Increasing Native Forb Seed Supplies for the Great Basin

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Abstract: Over the last 150 years, excessive grazing, annual weed invasions, increased wildfire frequency, and other human disturbances have negatively impacted native plant communities of the Great Basin. Native plant materials and appropriate planting strategies are needed to re-create diverse communities in areas requiring active restoration. Although native forbs are critical components of most plant communities, available seed supplies remain low. A cooperative research project being conducted by the USDI Bureau of Land Management Great Basin Restoration Initiative, the USDA Forest Service Rocky Mountain Research Station, and collaborators includes efforts to develop 20 native forbs as revegetation species. Research needs include selection of seed sources and development of seed production and wildland seeding technology for each species. Initial seed increase of new seed sources and maintenance of seed supplies will require production at a range of scales, likely creating new marketing niches for the native seed and nursery industries.

Keywords: native forbs, plant materials, seed production, seeding, rangelands

Introduction

The Great Basin Division of the Intermountain Region as defined by Cronquist and others (1972) (Figure 1) on a floristic basis includes the hydrographic Great Basin with no external drainage, as well as the Owyhee Uplands and Snake River Plain of southern Idaho drained by the Snake River. It encompasses about 200,000 mi^2 (518,000 km^2) with more than two-thirds publicly owned.

Although the population of the Great Basin is low, human impacts have been considerable. Livestock grazing in the late 1800s and early 1900s depleted herbaceous vegetation from great expanses, leaving them vulnerable to invasion by less palatable species. "The Western Range," a report prepared by the Secretary of Agriculture (USDA 1936), stated that during the preceding 30 years, about 95% of the public domain was degraded, and forage was depleted on about 67% of public lands.

The Eurasian annual grasses, cheatgrass (*Bromus tectorum*) and medusahead wildrye (*Taeniatherum caput-medusae*), were introduced in the Western States in the late 1800s and spread rapidly across degraded rangelands (Young and Evans 1970; Mack 1986). A 1994 survey of Great Basin States and Washington (Pellant and Hall 1994) indicated that about 17 million ac (6.9 million ha) of USDI Bureau of Land Management (BLM) lands were dominated or infested with cheatgrass, while an additional 60 million ac (24.3 million ha) were classified as vulnerable. D'Antonio and Vitousek (1992) called the spread of cheatgrass "the most significant plant invasion in the modern history of North America." The invasive annuals senesce early and provide continuous mats of fine fuels. These lengthen fire seasons and increase fire frequencies

Figure 1—The Great Basin (Cronquist and others 1972).

and sizes, deplete native vegetation and seedbanks, and open additional areas for weed invasions. The cheatgrass/wildfire cycle frequently provides conditions for replacement by noxious perennial weeds that are even more difficult to control. In 1996, the spread of invasive species on BLM and USDA Forest Service lands was estimated at 4,000 ac (1,600 ha) per day (USDI BLM 1996).

Pinyon-juniper communities of the Great Basin generally occupy areas at higher elevations that receive somewhat greater precipitation, ranging from 10 to 20 in (25 to 50 cm) per year. Expansion of these communities over the last 150 years has resulted from increasing temperatures, nitrogen, and atmospheric CO_2, heavy post-European settlement livestock grazing, and fire suppression and consequent decreases in fire frequency (Tausch 1999). As a result, these woodlands have expanded into sagebrush and other communities. The conifers provide shade and litter that permit them to out-compete other natives, leaving the soil vulnerable to erosion and colonization by invasive exotics (West and Young 2000).

The above impacts, as well as agricultural development and urbanization, have led to degradation, loss, and fragmentation of plant communities throughout the Great Basin. Protecting the remaining sagebrush and salt desert shrublands, as well as less widespread communities, has become a major challenge within the Great Basin and throughout the Intermountain West. Loss of species diversity in sagebrush communities alone has resulted in at least 338 plant and animal species being considered at risk (Wisdom and others 2003). The decline of sage-grouse, a sagebrush obligate, has led to petitions for population and species listing (Kritz 2004). Restoring their habitat is becoming a major focus of management and restoration efforts.

