

Title: Improvement and Propagation of Native Plants for Water-Conserving and Traditional Landscapes
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Abstract

Summary of 2013 Activities

The objective of this ISDA funded research project is to develop new, water-conserving native plant products for the Idaho nursery industry. Activities include collection, evaluation, increase, and finally commercialization of Intermountain native plants.

The most significant accomplishment of the past year is preparation of commercial sale of 30 native plant products through Native Roots, a partnering company and subsidiary of Conservation Seeding & Restoration, Inc., Kimberly, Idaho. Advertisement is beginning for these products and water-conserving plants will be sold to wholesale and retail nurseries in the form of seeds and liners.

Additional plant scouting was completed in 2013, including a week-long excursion into the backcountry of western Colorado. When purchases of seed from other collectors are complete, approximately 380 new accessions will be available for establishment into the research plots in 2014. The range of plant species collected and evaluated was expanded in 2013 to include species from previously unsampled genera, such as *Stephanomeria*, *Primula*, *Viola*, *Datura*, *Lomatium*, *Silene*, *Aristida*, *Yucca*, and *Viburnum*.

An aggressive program was carried out in 2013 to complete the core research supported by this ISDA grant; specifically, collection, evaluation, and selection of superior native plants. Three hundred and one accessions of native plants acquired in 2012 were germinated in flats, replanted into pots, then transplanted to the field in the spring of 2013. Of the 301 acquisitions, 181 were successfully established in evaluation plots.

Evaluations continued on 482 accessions of plants previously established and 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.

Additional new native plant products are being prepared for exploitation. Eight plant accessions were transferred in March 2013 to Native Roots for establishment in their foundation seed farm in Filer, Idaho. An additional 11 superior native plant accessions were graduated from evaluation plots into breeder seed production blocks at the Aberdeen R & E Center in preparation for future releases.

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 the summer of 2013 plant collection forays were completed in three areas, the St. Anthony Sand Dunes in Fremont County, Idaho; the Bloomington Lake Cirque in Franklin County, Idaho; and extensive collections in western Colorado, from Moffat County in the north to La Plata County in the south, and east to the Front Range. Additional seed acquisitions were or will be purchased or obtained from Alplains, the Denver Botanical Garden, North American Rock Garden Society, the American Penstemon Society, and the Eriogonum Society.



Berries of Wolfe's currant (*Ribes wolfii*) collected on the Grand Mesa in Colorado.

Results: When acquisition is complete in early January, 2014, approximately 380 new accessions will be available for next year's field establishment and evaluation. Eighty-three accessions were collected during this past summer as stem or root cuttings. These plants 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 2013.

Evaluation and Selection of Native Plant Accessions:

Methods: Three hundred one accessions of native plants obtained in 2012 were germinated in the greenhouse and prepared for field establishment and evaluation. In the period December through February 2012, seeds of species requiring cold treatment were mixed with moist potting soil, placed in Ziploc bags, and stratified for one to two months at 40⁰ 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 individual cells of cone trays. In June, these pot-grown plants were transplanted to the field on the Aberdeen R&E Center. One hundred eighty one accessions were successfully established in the evaluation plots. Observations were recorded on these first-year plants with respect to propagation success, response to field establishment, growth rate, and potential for first-year bloom.



Penstemon venustus located in evaluation plots at the Aberdeen R & E Center, summer 2013.

Horticultural performance evaluations were continued for the three acres of native plant accessions established during the period 2006 through 2012. 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. Water applications totaled 25 to 30% (based on evapo-transpiration) of water needed to maintain a bluegrass lawn in SE Idaho. Seven and one-half inches of supplemental (above natural precipitation) water was applied to the plots over the period June to September. During the growing season, plot by plot observations were recorded describing hardiness, soil and climate adaptation, mature appearance, flower color, bloom period, pest problems, 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, poor flowering

characteristics, unsightly appearance during any part of the growing season, disease or pest susceptibility, or any other inferior horticultural trait.



Berries of dwarf golden currant (*Ribes aureum*)

In addition to superior accessions identified in previous years, a number of new species emerged as outstanding performers in 2013. Examples of up and coming new selections include:

Dwarf golden currant (*Ribes aureum*): Almost any form of golden currant, with its golden spring flowers and edible berries, makes a good landscape plant. A selection from a population originally obtained from Draggin' Wing Farm in Boise was found to have compact, dense growth habit combined with large, attractive leaves. Mature size is only about 4 feet. This golden currant also produces a consistent crop of large, bright red (rather than the more common yellow) berries. In fall, the leaves turn a nice shade of purplish-red. This is the best form of golden currant we have seen to date.

