Best Management Practices for seed collection in Nevada, 2.2.3 Develop species-specific protocols for seed and seedling production that maintain genetic diversity, 2.2.4 Develop site preparation, seeding, and transplanting strategies that improve plant establishment and community diversity, 2.2.5 Identify the most effective seed mixes for rehabilitation, reclamation, and restoration

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: IT teams at various NNSP offices

Action 3.1.3 Develop trainings and resources to introduce and implement seed menus

The NNSP will develop trainings and resources on seed menus and other tools, implement these trainings for land managers, practitioners, producers, and stakeholders.

LINKS TO OTHER ACTIONS: 1.1.3 Develop a working group to create seed menus

COORDINATING PARTNERS: BLM, NDA, NRCS, USFS, USFWS

EXISTING RESOURCES: NNSP staff, Seedlot Selection Tool (USFS, Oregon State University, and Conservation Biology Institute), Provisional and empirical seed zones, NRCS ecological site descriptions and land resource units, UNR/NRCS disturbance response groups

Action 3.1.4 Develop a seed inventory system and forecasting tool for Nevada

Create a dynamic tool that links multiple databases to develop a Nevada seed inventory system, including forecasting tools. The seed inventory system will help forecast and predict seed needs and identify critical seeding areas as well as provide updates of seed availability and a list of commercial producers and nurseries. This tool will also help to stabilize the market allowing producers to forecast and predict desired species for rehabilitation, reclamation, and restoration. In the short term, our best available data will be provided to help determine future demand based on past purchases of seed and predictions of future needs.

LINKS TO OTHER ACTIONS: 1.1.1 Identify target species for seed collection and increase by assessing planned seeding projects, intersecting with empirical and/or provisional seed zones

COORDINATING PARTNERS: BLM, NDA, NDF, NDOW, USFS, USFWS

EXISTING RESOURCES: BLM inventory and seed warehouse reporting, NDA seed certification program, NDF purchasing, sales, and inventory records, NDOW seed purchasing records, USFS seed purchasing records, USFWS seed purchasing records



Objective

3.2



Develop tools to encourage market stability and develop coordinated approaches for procurement

The combination of high-interannual variability in seed use and geographic variation in seed needs creates a high level of uncertainty in the seed market, which harms both producers and managers. Sudden peaks in demand after wildfires are too rapid for immediate response by the seed industry, and result in spikes in price as available seed supplies are readily depleted. As a result, managers pay more for less seed, while the seed industry misses an opportunity to improve the volume of sales.

Tools, including new contracting and procurement methods, need to be created to smooth peaks in demand. Creating stability in demand encourages the market, resulting in a more reliable supply of seed. Further, development of a native seed cooperative would encourage native seed production through the pooling of resources and production efforts. Finally, producers need to be trained in the use of contracts and forecasting tools. Working collaboratively will help to provide certainty for all.

Action 3.2.1 Identify or develop contracting methods that promote certainty and stability for producers and buyers

Investigate contracting methods that minimize the problems associated with inter-annual variability in demand for native seeds and geographic variation in seed use, which create market uncertainty.

Contracting methods could include risk-sharing contracts that provide financial incentives from producers to users, and longer-term (3-5 year) contracts. Contract innovation for purchasing procedures and active coordination between land managers and producers can mitigate market risk, resulting in better restoration outcomes and a more

stable market.

LINKS TO OTHER ACTIONS: 3.2.4 Develop trainings and materials for Federal and State contracting

COORDINATING PARTNERS: BLM, NCDP, NDF, NDOW, NRCS, USFS

EXISTING RESOURCES: Federal indefinite delivery/indefinite quantity (IDIQ) contracts, Good of the State contracts, Nevada Shared Stewardship Agreement

Action 3.2.2 Create a streamlined approach for procuring native seed

Coordination is critical for increasing availability, lowering costs, and stabilizing demand for native seed. Under this action, we will identify the mechanisms and tools needed to streamline procurement and communication between Federal and State agencies (e.g. interagency agreements, Good Neighbor authorities). Improved procurement between agencies will also encourage existing and new producers to meet seed needs through mechanisms such as indefinite delivery/indefinite quantity contracts, blanket purchase agreements, and permitting practices.

