Final Report
ISDA Nursery, Landscape, and Florists Grant Program

Improvement, Propagation, and Commercialization of Native Plants for Water-Conserving and Traditional Landscapes

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Abstract

Objective: Domesticate wild-collected, water-conserving native plants for use by the Idaho nursery industry. Activities include collection, evaluation, increase, and commercialization of Intermountain West native plants.

Accomplishments: A significant 2014 advancement for the program was recruitment by Native Roots, LLC of 5 nurseries to serve as retail outlets for domesticated native plant products. Additionally, 5 new species of plants, including *Agastache rupestris, Eriogonum compositum, Eriogonum heracleoides, Penstemon cardinalis, and Penstemon humilis,* were added to the Native Roots product list. Wholesale production of the entire 35-plant product inventory is under way, with sales projected to include seed, liners, 4-inch pots, and gallon pots.

With intent to maintain a constant stream of new products for commercial exploitation, additional plant collections were made in 2014. Sixty-six accessions were acquired as cuttings or seed during an excursion designed to sample diminutive, high-elevation flora from mountain ranges in central Idaho, southeast Oregon, Nevada, and Utah. Additional acquisitions were made as purchases or donations from Alplains, the American Penstemon Society, and the Denver Botanical Garden.

All activities of the plant domestication research project supported by this ISDA grant were completed and advanced in 2014. Native plants were collected, evaluated, selected, included in seed increases, and subjected to propagation investigations.Accessions of native plants aquired in 2013 were germinated in flats, replanted into pots, then transplanted to the field in the spring of 2013. Of the 270 acquisitions, 234 were successfully established in evaluation plots.

Evaluations continued on 460 accessions of plants currently maintained in evaluation plots. Inferior or marginal plant materials were selectively eliminated. Superior accessions were retained in the plots and seed collected from the best plants within each accession for the purpose of initiating a second cycle of selection and to provide

propagation material for establishing seed increase blocks. Sixteen additional plant species were established in breeder seed increase blocks on the experiment station. An additional 14 prospective plant products were transferred to Native Roots, LLC for inclusion in their foundation seed farm in Filer, Idaho. Thirty-six native plant products are schedule for wholesale and retail sales in 2015.

Objectives

This project is guided by four primary objectives:

1) Acquire diverse native plant germplasm with potential to become viable nursery products.
2) Evaluate native and adapted species under limited water availability to determine their potential contribution to attractive water-conserving landscapes.
3) Select and develop market-ready native trees, shrubs, and perennials.
4) Produce usable quantities of seed or propagules and transfer this native plant material to the Native Roots partnering company for the purpose of creating marketable products for the Idaho nursery industry.

The ultimate goal is to develop unique plant materials that will attract new consumers and help keep Idaho nurseries competitive and profitable, especially - but not limited to - nurseries specializing in the production and sale of plants for water-conserving and sustainable landscapes.

Accomplishments

Acquisition of New Plant Material:

Methods: During July 28 through August 2, a plant collection foray was completed with specific intent to acquire diminutive, high elevation forms of native species. Target sites included exposed ridges, primarily at elevations above 9,000 feet, in nine Idaho, Oregon, Nevada, and Utah mountain ranges. Sample sites included the Lemhi Range, White Clouds Peaks, Seven Devils Mountains, Hell's Canyon East Rim, Wallowa Mountains, Ruby Range, Markagunt Pleateau, Henry Mountains, and Abajo Mountains. Plant cuttings and seeds were also collected on a trip into north-central Idaho and during some other brief forays. Additional seeds were acquired as purchases from Alplains, and donations from the American Penstemon Society and the Denver Botanical Garden.

Wayne Jones and Tony McCammon searching the Wallowa Mountains for horticulturally valuable plants.