Great Basin Restoration Initiative

In response to these problems, and in particular to the wildfires of 1999 that burned 1.7 million ac (700,000 ha) of Western rangelands, the Great Basin Restoration Initiative was launched to provide an approach for protecting and restoring native plant communities. The aim of this Initiative is to proactively plan for restoration at the landscape level (USDI BLM 1999, 2000, 2004b). Its 3 major goals are to:

1. Maintain native plant communities where healthy land exists now or can be restored by modifying standard management practices.
2. Restore degraded landscapes to improve land health and reduce invasive species, especially those responsible for altered fire regimes.
3. Sustain long-term multiple use and enjoyment of public land in the Great Basin and provide potential economic opportunities to local communities in the restoration process.

A Coordinator and team are in place and work has been conducted through a number of cooperative research, management, and public sector efforts including:

1. Eastern Nevada Landscape Coalition.
2. Integrating Weed Control for the Great Basin.
3. Coordinated Intermountain Restoration Project.
4. Cheatgrass Risk Assessment Mapping.
5. Southern Idaho Sagebrush/Sage-Grouse Habitat Project.
6. Great Basin Native Plant Selection and Increase Project.

Increasing the Availability and Use of Native Seed Supplies

A major focus of the Great Basin Restoration Initiative has been to accelerate the transition to greater use of native species in restoration seedings on rangelands. Introduced grasses and forbs have long been used to improve forage availability on disturbed rangelands, while native shrubs have been seeded or transplanted to improve disturbed wildlife habitat. Public interest in restoring and protecting biodiversity, repairing degraded ecosystems, and slowing the spread of exotic vegetation has contributed to greater emphasis on the use of native plant materials. This has been formalized in documents recommending use of native species when feasible (USDI and USDA 2002), including Executive Memoranda and Orders (Clinton 1994, 1999), agency regulations, and the FY02 Interior Appropriations Bill.

Recent decades have seen increases in BLM use of regional and local native seed sources. Although some native grasses are collected from wildlands, most available native species are grown as released cultivars and germplasms produced in seed fields. Shrub seeds are generally collected from native wildland stands, while native forb seeds may be wildland collected or produced in seed fields. Figure 2 compares average annual native and introduced seed purchases for the 1985 to 1991 and 1998 to 2002 periods as percentages of the total annual seeds purchased by weight. For the 1998 to 2002 period, nearly 2.9 million lb (1.3 million kg)

of seeds were purchased annually. Native seed purchases had increased to 47% of the total compared to 15% for the 1985 to 1991 period. Greatest increases were for native shrub and grass seeds, while native forb purchases continued to represent less than 1% of the total. From 1998 to 2002, an average of 8 of the 69 species purchased were native forbs (Figure 3).

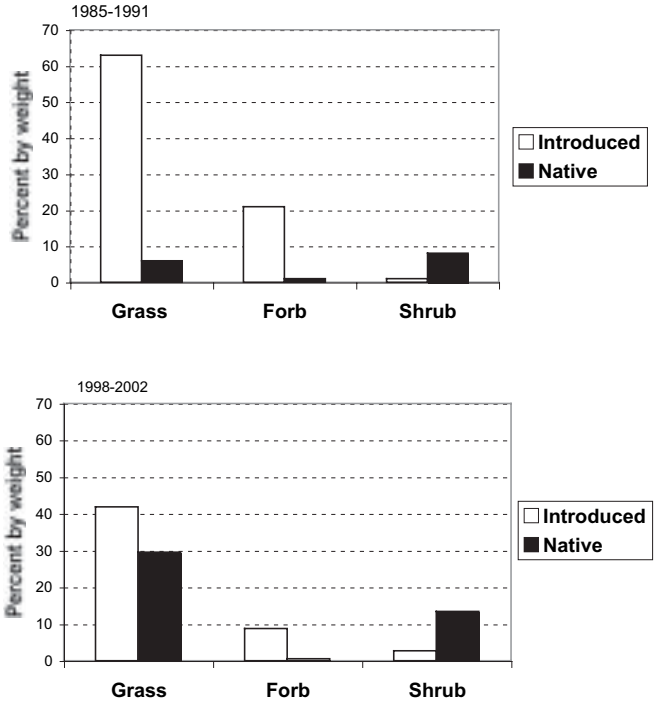

Figure 2—Native and introduced species of grass, forb, and shrub seeds purchased by the USDI Bureau of Land Management from 1985 to 1991 and 1998 to 2002 on a percent by weight basis (USDI BLM 2004a).