LINKS TO OTHER ACTIONS: 4.2.1 Develop and implement a comprehensive external communications plan

COORDINATING PARTNERS: BLM, NDA, NDF, NDOW, NRCS, USFS, USFWS

EXISTING RESOURCES: Federal IDIQ contracts, Good of the State contracts, Nevada Shared Stewardship Agreement, NRCS Environmental Quality Incentives Program (EQIP)

Action 3.2.3 Establish a Nevada Native Seed Cooperative

Investigate models for successful seed cooperatives from other regions, and make recommendations for how to create a seed cooperative for Nevada that addresses both Great Basin and Mojave species. A seed cooperative can mitigate some of the effort and cost of entering the native seed industry by providing shared operational support and resources



(including foundation seeds, planting and harvesting equipment), shared infrastructure for seed storage, and a community with shared goals and a pool of experience from which to draw advice.

LINKS TO OTHER ACTIONS: 1.2.2 Expand warehouse capacity and hire a dedicated seed warehouse manager, 1.2.3 Establish a Nevada Foundation Seed Program and hire a dedicated manager, 1.3.1 Expand seed collection and source identification efforts in Nevada, 1.3.4 Develop Best Management Practices for seed collection in Nevada, 2.2.2 Conduct research to improve seed cleaning and storage of target and workhorse species, 3.2.1 Identify or develop contracting methods that promote certainty and stability for producers and buyers

COORDINATING PARTNERS: NNSP, MDNPP

EXISTING RESOURCES: NNSP staff, existing seed cooperatives in other regions (e.g. Snake River Seed Cooperative, Institute for Applied Ecology’s Native Seed Network)

Action 3.2.4 Develop trainings and materials for Federal and State contracting

Develop trainings and materials specific to seed procurement that will outline the steps required to meet Federal and State contracting criteria. The training and materials will encourage new entrants into the seed industry, as well as simplify the process for existing seed producers.

LINKS TO OTHER ACTIONS: 3.2.1 Identify or develop contracting methods that promote certainty and stability for producers and buyers

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: US Small Business Administration and Nevada Department of Administration trainings and resources, Federal Contracting Officers, State of Nevada Purchasing Division



Left: NDOW hosts a sagebrush seed collection volunteer event in Spring Creek, Nevada where volunteers of all ages hand-pick sagebrush seed that is then sent to be cleaned before it is mixed with additional seed for use on large landscape-scale projects. Right: A hopper of sagebrush seed is loaded into an airplane for aerial application on the 2018 West Duck and Martin Fires. Bottom: A hopper in the process of being loaded.

Seed of species native to Nevada are commonly used in the collaborative fire rehabilitation and habitat restoration efforts of BLM and NDOW across northern Nevada. However, a majority of the seed available on a scale large enough to fulfill the needs for these landscape-level projects is sourced and/or produced in other western states and is rarely adapted to the local conditions where it is being applied in Nevada. While there has been short-term success of drill- and aerially-applied native seed, the long-term success of these efforts will be improved with the availability of genetically appropriate and/or locally-adapted native seed. Because of this, a

conscious effort is being made to purchase seed that is locally-sourced for rehabilitation and restoration projects. For example, for the last several years, most of the sagebrush (*Artemisia* sp.) seed used for rehabilitation projects in the Elko BLM District has been wildland collected within the Elko District from similar precipitation and elevation zones to where it's planned for application. When needed for large landscape-scale rehabilitation projects, the locally-collected seed is batched with seed acquired from similar seed transfer zones and applied across the expansive burn areas.



Successful implementation of this Strategy will require broad communication and outreach to engage NNSP agencies, partners, and stakeholders in the shared goals of the Strategy. NNSP agencies and partners play an important role in achieving the Strategy’s goals, with progress fostered as a collaborative effort. Communications should be tailored to key audiences, including federal, state, and non-governmental agency partners, collaborators, other stakeholders, and interested publics. Each NNSP agency or partner will report progress on Strategy implementation to leadership and other Strategy participants. An emphasis on feedback, evaluation, and improvement of the Strategy will help ensure it remains relevant and responsive to evolving needs. Success stories, lessons learned, and recommendations for improvements should be highlighted in communications products and materials.



Objective 4.1



Internal coordination and communications: Distribute and implement the Strategy across NNSP agencies and partners

Action 4.1.1 Ensure staff support to continue coordination and communication among NNSP organizations

Managing the progress and communications of the NNSP needs ongoing support from dedicated staff. NNSP leadership will ensure this level of commitment continues or is increased commensurate with the progress of the NNSP either through the direction of staff time or the commitment of resources to expand capacity.

