Native Seed Production for Crop Diversification
Ron Godin (Colorado – Research & Education Grant)

Project Number: SW04-084

Title: Native Seed Production for Crop Diversification

Principal Investigator:
Ron Godin, Research Scientist
Colorado State University
Western Colorado Research Center – Rogers Mesa
30624 Hwy 92
Hotchkiss, CO 81419
(970) 872-3387
rgodin@lamar.colostate.edu

Blue Penstemon in flower.

Major Participants:
The Uncompahgre Plateau Project, Montrose
Bureau of Land Management, Montrose
U.S. Forest Service, Delta
Public Lands Partnership, Delta

Cooperators:
Dave Herz, Growers, Paonia
Cindy and Carl Roberts, Hotchkiss
Kenny Hines, Delta
Missy Rogers, Hotchkiss

Blue Penstemon ready for harvest.

Western SARE Grant: $171,121

Situation:
The Uncompahgre Plateau in Western Colorado encompasses 1.5 million acres of mostly private and some public lands. In the past 120 years, the Plateau has been harmed by human activities, including grazing, logging, recreation, fire suppression and road construction. Livestock grazing and fire suppression have allowed:
- An increase in the size and density of the pinyon-juniper shrub and woodlands
- A decrease in elk and mule deer habitat and winter feeding grounds

Restoration efforts have placed high demand on a limited supply of native seed. Growing native plants under cultivation could reduce the need for wild-collected seed, increase seed supply for restoration and expand grower options for crop diversification, potentially increasing profit and reducing risk.

Objectives:
1. Rehabilitate and restore natural ecosystems on the Uncompahgre Plateau through the use of locally produced native plant seed
2. Enhance viability of long-term seeding projects by using locally produced and adapted species
3. Provide information, knowledge and infrastructure for raising native plant seeds commercially for an existing high-demand market
4. Conduct research on native seed production and transfer production information to growers
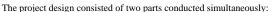
Actions:

This project's perennial native plants, selected by botanists and scientists from state and federal agencies, are considered critical species for improving mule deer habitat:

Grasses
- Basin Wildrye (*Leymus cinereus*)
- Bottlebrush Squirreltail (*Elymus elymoides*)
- Mountain Brome (*Bromus marginatus*)
- Muttongrass (*Poa fendleriana*)
- Prairie Junegrass (*Koeleria mcrantha*)
- Salina Wildrye (*Elymus Salinas*)
- Sandberg Bluegrass (*Poa secunda*)

Forbs
- Blue Flax (*Linum lewisii*)
- Bluestem Penstemon (*Penstemon cyanocaulis*)
- Sulfur Buckwheat (*Eriogonum umbellatum*)
- Utah Sweetvetch (*Hedysarum boreale*)
- Western Yarrow (*Achillea lanulosa*)
- Wild Aster (*Erigeron speciousus*)

Prairie Junegrass.

The project design consisted of two parts conducted simultaneously:
I. Four one-third-acre grower plots, each plot split into thirds for three grass species
II. At the CSU Research Center in Hotchkiss, two replicated plots to examine irrigation and plant spacing, and 10 'life history' blocks to study plant development over the life of the project

Pre-plant weed control – Tillage and herbicide to keep spring, summer and fall weed seeds from the soil.
Planting – Native seedlings, from seed collected on the plateau, propagated in the greenhouse, then transplanted, and direct seeding in fall to mimic over-wintering wild seed.
Seed spacing – Forty to 50 seeds per meter in rows spaced 30 inches apart (aperture spacing for gated pipe).
Irrigation – Furrow-irrigated on grower plots every 10 days to two weeks.
In-season weed control – Pre- and post-emergent herbicides and cultivation as needed.
Seed harvest – Done when 80% of seed was ripe.

Research Center replicated study design:
- Irrigation – Compare yield differences between partial and full-season irrigation in 18 plots (six species, three replications) irrigated every 5 to 10 days, depending on climate and soil conditions.
- Spacing – Compare yield differences at three plant spacings (18, 24 and 30 inches) for six species with three replications, or 54 plots.

Muttongrass at seed maturation.

A field of Wild Aster

Results:

Grower-cooperator plots suffered from weed competition. Probable cause: Native plants compete poorly with invasive weeds, and only one year of weed eradication was insufficient. One grower plot had a large yield of Mountain Brome, likely the result of effective, continuous weed control before the experiment.

Irrigation study:
- Prairie Junegrass – Full-season irrigation yielded significantly higher
- Muttongrass – Irrigation until seed maturity yielded significantly higher
- Blue Penstemon – Irrigation until seed maturity yielded significantly higher
- Sulfur Buckwheat – No significant differences in either year, but seven times more seed in 2007 than 2006

Spacing study:
Results show decreasing yields from year to year, except with Sulfur Buckwheat. The study examined the possibility that plants might yield more as in-row spacing increased, possibly allowing plants to grow larger and produce more seed. However, wide spacing also reduces the number of plants per hectare. Results are inconclusive at this time.

Sulfur Buckwheat in full bloom

Wild Aster harvest.

Potential Benefits:
Researchers and growers gained critical knowledge and experience in establishing native plants in cultivated fields:
- Grower-cooperators are continuing and expanding seed plots, aware that it takes several years to establish stands.
- Knowledge gained early and implemented at the Hines Farm resulted in significant increases in seed yield, demonstrating the study's value.
- Observations from the study have greatly improved management of cultivated native seed.
- Seed produced by the project is being used in research areas on the Uncompahgre Plateau under natural conditions.
- The Research Center has developed species-specific protocols for handling and cleaning native seed.

The study was showcased in an article in the Denver Post, June 19, 2007, and information gained can be found at http://upproject.org (click on 'Native Plant Program').