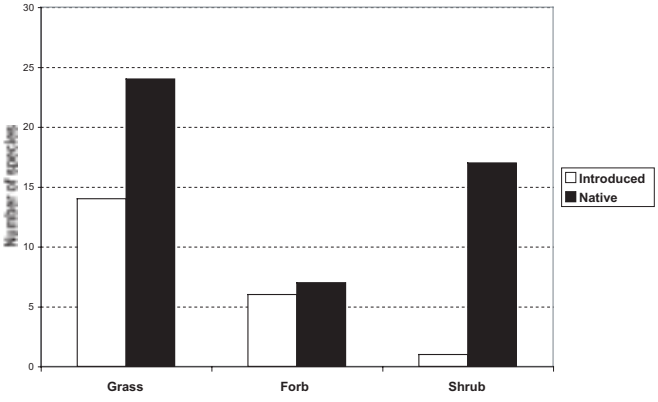

Figure 3—Average number of introduced and native grass, forb, and shrub species purchased annually by the USDI Bureau of Land Management from 1998 to 2002 (USDI BLM 2004a).

Development of a BLM regional seed storage facility in Boise, Idaho, has facilitated revegetation planning and seed purchasing, storage, and distribution. A Regional Seed Coordinator compiles BLM District seed purchase requests. These are advertised for consolidated seed buys, with seeds stored at the Boise location or at warehouses rented or owned by the Districts until needed. Requests for field-grown cultivars or germplasms as well as Source Identified wildland collected seeds (Young and others 2003) are becoming more common. In addition, where use of locally adapted germplasm is a high priority, some Districts may collect or contract seed collection from specific areas. Collected seeds may be used immediately or increased by private growers if larger quantities of seeds are required or if the need for a particular source is expected to extend over a period of years.

The "Guidebook to the Seeds of Native and Non-native Grasses, Forbs, and Shrubs of the Great Basin" (Lambert, forthcoming) provides lists of species suitable for revegetation uses in major plant communities of each Level III Ecoregion (Omernik 1987) within the Great Basin, along with ecological information and characteristics of each species, seed costs, and recommended seeding rates. In addition, some Districts are creating lists of priority revegetation species suitable for widespread plant communities.

Great Basin Native Plant Selection and Increase Project

To increase the availability of native seed supplies, particularly native forbs, for rehabilitation of burned areas and restoration of degraded rangelands in the Great Basin and the technology for their use, a collaborative research project was developed between the USDI BLM and the USDA Forest Service, Rocky Mountain Research Station Shrub Sciences Laboratory and their cooperators (Table 1). Objectives of this group, The Great Basin Native Plant Selection and Increase Project, are to (1) increase the supply of native plant materials available for restoration, (2) manage or restore seed sources on wildlands and develop technology to improve the diversity of introduced grass seedings, and (3) provide technology transfer. Support for this work has been provided through a 5-year agreement with the USDI BLM Great Basin Restoration Initiative and funding from the Native Plant Initiative.

Why Forbs?

Although forbs are components of most native communities, the use of native forbs in revegetation has been limited (McArthur and Young 1999) (Table 2). Forbs are needed to increase biodiversity, resist the spread of weeds, and improve habitat diversity (Shaw and Monsen 1983; Stevens and others 1985; Walker and Shaw, forthcoming). They increase forage quality and season of availability. Forbs provide soil stabilization and cover, and they improve aesthetics of wildlands, recreational sites, and domestic landscapes (Parkinson 2003). Forb fruits, seeds, and leaves are important foods for upland game birds and other organisms. Their importance to sage-grouse (Connelly and others 2000) plays a critical role in considerations for revegetation within the range of this species.

Table 1—Great Basin Native Plant Selection and Increase Project cooperators.