LINKS TO OTHER ACTIONS: 4.1.3 Communicate to NNSP leadership to report progress, 4.2.1 Develop and implement a comprehensive external communications plan

COORDINATING PARTNERS: NNSP leadership

EXISTING RESOURCES: NNSP monthly meetings

Action 4.1.2 Conduct monthly NNSP meetings

Continue monthly NNSP meetings to facilitate implementation of the Strategy. Meetings will be organized by a designated facilitator within the NNSP, who will establish a date, time, and location for meetings. Meeting agendas will be developed collaboratively with the intent that each NNSP member has sufficient opportunity to address Strategy progress, ideas, and concerns. Meetings will include discussions of NNSP progress, including successes, challenges, and ideas for improving effectiveness, and also include planning discussions for coordinated research efforts on an annual basis. Additional NNSP partners can be added as needed in response to interest and need.

LINKS TO OTHER ACTIONS: 4.1.3 Communicate to NNSP leadership to report progress, 4.2.1 Develop and implement a comprehensive external communications plan

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: NNSP monthly meetings

Action 4.1.3 Communicate to NNSP leadership to report progress

In addition to formal leadership meetings, NNSP members will be responsible for communicating to their leadership on NNSP progress to ensure that their interests are being met. As staff turnover and changes in funding occur for NNSP members, members will confer with their leadership to ensure that these changes do not hinder NNSP progress or persistence and/or to designate new representatives for participation with the NNSP. Changes that may affect the NNSP will be addressed on an annual basis in meetings with NNSP members and their leadership.

LINKS TO OTHER ACTIONS: 4.1.1 Ensure staff support to continue coordination and communication among NNSP organizations, 4.1.2 Conduct monthly NNSP meetings

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: NNSP monthly meetings, NNSP leadership meetings

External coordination and communications:



Conduct education and outreach through the Nevada Native Seed Partnership

The NNSP is uniquely suited to communicate with and connect individuals and organizations that have interest and expertise in expanding the availability and use of native seed. The importance of this Strategy and the significant role of collaboration in meeting the Strategy's goals should be shared with a broad audience and incorporated into partner communications and materials, as appropriate.

Action 4.2.1 Develop and implement a comprehensive external communications plan

The formation of a more formal, strategic communications plan will accelerate the dissemination and uptake of key information about native seed and plant materials. Once developed, disseminate information by creating communications tools such as videos, press releases, social media platforms, or other supporting communications materials. Communications will focus on connecting stakeholders with information and opportunities, including topics such as: New and useful fact sheets and tools, funding opportunities, relevant publications, and case-studies of local successes.

Channels for marketing of these materials may include social media, email listservs, regional publications, meetings, and other forums. Additionally, the NNSP will coordinate outreach to individuals and local groups (e.g. local conservation districts and weed management agencies) who express an interest in native seeds and provide educational presentations and meetings upon request.



LINKS TO OTHER ACTIONS: 3.1.1 Identify, update, and develop guides, protocols, and factsheets, 3.1.2 Develop and maintain a website to provide access to resources, 3.1.3 Develop trainings and resources to introduce and implement seed menus, 3.1.4 Develop a seed inventory system and forecasting tool for Nevada, 3.2.1 Identify or develop contracting methods that promote certainty and stability for producers and buyers, 3.2.2 Create a streamlined approach for procuring native seed, 3.2.3 Establish a Nevada Native Seed Cooperative, 3.2.4 Develop trainings and materials for Federal and State contracting

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: NNSP monthly meetings, NNSP annual forum, NNSP leadership meetings, Western Forbs: Biology, Ecology, and Use in Restoration Manual, NRCS Plant Materials Program manuals and guides, GBNPP, MDNPP, Great Basin Joint Fire Science Exchange, existing social media platforms for NNSP agency partners

Action 4.2.2 Organize and implement the annual Nevada Native Seed Forum

Organize the annual Nevada Native Seed Forum to bring producers, technical experts, and land managers together to discuss native seed production in Nevada. This forum will distribute available resources and tools, while increasing awareness and facilitating knowledge transfer among current and potential native seed producers.