Results: Sixty-six plant collections were made as seed or cuttings during the July-August excursion. Another 46 collections were made during the north Idaho and other miscellaneous forays. Added to the 43 aquisitions from other collecters, the count is approximately 155 new accessions available for next year's field establishment and evaluation. The 79 accessions collected during this past summer as stem or root cuttings are being over-wintered in the greenhouse. The remainder were collected as seed that will be stratified, scarified, or pretreated using other appropriate methods beginning in December 2014.

Evaluation and Selection of Native Plant Accessions:

Methods: Three hundred eighty-nine accessions of native plants obtained in 2013 were germinated in the greenhouse and prepared for field establishment and evaluation. Beginning December 2014, seeds of species requiring cold treatment were mixed with moist potting soil, placed in Ziploc bags, and stratified for one to two months at 40^0 F. Where appropriate, seeds of some species were also hot-water scarified or warm-stratified. In March and April, pretreated seed was planted in flats and allowed to germinate in a greenhouse at the Aberdeen R&E Center. When plants were 3-4 weeks old, a maximum of 40 plants from each seed lot were teased out of flats and planted into small pots. In late May, these pot-grown plants were transplanted to the field on the Aberdeen R&E Center. One hundred sixty-nine accessions were successfully established in the evaluation plots. Observations recorded on these first-year plants include propagation success, response to field establishment, growth rate, and potential for first-year bloom.

Assorted native plant species in evaluation plots at the Aberdeen R & E Center, June 2014.

Horticultural performance evaluations were continued on the three acres of native plant accessions (460 accessions representing 260 species) established during the period 2006 through 2013. The plots were exposed to environmental factors designed to allow selection of adapted, drought tolerant species. The evaluation plots were located in a field with moderately heavy silt-loam soil and a high pH (8.2). Drought stress was imposed by limiting irrigation with water applications comprised of 25 to 30% (based on evapo-transpiration) of water needed to maintain a bluegrass lawn in SE Idaho. Six inches of supplemental (above natural precipitation) water was applied to the plots over the period June to August. Rains in August served to shorten the necessary irrigation season. During the growing season, plot by plot observations were recorded describing hardiness, soil and climate adaptation, mature appearance, flower color, bloom period, plant longevity, pest issues, and general horticultural value.

Results: Native plant species with superior adaptation and horticultural performance were identified through comparative evaluations. Seed was collected from the best plants within superior accessions. Seed was cleaned, packaged, labelled, and made available for additional cycles of selection or for introduction into breeder seed increase blocks. Entire accessions or plants within accessions were eliminated if they showed excessive winter injury, weakened growth due to lack of adaptation to soil or climate, short life-span, poor flowering characteristics, unsightly appearance during any part of the growing season, disease or pest susceptibility, or any other inferior horticultural trait.

In addition to superior accessions identified in previous years, a number of new species emerged as outstanding performers in 2014. Examples of up and coming species include:

Dark pink flowers of *Phlox colubrina*, the Snake River phlox.

Snake River phlox (*Phlox colubrina*): This local, narrow endemic, from the Hell's Canyon region, is a remarkably attractive representative of the genus. Its native habitat is comprised of dry, rocky, sun-baked slopes, lending considerable drought tolerance to this species. The loosely mounded plants grow to a height of about 8 inches. The gray leaves are long and narrow. The flowers are large, dark pink, and bloom for 5 to 6 weeks, typically in late May and June. The combination of drought tolerance, adaptation to alkaline soils, bright flower color, and long bloom period, give this plant exceptional potential for use in foregrounds of mixed xeric beds and borders.

Short growth habit and prolific bloom of selected common harebell (*Campanula rotundifolia.*)

Common harebell (*Campanula rotundifolia*): This is a widespread but often under-appreciated native plant species. The selected form has compact growth habit, limited rhizomatous spread, and prolific bloom. A low mound of dark green, spoon-shaped leaves forms in spring, followed by flowering stalks with smaller linear leaves and medium to dark blue flowers. The flowers are bell-shaped and nodding. The primary bloom period lasts for 5 to 6 weeks in June and July. Repeat blooms are often present in smaller numbers, providing summer-long beauty to any low-water garden. Although quite drought tolerant, this species is probably at its best where it receives periodic supplemental irrigation and may also benefit from some light shade.