Wheeler's orange wallflower (*Erysimum wheeleri*): Native to the mountains of southeast Arizona. Remarkable bright orange flower color - unique within the genus - gives this species great potential in the xeric garden. Mature plants grow to a height of about 3 feet. The plants are hardy and drought tolerant. The bloom period lasts for 8 to 9 weeks in spring and early summer. One positive characteristic of Wheeler's wallflower is consistent and profuse bloom during the first summer after planting.



Orange flowers of Wheeler's wallflower (*Erysimum wheeleri*)



Dark red flowers of lance-leaf penstemon (*Penstemon ramosus*)

Lanceleaf beardtongue (*Penstemon ramosus*): Native to the southeastern corner of Arizona, southern New Mexico, and western Texas. This spectacular red-flowered penstemon attracts hummingbirds and other pollinators. The plants are almost bush-like with open architecture and small, linear green leaves. The plants bloom for much of the summer and fall. In spite of its warm-climate origins, this species is remarkably hardy. This is a very attractive member of a

genus that is full of great landscape plants.

Roundleaf alumroot (*Heuchera cylindrica*): Plants of the genus *Heuchera* - as a general rule - are shade-loving plants that grow best with plenty of moisture. *Heuchera cylindrica* is an exception and is often found growing on open, dry, rocky slopes. We found an exceptional form of the species growing in Railroad Canyon near Leadore, Idaho. It is very robust with large, lime-green leaves and creamy flowers produced on tall spikes. Mature plants are about 15 inches tall. Primary bloom occurs in June but the plants often produce multiple cycles of rebloom.



Small cream flowers of round-leaf alumroot (*Heuchera cylindrica*)



Large orange-yellow flowers of owls claws (*Helenium hoopesii*)

Owls claws (*Helenium hoopesii*): In nature, this species is found in high-elevation meadows where it can put on an incredible early summer show. It is an unusual plant of the sunflower family with long, narrow, arching, fleshy leaves. Large sunflowers - an unusually dark orange-yellow - color are produced on stalks about 30 inches tall. The long petals of the ray flowers are often recurved downward, a feature that gives the species its common name. Bloom period is 7 weeks in early June into July. The foliage remains green and interesting long after bloom is complete.

Smooth sumac (*Rhus glabra*): Tall forms of this species can occasionally be found in established landscapes. This selection, from the Clearwater River Valley in northern Idaho, is very compact. Mature plants grow to a restricted height of about 4 feet. The leaves are very large, dark green, and provide texture with a tropical feel. The flowers are inconspicuous but the inflorescence heads turn bright red as the berries mature. In fall, the leaves turn an intense shade of dark maroon. The plants are quite drought tolerant but also thrive in and irrigated landscape. True to its origins,



Tropical-appearing foliage of dwarf smooth sumac (*Rhus glabra*)

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the plants will spread via rhizomes but seems to be less aggressive than many forms of this species.

Public Evaluation of Advanced Accessions:

Methods: Collaborators working with public and private gardens were recruited to evaluate some of the best and most advanced native plant materials. Evaluation sites include botanical gardens, arboreta, school plantings, and private gardens.

Results: Over the period 2008-2013, publicly accessible evaluation gardens have been established at over 20 sites. Fourteen sites, located in many regions of Idaho, are currently active. These sites have served 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 and recognition of the plant domestication project. Many of the sites also serve as good demonstration sites for water-conserving landscaping and gardening practices.



Native plant evaluation garden maintained at the University of Idaho Arboretum

Commercialization and Exploitation Activities

Methods: A process successful seed production of superior clones has been developed in cooperation with Native Roots LLC. Breeder seed is being produced at the Aberdeen R & E Center and provides a source of material for transfer to industry. Production of foundation seed has been located at the Native Roots seed production farm in Filer, Idaho. Following transfer of breeder seed to Native Roots, parental seed blocks are installed to provide a source of commercial grade material.

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 with additional wholesalers and retailers.

Results: Breeder seed production at the Aberdeen R & E Center was bolstered by the addition of 11 superior accessions and by adding supplemental parental plants to existing increase blocks. In March 2013, 8 new prospective native plant products were released to Native Roots. This brings the total number of product transfers from 2011 through 2013

to 102. 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 2013 growing season. The remainder are still in the establishment phase.