LINKS TO OTHER ACTIONS: 3.1.1 Identify, update, and develop guides, protocols, and factsheets, 3.1.2 Develop and maintain a website to provide access to resources, 3.1.3 Develop trainings and resources to introduce and implement seed menus, 4.2.1 Develop and implement a comprehensive external communications plan

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: NNSP staff

Action 4.2.3 Organize native seed-focused field visits and tours

Field tours are particularly effective for communicating successes, challenges, and opportunities to a variety of target audiences. The NNSP will organize field tours for land managers, producers, and other interested parties to production fields, seed storage and cleaning facilities, seeding projects, and seed collection sites, to help build awareness of this collaborative effort and increase the breadth of the partnership.

LINKS TO OTHER ACTIONS: 1.2.2 Expand warehouse capacity and hire a dedicated seed warehouse manager, 2.2.4 Develop site preparation, seeding, and transplanting strategies that improve plant establishment and community diversity, 2.2.5 Identify the most effective seed mixes for rehabilitation, reclamation, and restoration, 4.1.2 Conduct monthly NNSP meetings

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: Common garden network (some sites established), UNR field plots, NRCS Great Basin Plant Materials Center, NRCS Tucson Plant Materials Center, BLM Ely Regional Seed Warehouse, NDF seedbank, UNR seedbank, seeding projects associated with various NNSP agencies



Objective

4.3



Report progress, recognize achievements, and revise Strategy

Actions under this objective will encourage external and internal communication and feedback and raise the visibility of rehabilitation, reclamation, and restoration efforts that result from actions outlined in the Strategy. Planning for progress, achievements, and revisions to the Strategy will help ensure the goals remain relevant, and that the NNSP is responsive to changes in knowledge, practices, and needs.

Action 4.3.1 Establish a mechanism to report on the progress and achievements of the Strategy

Under this action, NNSP annual leadership meetings would provide a feedback mechanism for NNSP members to report progress and achievements. This could facilitate the production of an annual report to track progress on the Strategy for use and analysis for Action 4.3.2.

LINKS TO OTHER ACTIONS: 4.1.2 Conduct monthly NNSP meetings, 4.2.2 Organize and implement the annual Nevada Native Seed Forum

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: NNSP monthly meetings, NNSP leadership meetings, timelines set in the strategy



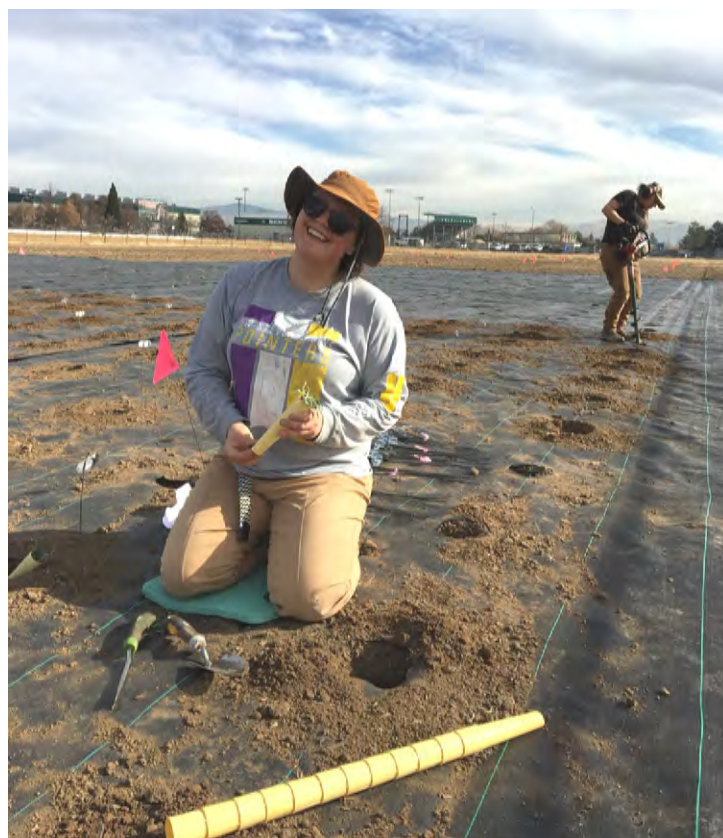
Action 4.3.2 Review and revise the Strategy

The Strategy will be reviewed by the NNSP every 1 to 3 years and by NNSP leadership every 5 years. Review of the Strategy will allow for refinement of goals, objectives, or actions, and development of new goals, objectives, or actions. Strategy editors will be designated within the NNSP.