Low-growing, prolific plants of Colorado tansyaster (*Machaeranthera coloradoensis*).

Colorado tansyaster (*Machaeranthera coloradoensis*): A relative of the more common hoary tansyaster, this species is the swan among ugly ducklings. Plants of this very drought tolerant species form mounds of gray, lobed or toothed leaves to a few inches high. The flowers are dark pink and about two inches in diameter. Bloom occurs sporadically from early spring to frost, with the heaviest flowering from May into July. This is a hardy, tough plant that can contribute to any xeric bed, border, or rock garden.

Very attractive plants of Sandia Mountain alumroot (*Heuchera pulchella*).

Sandia Mountain alumroot (*Heuchera pulchella*): This remarkable, small-statured alumroot is native to the Sandia Mountains of New Mexico. This species can grow under a range of conditions, from full sun to moderate shade, and from low to moderate irrigation levels. Plants form mounds of large, dark green leaves that are highlighted with red. Remaining compact in bloom, the dark pink flowers are formed on upright, numerous flower stalks. Blooms last 5 to 6 weeks, occurring in June and July. The foliage remains very attractive throughout the growing season. Although among the most drought tolerant of the alumroots, this species will do best with periodic supplemental irrigation.

Rock clematis (*Clematis columbiana*): A short, scrambling vine, this species can be used as a climbing element, a groundcover, or a horizontal shrub. The selected form of this plant produces numerous short vining stems, red-hued tri-foliate leaves, and pink to lavender flowers. The flowers have narrow, outwardly-curved petals. June flowers are following by round, feathery seed heads. This versatile plant can be used in a number of situations in either water-conserving or traditional gardens. Before this plant can be commercialized, studies will be required to optimize seed germination.

Scrambling vines of rock columbine (*Clematis columbiana*).

Public Evaluation of Advanced Accessions:

Methods: Collaborators working with public and private gardens helped evaluate some of the most advanced native plant materials. Evaluation sites included botanical gardens, arboreta, school plantings, and private gardens.

Native plant evaluation garden at the Blackfoot Extension office.

Results: During the 2014 growing season, new evaluation sites were established at BYU-Idaho in Rexburg, the private residence of Sue Weeg in Pocatello, and with the public works department in Shoshone. New plant materials were added to existing evaluation gardens at the UI arboretum in Moscow and the visitor's center at Harriman State Park in Island Park. Over the period 2008-2013, publicly accessible evaluation gardens have been established at over 25 sites, most of which remain active. These sites serve two purposes: 1) secondary evaluation sites that provide valuable information on plant performance in various climates and production conditions, and 2) public exposure for our improved palette of native plants. Some of the sites also serve as good demonstration gardens for water-conserving landscaping and gardening practices.

Commercialization and Exploitation Activities

Methods: Commercialization activities involve seed production, fabrication of advertising materials, and recruitment of wholesale and retail partners. Breeder seed is being produced at the Aberdeen R & E Center and provides a source of material for transfer to industry. All other marketing activities are completed under the umbrella of the Native Roots, LLC partnering company. Commercial scale seed production is accomplished at the Native Roots, LLC seed production farm in Filer, Idaho following transference of breeder seed.

Internet based and printed advertising materials have been produced for the 35 native plant products that are being produced for sale. A second element of commercialization is wholesale and retail marketing of native plant products. This activity is based in a partnership between the University of Idaho and Native Roots LLC. A marketing plan has been developed that will involve partnerships and contracts between Native Roots, LLC and other native plant wholesalers and retailers.

Results: Breeder seed production at the Aberdeen R & E Center was bolstered by the addition of 16 superior accessions to seed increase blocks, bringing the current total to 160 accessions. Fourteen prospective native plant products were transferred to Native

Roots. This brings the total number of product transfers from 2011 through 2014 to 116. Approximately half of the native plant accessions have been established at the Native Roots foundation seed farm in Filer, Idaho. Most of the production seed blocks produced varying quantities of commercial-quality seed during the 2014 growing season.