Successful seed harvest has paved the way for public sales of the first native plant products. Native Roots has prepared seeds, tags, and advertising materials for 30 native plant species introductions. A sales strategy has been developed and the company is beginning the process of identifying partners and customers. See Table 1 for a listing of the native plant species that make up the first sales endeavor. More information about the native plant products can be found at this Native Roots LLC web site: http://native-roots.net/PDFs/NativeRoots_SpeciesFlyers.pdf.

Table 1. List of native plant products proposed for spring 2014 sales by Native Roots LLC, Kimberly, Idaho.

Common Name	Species Name	Proposed Nativar Name	Horticultural Properties
Cusick's hyssop	<i>Agastache cusickii</i>	'Fragrant Pearl'	A dwarf form of hyssop. 12" plants produce small pink blooms virtually summer-long. Plants are dense and bloom profusely. Selected for longevity, compactness.
Golden Columbine	<i>Aquilegia chrysantha</i>	'Summer Gold'	Tall (36") species of columbine. Flowers are large, bright yellow, and bloom is later than for most columbines (in summer). Tolerates dry soil. Selected for late-season bloom.
Desert columbine	<i>Aquilegia desertorum</i>	'Desert Blaze'	Short, bushy columbine with reddish-green leaves. Flowers are borne on wiry, crooked stems. Flowers are dark red and yellow. Drought tolerant. Selected for heavy bloom.
Rock columbine	<i>Aquilegia scopulorum</i>	'Petite Blue'	Unique dense, blue, mounding foliage. Flowers are medium blue and held just above the foliage. Blooms in spring and often reblooms multiple times. Selected for dark flower color.
Fringed sage	<i>Artemisia frigida</i>	'Mystic Sage'	Silver-green leaves set off grey flower stems. This plant has the toughness of sagebrush and the attractiveness of wormwood. Selected for exceptional color and very dense habit.
Seaside daisy	<i>Erigeron glaucus</i>	'Lavender Sprite'	Tidy plants with low mounds of soft, dark green leaves. Flowers are large, symmetrical, and dark purple. Plants bloom late spring through summer. Selected for hardiness and compactness.
Aspen daisy	<i>Erigeron speciosus</i>	'Spring Amethyst'	Bushy plants with shiny dark green leaves up and down the branches. Flowers are medium to dark lavender. Plants bloom in June into July. Selected for flower size and bloom profusion.
Short-stem buckwheat	<i>Eriogonum brevicaule</i>	'Old Gold'	Mounding plant with long grayish-green leaves. Flowers are small, bright yellow pom-poms. The plants bloom from late spring to mid-fall. Selected for compact form, long bloom.
James' Buckwheat	<i>Eriogonum jamesii</i>	'Terra Cotta'	This is a red-leaf form of the species. Loose mounds of fuzzy reddish-gray leaves give rise to white-buff flowers that fade to a rusty color. Blooms summer into fall. Selected for red leaf color.