Primary cooperators
USDI Bureau of Land Management, Great Basin Restoration Initiative, and UT, NV, ID, and OR State Offices
USDA Forest Service, Rocky Mountain Research Station, Shrub Sciences Laboratory, Provo, UT, and Boise, ID
Utah Division of Wildlife Resources, Great Basin Research Center, Ephraim, UT
USDA Agricultural Research Service, Forage and Range Research Laboratory, Logan, UT
USDA Natural Resources Conservation Service, Aberdeen Plant Materials Center, Aberdeen, ID
USDA Agricultural Research Service, Bee Biology and Systematics Laboratory, Logan, UT
USDA Agricultural Research Service, Western Regional Plant Introduction Station, Pullman, WA
USDA Forest Service, National Tree Seed Laboratory, Dry Branch, GA
Association of Official Seed Certifying Agencies and State Foundation Seed Programs of ID, NV, OR, UT, and WA
Brigham Young University, Departments of Integrative Biology and Plant and Animal Science, Provo, UT
Colorado State University, Cooperative Extension Service, Tri-River Area, Grand Junction, CO
Oregon State University, Malheur Experiment Station, Ontario, OR
Utah Crop Improvement Association, Logan, UT
Private seed industry
Additional cooperators
Boise State University, Larry Selland College of Applied Technology—Horticulture Program, Boise, ID
Idaho State Department of Agriculture, Seed Laboratory, Boise, ID
Idaho State Department of Fish and Game, Jerome, ID
Nitragin Company, Milwaukee, WI
Oregon State University, Seed Laboratory, Corvallis, OR
Nevada State Seed Laboratory, Carson City, NV
USDA Forest Service, National Forest Genetic Electrophoresis Laboratory, Placerville, CA
USDA Forest Service, Boise National Forest, Lucky Peak Nursery, Boise, ID
USDA Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, Corvallis, OR
USDA Agricultural Research Service, Poisonous Plant Research Laboratory, Logan, UT
Harold Wiedemann (retired), Texas A & M University, College Station, TX

A large number of forb species are present in the Great Basin. They represent a variety of plant families and exhibit differing reproductive strategies, fruit and seed types, sizes, and shapes, and requirements for germination and seedling establishment. Some species are abundant, widely distributed, and occur across a wide variety of environments, while others are narrowly restricted endemics. Literature on the biology of native forbs is generally limited. Thus, considerable effort and resources are required to develop seed production and wildland seeding technology for each candidate revegetation species. This makes difficult the challenge of providing adapted native forb seed supplies for the Great Basin.

Native forbs offer unique problems in seed collecting, handling, and seeding. Seeds of many species are generally hand collected from wildland stands (Davison 2004). Seed production is highly erratic; thus cost and seed availability are unpredictable. Collections are often contaminated with weed seeds. Seed handling guidelines, cleaning methodologies, and storage requirements are generally not known. Standardized seed quality testing procedures have not been developed. Few seed and vegetative propagation protocols for use in seed fields or establishment on wildland sites are available, and guidelines are often fragmentary. Jensen and others (2001), Lambert (1999, forthcoming), Native Plant Network (nd), Shaw and Monsen (1983), Stevens and Monsen (2004), Stevens and others (1985, 1996), Walker and Shaw (forthcoming), and Wasser (1982) provide summaries for some Great Basin species.

To date, few seed sources of native forbs have been developed for the Great Basin. This is illustrated by Table 3, which provides a list of native forbs released by the USDA Natural Resources Conservation Service and their cooperators for the Intermountain area. In addition to released materials, contract growing for agencies and speculation growing of wildland collections made by seed producers or their collectors are now becoming more common.

Forb Research

Selection of species on which to focus research efforts was accomplished through examination of floras, field survey lists, and herbaria. It also included consultations with taxonomists, wildlife biologists, botanists, and revegetation specialists. Consideration was given to species that are fairly widespread in arid and semiarid areas of the Great Basin and are of greatest concern to the BLM, including degraded big sagebrush, salt desert shrub, and pinyon-juniper communities. Seed production characteristics and potential were also evaluated, as markets for individual species are not likely to develop if seed costs are unreasonably high. Likewise, growers are reluctant to begin growing new species if seed production, harvesting, or processing problems appear insurmountable. Forb species initially selected for research plus those added in subsequent years are listed in Table 4. This table also lists grasses and shrubs being studied by cooperators in the Great Basin Native Plant Selection and Increase Project.