Successful commercial-scale seed production has paved the way for a second year of public sales of the first native plant products. Native Roots has prepared seeds, tags, and advertising materials for 35 native plant species introductions, including 5 new introductions released in 2014. New plants prepared for sale in 2015 include *Agastache rupestris, Eriogonum compositum, Eriogonum heracleoides, Penstemon cardinalis, and Penstemon humilis* (See Table 1 for the full plant product list).

Seed production blocks at the Native Roots, LLC production farm in Filer, Idaho.

As part of a progressive sales strategy, Native Roots, LLC has initiated the process of contracting with wholesale and retail marketing partners. To date, the following nurseries have contracted to sell Native Roots plant products: Conservation Seeding & Restoration, Perennial Favorites, Norman's Nursery, Plants of the Wild, and Westscape Wholesale Nursery. More information about the native plant products and suppliers can be found at this Native Roots LLC web site: http://native-roots.net/PDFs/NativeRoots_SpeciesFlyers.pdf.

Table 1. List of 35 native plant products ready for spring 2015 sales by Native Roots LLC, Kimberly, Idaho.

Common Name	**Species Name**		**Common Name**	**Species Name**
Cusick's hyssop	*Agastache cusickii*		Bee balm	*Monarda menthaefolia*
Threadleaf hyssop	*Agastache rupestris*		Cardinal penstemon	*Penstemon cardinalis*
Golden Columbine	*Aquilegia chrysantha*		Yellow penstemon	*Penstemon confertus*
Desert columbine	*Aquilegia desertorum*		Wasatch penstemon	*Penstemon cyananthus*
Rock columbine	*Aquilegia scopulorum*		Lowly penstemon	*Penstemon humilis*
Fringed sage	*Artemisia frigida*		Cordroot penstemon	*Penstemon montanus*
Seaside daisy	*Erigeron glaucus*		Pineleaf penstemon	*Penstemon pinifolius*
Aspen daisy	*Erigeron speciosus*		Richardson's penstemon	*Penstemon richardsonii*
Short-stem buckwheat	*Eriogonum brevicaule*		Bridge's penstemon	*Penstemon rostriflorus*
Arrowleaf buckwheat	*Eriogonum compositum*		Rocky Mountain penstemon	*Penstemon strictus*
Wyeth's buckwheat	*Eriogonum heracleoides*		Whipple's penstemon	*Penstemon whippleanus*
James' Buckwheat	*Eriogonum jamesii*		Big bluegrass	*Poa secunda*
Strict buckwheat	*Eriogonum strictum*		Thurber's cinquefoil	*Potentilla thurberi*
Idaho fescue	*Festuca idahoensis*		Giant purple sage	*Salvia pachyphylla*
Blanketflower	*Gaillardia aristata*		Giant sacaton	*Sporobolus wrightii*
Ross' avens	*Geum rossii*		Hoary Townsend's daisy	*Townsendia incana*
Sundancer daisy	*Hymenoxys acaulis*		Desert zinnia	*Zinnia grandiflora*
Desert 4 o'clock	*Mirabilis multiflora*			

Expenditure Report

In 2014, $12,036 was granted by ISDA for on-going native plant domestication and commercialization. To date, the entire amount has been expended. More than half of the funds were allocated for wages and fringe benefits, the remainder for supplies and travel.

Category	Amount Allocated	Amount Expended
Part-time wages and fringe benefits	$ 8,136	$ 9,311
Travel for collection, marketing activities	$ 1,000	$ 1,000
Seed, pots, trays, labels, soil mix, etc	$ 1,200	$ 25
Field charges, local motor pool, seed	$ 1,700	$ 1,700
Total funds allocated	$12,036	
Total expended to date		$12,036
Amount remaining as of 31 Dec 2014	$ 0	