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Common Name	Species Name	Proposed Nativar Name	Horticultural Properties
Strict buckwheat	<i>Eriogonum strictum</i>	‘Platinum Blush’	Foliage is mounding and bright silver. Spherical habit when in flower. Light pink flowers early summer to fall. Consistent performer. Selected for bloom density, pink flowers, leaf health.
Idaho fescue	<i>Festuca idahoensis</i>	‘Idaho Topaz’	Small clump grass with greenish-blue leaves. Selected form has red colored flower stems and is more resistant to summer dormancy, enhancing value in the heat of summer.
Blanketflower	<i>Gaillardia aristata</i>	‘Ruby Sun’	Dense plant with dark green fuzzy leaves. Intensely red sunflowers are produced all summer. Plants were selected and propagated for uniformly dark red flower color.
Ross’ avens	<i>Geum rossii</i>	‘Petite Sunbeam’	A low growing avens with fuzzy pinnate leaves. Plant is dense and attractive. Bright yellow potentilla-type flowers appear all summer. Selected for dense form and heavy bloom.
Sundancer daisy	<i>Hymenoxys acaulis</i>	‘Radiant’	Mats of long, fuzzy green leaves. Solitary yellow daisies grow at the ends of wavy stems. Bloom time is late spring until frost. Very attractive.
Desert 4 o’clock	<i>Mirabilis multiflora</i>	‘Desert Trumpet’	Trailing plant that grows to 8’ across. Foliage is attractive and light grayish-green. Flowers are trumpet-shaped, purple-pink, and profuse. Selected for hardiness.
Bee balm	<i>Monarda menthaefolia</i>	‘Honey Balm’	Tall plant - to 30” - with reddish young leaves. Large (3”) purple flowers appear in summer, followed by red seed heads. Selected form has clump habit and dense form.
Yellow penstemon	<i>Penstemon confertus</i>	‘Buttered Popcorn’	Small plant (12”) that produces a dense mat of dark green leaves. Numerous short spikes of light yellow flowers in spring. Selected for heavy bloom and darker yellow flowers.
Wasatch penstemon	<i>Penstemon cyananthus</i>	‘Sapphire’	Large-flowered blue penstemon - 24” tall. Leaves are dark green and large. Flowers are intensely dark blue. Plants selected for longevity and consistent flower production.
Cordroot penstemon	<i>Penstemon montanus</i>	‘Pixie Dust’	Loose, mounding plant. Sparkling grayish-green leaves. Flowers lavender to light purple and very large. Bloom time late spring to early summer. Selected for heavy bloom, longevity.
Pineleaf penstemon	<i>Penstemon pinifolius</i>	‘Hot Tamale’	Short, compact plant with stems that look like pine boughs. Flowers are dark red and appear late spring through summer. Selected for dark red flower color and heavy bloom.
Richardson’s penstemon	<i>Penstemon richardsonii</i>	‘Cotton Candy’	Open spreading plants with somewhat sparse stems. Very large light pink or purple flowers. Blooms most of the summer and into the fall. Selected for dark pink flowers.
Bridge’s penstemon	<i>Penstemon rostriflorus</i>	‘Hummingbird Haven’	Shrubby form to 24” tall. Dark red flowers produced on numerous stems. Extended bloom period, early summer to frost. Selected for upright habit, dark red flowers, and heavy bloom.
Rocky Mountain penstemon	<i>Penstemon strictus</i>	‘Amethyst Cloud’	Large-flowered blue penstemon. Dense mats of basal leaves give rise to tall (30”) spikes in early summer. Tends to be long-lived. Selected for purple leaf color, resistance to mildew.
Whipple’s penstemon	<i>Penstemon whippleanus</i>	‘Wedding Bells’	Large, dark green mats of leaves that persist into fall. The flowers are dark purple (almost black). Spikes are leafy and 24” tall. Selected for early bloom and dark purple flower color.
Big bluegrass	<i>Poa secunda</i>	‘Azure Gem’	Part of the P. sandbergii complex. The plants are upright with bluish leaves and light tan inflorescences. Mimics a small form of feather reed grass. Selected for blue leaf color.
Thurber’s cinquefoil	<i>Potentilla thurberi</i>	‘Verdant Ruby’	One of the herbaceous potentillas. The plants grow to 20” high. The leaves are dark green and palmate. The mid-summer flowers are very dark red. Selected for intense red flower color.

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Common Name	Species Name	Proposed Nativar Name	Horticultural Properties
Giant purple sage	<i>Salvia pachyphylla</i>	'Burgundy Sky'	Large form of purple sage. The foliage is light gray, evergreen, and strongly fragrant. Flowers appear midsummer through frost. Selected for hardiness, compact form, and dark blue flowers.
Giant sacaton	<i>Sporobolus wrightii</i>	'Colossus'	Attractive tall native grass. Foliage is light green and vase-shaped to arching. The flowers are held high, loosely arranged, and slightly red in color. Selected for density and hardiness.
Hoary Townsend's daisy	<i>Townsendia incana</i>	'Fairy Blush'	Very small (4") mounding plant with fuzzy silver-gray leaves. Blooms all summer. Flowers are comparatively large, open with a pink blush, then turn clear white.
Desert zinnia	<i>Zinnia grandiflora</i>	'Evergold'	Small (5") dense plants with unremarkable grayish-green foliage. Topped with bright orange-yellow flowers from early summer to frost. Selected for dark yellow flower color.

Expenditure Report

<u>Category</u>	<u>Amount Allocated</u>	<u>Amount Expended</u>
Part-time wages and fringe benefits	\$ 7,910	\$ 7,910
Travel for collection, marketing activities	\$ 1,000	\$ 1,000
Seed, pots, trays, labels, soil mix, etc	\$ 1,200	\$ 1,200
Field charges, local motor pool, seed	\$ 1,700	\$ 1,700
Total funds allocated	\$11,810	
Total expensed to date		\$11,810
Amount remaining as of 19 Dec 2013	\$ 0	