Initial research has involved germplasm collection from throughout the Great Basin and surrounding areas for establishment of common gardens and studies of physiological, morphological, and molecular traits. These will aid in evaluating the nature and extent of variability occurring within species and their subspecific taxa, and in determining the ecological and geographic distances that plant materials may be transferred from their site of origin. As yet, seed transfer zones, expected to differ among species, are not available for native forbs. Although a number of classification systems are available (for example, Bailey and others 1994), use of Level III Ecoregions (Omernik 1987) as an interim surrogate for seed transfer zones has been suggested (Withrow-Robinson and Johnson 2004), but with the caution that finer divisions have been necessary for many forest tree species.

Table 2—USDI Bureau of Land Management forb seed purchases in 2000.

Scientific name	Common name	Origin[a]	lb	kg
Medicago spp.	Alfalfa (Ladak and others)	I	99,490	45,130
Sanguisorba minor	Small burnet	I	53,930	24,460
Linum perenne	Blue flax (Appar)	I	51,020	23,140
Onobrychis viciaefolia	Sainfoin	I	40,100	18,190
Achillea millefolium	Western yarrow	N	12,290	5,570
Melilotus officinalis	Yellow sweet clover	I	12,050	5,470
Astragulus cicer	Cicer milkvetch	I	6,250	2,830
Penstemon palmeri	Palmer penstemon	N	810	370
Sphaeralcea grossulariifolia	Gooseberryleaf globemallow	N	390	180
Helianthus spp.	Sunflower	N	230	105
Cleome serrulata	Rocky Mountain beeplant	N	100	45
Helianthus annuus	Annual sunflowers	N	90	40
Sphaeralcea munroana	Munro globemallow	N	50	20
Penstemon strictus	Rocky Mountain penstemon	N	30	15

[a] I = introduced, N = native.

Table 3—Native forbs released by the USDA Natural Resources Conservation Service and their cooperators for the Intermountain area[a].

Scientific name	Common name	Origin	Release	Class
Artemisia ludoviciana	Louisiana sage	ID	Summit	Cultivar
Eriogonum niveum	Snow buckwheat	OR	Umatilla	Cultivar
Eriogonum umbellatum	Sulfur buckwheat	CA	Sierra	Cultivar
Hedysarum boreale	Utah sweetvetch	UT	Timp	Cultivar
Linum lewisii	Lewis flax	UT	Maple Grove	Selected
Penstemon angustifolius	Narrow leaf penstemon	NM	San Juan	Selected
Penstemon eatonii	Eaton penstemon	UT	Richfield	Selected
Penstemon palmeri	Palmer penstemon	UT	Cedar	Cultivar
Penstemon strictus	Rocky Mountain penstemon	NM	Bandera	Cultivar
Penstemon venustus	Venus penstemon	ID	Clearwater	Selected
Sphaeralcea coccinea	Scarlet globemallow	ID	ARS-2936	Selected
Sphaeralcea munroana	Munro globemallow	UT	ARS-2892	Selected

[a] Englert and others (2002).

Basic studies of plant life histories, particularly phenological development, breeding systems, and seed biology and ecology, provide data required for developing agricultural seed production systems for individual species. In some cases, species identified here or related species have been used in revegetation efforts. Knowledge gaps are identified and research is being conducted to develop technology needed for all phases of seeding, harvesting, handling, testing, and storage. Seed dormancy is particularly problematic for field or nursery establishment of most Great Basin forbs due to long prechill requirements.

Species-specific cultural practices are required to produce reliable seed crops at reasonable prices. Ongoing research on herbicide tolerances and appropriate application rates will permit control of common weeds with minimal impact to the forb species being propagated. Irrigation studies are being conducted to determine water requirements and evaluate the feasibility of using drip irrigation to conserve water and discourage weed growth. Determination of specific soil conditions, seedbed microsite requirements, and inoculum specificity for legumes are providing growers with guidelines for seeding to improve the return from limited quantities of seeds during initial increases. This data will also aid in developing strategies for establishing the species in wildland seedings.

Insects are important as pollinators of many forb species and as predators of seeds and vegetative plant parts. Studies of breeding systems and native populations are aiding in determining whether reproduction is pollinator-limited. Identified pollinators of wild populations and currently managed bee species are being tested as pollinators for seed production fields. This research will contribute to knowledge of pollination requirements and use and management of captive pollinator populations where appropriate to improve seed production. Seed and plant predatory insects become problematic where host species are seeded as monocultures. Determination of areas of occurrence, host species, and life histories are contributing to development of management strategies.