LINKS TO OTHER ACTIONS: All

COORDINATING PARTNERS: NNSP

EXISTING RESOURCES: NNSP



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Glossary

The glossary describes terms referenced in the Nevada Seed Strategy. These terms are defined with the intent of providing clarity for their use in this Strategy. These terms have been previously described by agencies, organizations, or in scientific literature; however the terms may have been modified to meet the purposes of this document. Sources include: Beck et al. 2006, BLM 2018, Bower et al. 2014, Caudle et al. 2013, Gann et al. 2019, Havens et al. 2015, Johnson et al. 2012, Johnson et al. 2014, Johnson and Vance-Borland 2016, Johnson et al. 2017, NAC 587.222–256, Kramer et al. 2015, PCA 2015, Shryock et al. 2017, Shryock et al. 2018, St. Clair et al. 2013, and USFS 2008.

Adapt (Adaptability): To become fitted to one's environment and its pressures, as a result of natural selection.

Annual: A plant species that completes its lifecycle within one growing season.

Best Management Practices (BMPs): Utilizing the best available methods to achieve a desired project outcome.

Common Garden: An experiment where different genotypes, populations, or varieties are grown together in the same environment such that environmental effects on trait expression are minimized and genetic differences are more readily observed.

Conservation: The preservation and protection of natural landscapes.

Cultivar (Plant Variety): Cultivated subdivision of a selected plant species which is distinct, uniform and stable.

Demand: The total amount of seed desired by the market, whether available or not.

Ecological Site Descriptions (ESDs): Reports that provide detailed information about a particular kind of land - a distinctive ecological site. ESDs include

site-specific management information about natural vegetation, invasive plants, forestry, grazing, wildlife, and soil properties.

Empirical Seed Zone: Empirical seed zones are developed for individual species based on climate variables and a species' genetic variation across their distribution through the following steps: (1) Researchers collect seed from diverse geographic and climatic areas of the targeted region; (2) Researchers evaluate plantings from collected seeds in common gardens for production, morphology, phenology, and physiological traits; (3) Researchers develop regression models that link genetic variation across the landscape with collection location environments to delineate seed zones for the collected species.

Foundation Seed: The earliest certified generation of seed available to producers for seed production (G1 seed). (See also source identification in the glossary; Johnson et al. 2012, Johnson et al. 2014, Johnson and Vance-Borland 2016, Johnson et al. 2017, Shryock et al. 2017, St. Clair et al. 2013).

Genetic Diversity: The amount of genotypic variability between the same species, or different species, within a defined region.

Genetically Appropriate: Native seeds or plant materials environmentally adapted to a site that are likely to establish, persist, and promote community and ecological relationships. (See also seed transfer guidance in the glossary).

Genetics: The study of plant genes, heredity and genetic variation between species.

Germplasm: Living plant tissue from which new plants can be established (ie. seed, leaf, stem, pollen).

Great Basin: A contiguous geographic region, encompassing a major portion of the Western United States, spanning nearly all of northern Nevada, much of Oregon and Utah, and portions of California and Idaho.

Invasive Plant: A plant that is both nonnative and able to establish on many sites, grow quickly, and spread to the point of disrupting plant communities or ecosystems.

Locally Adapted: A plant that performs better in a particular environment than other individuals of the same species, and is more likely to establish and persist.

Mojave Desert: A contiguous geographic region, encompassing southeastern California and southern Nevada, with small areas extending into Utah and Arizona.

Native: Indigenous terrestrial and aquatic plant species that have evolved and occur naturally in a particular region, ecosystem, or habitat.

Nonnative: Alien, foreign, nonindigenous, or exotic plant species that have been introduced by humans to a location(s) outside its native or natural range.

Plant Biology: The study of how plants function and interact with their environment.

Plant Establishment: The ability for a plant to emerge from seed and mature into a healthy, sustainable organism.

Plant Phenology: Study involving effects that seasonality and climate has on plants, including germination, emergence, flowering, dieback, etc.

Population: The total number of specific plant species within a defined geographic region.

Propagation: The process by which plants are grown into new plants through the use of seed or other sources.

Provisional Seed Zone: Provisional seed zones are based on climate data and used for species for which empirical seed zones have not been developed. Provisional seed zones in combination with established ecoregions can be used to guide seed transfer. (See also empirical seed zone in the glossary; Bower et al. 2014, Shyrock et al. 2018).