Products of forb research will include native forb plant materials adapted to defined areas of the Great Basin and the technology required to produce and maintain seed supplies of each. This technology will provide a basis for developing appropriate seeding technology for establishing these species on wildland sites.

Table 4—Grass, forb, and shrub species included in the Great Basin Native Plant Selection and Increase Project.

Family species	Common name	Growth form
Apiaceae		
Lomatium dissectum	Fern-leaf biscuitroot	Forb
Lomatium grayi	Gray's biscuitroot	Forb
Lomatium nuttallii	Nuttall desert parsley	Forb
Lomatium triternatum	Nineleaf biscuitroot	Forb
Asteraceae		
Achillea millefolium	Western yarrow	Forb
Agoseris glauca	Pale agoseris	Forb
Artemisia tridentata	Big sagebrush	Shrub
Balsamorhiza hookeri	Hooker balsamroot	Forb
Balsamorhiza sagittata	Arrowleaf balsamroot	Forb
Chrysothamnus nauseosus	Rubber rabbitbrush	Shrub
Crepis acuminata	Tapertip hawksbeard	Forb
Erigeron pumilus	Shaggy fleabane	Forb
Capparidaceae		
Cleome lutea	Yellow beeplant	Forb
Chenopodiaceae		
Atriplex canescens	Fourwing saltbush	Shrub
Ceratoides lanata	Winterfat	Shrub
Fabaceae		
Astragalus eremiticus	Hermit milkvetch	Forb
Astragalus filipes	Threadstalk milkvetch	Forb
Astragalus utahensis	Utah milkvetch	Forb
Hedysarum boreale	Utah sweetvetch	Forb
Lupinus argenteus	Silvery lupine	Forb
Lupinus sericeus	Silky lupine	Forb
Vicia americana	American vetch	Forb
Viguiera multiflora	Showy goldeneye	Forb
Liliaceae		
Allium acuminatum	Tapertip onion	Forb
Linaceae		
Linum lewisii	Lewis flax	Forb
Malvaceae		
Sphaeralcea coccinea	Scarlet globemallow	Forb
Sphaeralcea grossulariifolia	Gooseberryleaf globemallow	Forb
Sphaeralcea munroana	Munro globemallow	Forb
Poaceae		
Achnatherum hymenoides	Indian ricegrass	Grass
Achnatherum thurberianum	Thurber needlegrass	Grass
Hesperostipa comata	Needle and thread	Grass
Elymus elymoides	Squirreltail	Grass
Elymus multisetus	Big squirreltail	Grass
Leymus cinereus	Basin wildrye	Grass
Pascopyrum smithii	Western wheatgrass	Grass
Poa secunda	Sandberg bluegrass	Grass
Pseudoroegneria spicata	Bluebunch wheatgrass	Grass
Polemoniaceae		
Phlox longifolia	Longleaf phlox	Forb
Polygonaceae		
Eriogonum heracleoides	Wyeth buckwheat	Forb
Eriogonum ovalifolium	Cushion buckwheat	Forb
Eriogonum umbellatum	Sulfur buckwheat	Forb
Rosaceae		
Purshia tridentata	Bitterbrush	Shrub
Scrophulariaceae		
Penstemon acuminatus	Sharpleaf penstemon	Forb
Penstemon cyaneus	Blue penstemon	Forb
Penstemon deustus	Scabland penstemon	Forb
Penstemon pachyphyllus	Thick-leaf penstemon	Forb
Penstemon palmeri	Palmer penstemon	Forb
Penstemon speciosus	Sagebrush penstemon	Forb

Seed Increase: The Native Seed and Nursery Industry Connection

The private sector native seed and nursery industries are extremely important components of the native forb development project. The selection and increase of native forb materials has been handled through the conventional variety release program administered by Foundation Seed programs in each State for crop species. An alternative, the Pre-Variety Germplasm (PVG) system, was developed to provide native plant materials when supplies of seeds or vegetative materials are needed quickly in somewhat limited quantities, generally for specific geographic areas (Young and others 2003). Materials are released through this system as Source Identified, Selected, Tested, or Cultivar/Variety. Prevariety germplasm releases can be tracked by State seed certification systems.

Two programs are available for seed growers or nurseries willing to grow small lots of native forbs, Utah's Foundation Seed Program and the Cooperative Native Seed Increase Program. A buy-back program, operated by Utah's Foundation Seed Program and supported in part by the Native Plant Selection and Increase Project, provides early generation seeds of new releases to growers and includes a buy-back option in the contract to purchase seeds from the first crop for distribution to secondary growers. Information on this program may be obtained from Stanford Young, Seed Certification Specialist, Utah State University, Logan, UT (e-mail: sayoung@mendel.usu.edu).

The Association of Official Seed Certifying Agencies (AOSCA) and Foundation Seed Agencies in Idaho, Nevada, Oregon, Utah, eastern Washington, and other areas surrounding the Great Basin administer the second program known as the Cooperative Native Seed Increase Program (USDA FS nd). Small quantities of Source-Identified seeds collected from areas of revegetation concern to the BLM are provided to seed growers along with available knowledge and literature on seed production of the species or of related species. Foundation Seed Agencies will purchase seeds during the first 2 crop years up to an agreed upon minimum. Additional seeds not purchased by State agencies can be sold on the open market as G2 seeds. Growers also agree to provide records of their cultural practices applied to production of these seeds. When initial wildland collections of desired populations are extremely small, initial increase may be grown at a State or Federal nursery, a NRCS Plant Material Center, or university field site. Details of this program may be obtained by contacting Ann DeBolt, USDA Forest Service, Rocky Mountain Research Station, Boise, ID (e-mail: adebolt@fs.fed.us). Table 5 lists the species currently being increased through these 2 programs.

Summary

Although forbs are components of most native plant communities, the incorporation of native forb species in revegetation projects in the Great Basin has been limited, largely due to inadequate seed supplies. Recognition of forb values for increased biodiversity, soil stabilization, improved aesthetics and wildlife, and the critical shortages realized after the 1999 and 2000 fire seasons has boosted efforts to increase their supplies. Through the Great Basin Restoration Initiative and subsequent development of the Great Basin Native Plant Selection and Increase Project, collaborative on-going research and partnerships focused on increasing the supply of native plant materials, managing and restoring seed sources on wildlands, developing technology to improve the diversity of introduced grass seedings, and technology transfer products will create and

Table 5—Native species being increased through the AOSCA Cooperative Native Seed Increase and Buy-back Programs.

Species	Common name	Seed origin	Production State	AOSCA	Buy-back
Achillea millefolium	Western yarrow (Eagle)	ID	WA		X
Achnatherum thurberianum	Thurber needlegrass	ID, NV	ID	X	X
Balsamorhiza hookeri	Hooker balsamroot	ID	CO, ID		X
Balsamorhiza sagittata	Arrowleaf balsamroot	NV, OR	ID, UT	X	
Crepis acuminata	Tapertip hawksbeard	NV	NV, UT	X	X
Cleome lutea	Yellow beeplant	NV	NV	X	
Eriogonum heracleoides	Wyeth buckwheat	ID	UT	X	
Eriogonum ovalifolium	Cushion buckwheat	NV	NV	X	
Eriogonum umbellatum	Sulfur buckwheat	NV	ID	X	
Lomatium dissectum	Fern-leaf biscuitroot	ID, OR	NV, UT	X	X
Lomatium triternatum	Nineleaf biscuitroot	ID	ID, OR		X
Penstemon acuminatus	Sharpleaf penstemon	ID	OR		X
Penstemon cyaneus	Blue penstemon	ID	CO, ID, WA	X	X
Penstemon deustus	Scabland penstemon	ID	ID		X
Penstemon pachyphyllus	Thickleaf penstemon	UT	OR		X
Penstemon speciosus	Sagebrush penstemon	ID, OR	ID, UT	X	
Poa secunda	Sandberg bluegrass (Mtn. Home)	ID	WA		X
Pseudoroegneria spicata	Anatone bluebunch wheatgrass	WA	ID, OR, WA		X
Sphaeralcea grossulariifolia	Gooseberryleaf globemallow	NV	OR		X
Sphaeralcea munroana	Munro globemallow	OR	OR	X	
Sphaeralcea parvifolia	Smallflower globemallow	UT	CO		X

stabilize markets for the native seed and nursery industries while restoring important native plant communities.

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