Reclamation: Actions to stabilize the terrain, assure public safety, improve aesthetics, and usually to return the land to what, within the regional context, is considered to be a useful purpose.

Rehabilitation: Rehabilitation emphasizes the reparation of ecosystem processes, productivity, and services, whereas the goals of restoration also include the reestablishment of the preexisting biotic integrity in terms of species composition and community structure.

Restoration: The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.

Seed Cleaning: The process through which a seed collection/crop is processed to ensure a higher level of purity.

Seed Collection Permit: An official document issued to an applicant intending on collecting seed from public lands.

Seed Increase: The production of seed with intent to yield a higher amount than what was originally available.

Seed Menus: Resource guides that allow prospective seed user to select the appropriate seed or seed mix based upon site characteristics.

Seed Mix: A mixture of seed from various species that can be applied to the landscape for reclamation, rehabilitation, or restoration.

Seed Orchard: A field, whether agricultural or not, that is used to specifically produce a seed crop.

Seed Transfer Guidelines: Recommendations for protecting adaptations of wild populations by restricting seed transfer only to areas where they will grow, reproduce successfully, and produce no adverse genetic effects

Seed Zone: A mapped area with fixed boundaries in which seeds or plant materials can be transferred for the best chance of success. There are two types of seed zones - provisional and empirical. (See also provisional seed zone and empirical seed zone in the glossary).

Source Identification: Inspected seed that is harvested from uncultivated land, seed production areas, seed fields, or orchards where no selection or testing of the parent population has been conducted (G0 seed). (See also foundation seed in the glossary)

Supply: Total amount of seed available on the open market.

Target Species: Species that are prioritized for collection, research, and/or increase due to demand, habitat needs, fire history, and other factors. These species are prioritized by the NNSP under Action 1.1.1. A species can be both a target and workhorse species.

Viability (viable): The percent of seed that is capable of germination and developing into a mature plant under suitable conditions.

Workhorse Species: Species that are abundant across a wide range of ecological settings, establish quickly, and produce high ground cover on disturbed sites.



Organization Acronyms

Name	Acronym
Association of Official Seed Certifying Agencies	AOSCA
Bureau of Land Management (DOI)	BLM
Department of the Interior	DOI
Great Basin Native Plant Project	GBNPP
Great Basin Institute	GBI
Mojave Desert Native Plant Program	MDNPP
Natural Resources Conservation Service	NRCS
Nevada Department of Agriculture	NDA
Nevada Division of Forestry	NDF
Nevada Department of Wildlife	NDOW

Name	Acronym
Nevada Conservation Districts Program	NCDP
Reno-Sparks Indian Colony	RSIC
Rocky Mountain Research Station (USFS)	RMRS
The Nature Conservancy	TNC
University of Nevada, Reno	UNR
U.S. Department of Agriculture	USDA
U.S. Fish and Wildlife Service (DOI)	USFWS
U.S. Forest Service (USDA)	USFS
U.S. Geological Survey	USGS
Walker Basin Conservancy	WBC

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Nevada Native Seed Partnership

Beth Leger (University of Nevada, Reno)

Bettina Scherer (Nevada Conservation Districts Program)

Brittany Trimble (Nevada Department of Wildlife)

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Coreen Francis (Bureau of Land Management)

Dash Hibbard (Walker Basin Conservancy)

Dirk Netz (U.S. Forest Service)

Eric Roussel (Nevada Division of Forestry)

Fred Edwards (Bureau of Land Management)

James Gatzke (Walker Basin Conservancy)

Jess Kindred (Great Basin Institute)

Judy Perkins (Bureau of Land Management)

Karri Honaker (Natural Resources Conservation Service)

Kevin Badik (The Nature Conservancy)

Lara Kobelt (Bureau of Land Management)

Lee Davis (Nevada Department of Wildlife)

Lee Turner (Nevada Department of Wildlife)

Lesley DeFalco (U.S. Geological Survey)

Liz Munn (The Nature Conservancy)

Meghan Brown (Nevada Department of Agriculture)

Michael Taylor (University of Nevada, Reno)

Mitch Markey (Reno-Sparks Indian Colony)

Russ Wilhelm (Nevada Department of Agriculture)

Ryan Sharrer (Nevada Division of Forestry)

Sarah Kulpa (U.S. Fish and Wildlife Service)

Sophia Heston (Great Basin Institute)

Zach Ormsby (Nevada Conservation Districts Program)

