

IDAHO NATIONAL GUARD VEGETATIVE REHABILITATION PROJECT

1996-1997 Project Report

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Introduction:

The United States Department of Agriculture, Natural Resources Conservation Service (NRCS), Plant Materials Program, in carrying out its assigned responsibilities under applicable legislation, tests and evaluates plant materials used in rehabilitating lands to prevent erosion, improve water quality, and improve the effectiveness of land use. The Idaho Army National Guard (IDARNG) has similar responsibilities and requested assistance in testing and establishment of vegetative cover to rehabilitate sites within the Orchard Training Area (OTA) located south of Boise, Idaho. Under direct supervision of NRCS, the South Bingham Soil Conservation District (SBSCD), is assisting in this project. The appropriate agreements were signed during 1996, and work began in late 1996. This report describes progress from 1996 through September 1997.

The IDARNG has interest in replanting native plants on the OTA for restoration, diversity and sustainability, and for conservation purposes such as wind and water erosion control. Native plants have a long list of attributes, including superior longevity, low input requirements, ecological diversity, wildlife habitat, and the advantage of thousands of years of adaptation to the OTA environment.

Specific requests for assistance from NRCS by IDARNG include:

- 1) seed collection, seed increase, and plant establishment technique development for Tapertip hawksbeard and Sharpleaf penstemon;
- 2) test performance of regionally adapted accessions of native grasses, forbs, and shrubs;
- 3) demonstrate seedbed preparation and planting techniques; conduct tests on the chemical control of cheatgrass followed by planting;
- 4) test techniques for efficient collection of winterfat seed;
- 5) assistance with the development of commercial seed production avenues for large scale increase;
- 6) assistance in installing a weather station at the south end of the OTA (site 26);
- 7) assist in acquiring and testing an ATV, seeder/harrow, and trailer for field planting;

Seed collection, seed increase, and plant establishment technique development for Tapertip Hawksbeard and Sharpleaf Penstemon.

The purpose of the National Guard - NRCS vegetative project is the rehabilitation of native plants on the OTA. Wildfire, livestock grazing, and tank training maneuvers have all been contributing factors in the depletion of native plants and the enhancement of undesirable plant populations on the training range. One of the major benefits of native plants is their adaptation to the extreme environmental conditions that are common on the OTA. Tapertip hawksbeard (*Crepis acuminata*) and Sharpleaf Penstemon (*Penstemon acuminatus*) have been identified as key forb species for research that will help facilitate the rehabilitation efforts.

In order to obtain the proper amount of Tapertip Hawksbeard and Sharpleaf Penstemon for research, it is necessary to collect seed on the OTA as well as other off-site locations. As seed becomes available, production techniques will be implemented to produce the amounts of seed

necessary for project completion. The proper planting techniques for tapertip and penstemon will be developed to achieve the best planting success.

Materials and Methods:

Tapertip Hawksbeard

In December 1996 and January 1997 germination tests were conducted on tapertip hawksbeard seed collected by IDARNG in 1993. Three different seed sources were used in this study. Source 1 was collected on 7/15/93; Source 2 collected on 7/8/93; and the third source had no collection date listed. Two seed sources were tested in four replications, and the third source was tested in two replications due to limited amounts of seed. Each replication was planted with 25 seeds on blue blotter paper and placed in germination chamber at 20 degrees C. with 16 hours of light and 8 hours of dark. Germination results ranged from 8 to 11 %.

Tapertip hawksbeard was planted in flats by broadcast seeding in January 1997. The flats were then placed in the PMC Greenhouse at 20 degrees C. and watered as necessary. This method also resulted in low germination. After emergence, the healthy plants were transplanted into 10 cubic inch conetainers to allow deeper root development than allowed in flats. Tapertip hawksbeard seedlings produced a long, single taproot which rapidly outgrew the small conetainers. The intent was to transplant them into the field. Observation indicated that the plants were weak and larger conetainers were needed for proper root establishment. Attempts to plant into bigger conetainers failed due to the delicate nature of the plants. No other tests of tapertip hawksbeard were conducted because of lack of seed. The fact that the tapertip hawksbeard seed available was four years old may have contributed to the failures. It was concluded that any attempts for field transplantings of this seed collection would not be successful.

During July of 1997 the IDARNG located collection sites of tapertip hawksbeard on the OTA. Due to unusual summer rains, only a small amount of seed was available for collection because most mature seed had already shattered from the plant. The participating technicians concluded that adequate amounts of seed would not be available from the OTA.

Attempts were made to acquire seed from off-site locations. Two off-site collection locations of tapertip were identified. One site is approximately 23 miles northwest of Aberdeen, Idaho on the Big Desert. This site will be called the "Springfield Selection" site. The other site (Weiser Selection) is five miles north of Weiser, Idaho. Only very small amounts of seed were collected from these sites as the seed was too mature and shattered by the time it was determined that off-site locations should be collected. These sites should be excellent locations for Tapertip hawksbeard seed collection in future years.

Sharpleaf Penstemon

Germination and stratification studies were conducted on Sharpleaf Penstemon seed collected by the National Guard. The first test conducted used four petri dishes in germination chamber with 100 seeds each. No cold stratification was used. The second, third, and fourth tests were conducted by using seed that was frozen at -12 degrees C. for 4, 6, and 8 weeks respectively, and then placed in the germination chamber with 100 seeds per petri dish with four replications each. One half of the tests were conducted using blue blotter paper and the other by using sand as the growing medium. The germination chamber was set for 16 hours light and 8 hours dark, and temperature set at 20 degrees C. An additional test was conducted as above, but with the temperature set at 22 degrees C. Each test was conducted for approximately one month and no germination of seed occurred.

In April, another stratification study of Sharpleaf penstemon was conducted. The seed was soaked in water for 24 hours at -12 degrees C. prior to planting into blotter paper and sand. Stratification of 4, 6, & 8 weeks were used. Two replications of 50 seeds each were placed in the germination chamber with the temperature setting of 22 degrees C. and 16 hours light and 8 hours dark. This test also resulted in no germination of seed.

The Bridger, Montana PMC expressed interest in examining germination requirements of Sharpleaf Penstemon and seed was supplied to them. Results from Bridger are pending, and will be addressed in future reports.

A penstemon seed sample was sent to the State Seed Lab for tetrazolium tests which estimates seed viability. Results indicated 92% seed viability.

The Aberdeen PMC has had success planting other species of penstemon seed directly through weed barrier material in the field. This method will be studied in the late fall of 1997. If successful, this practice should supply adequate amounts of seed for further production and study.

Test performance of regionally adapted accessions of native grasses, forbs, & shrubs.

The purpose of the NRCS-IDARNG plant development project is to evaluate the potential of native grasses, forbs, and shrubs for revegetation of the Orchard Training Area. In order to meet project objectives, test sites needed to be located. Each site will include a trial to test the performance of native plants, test seedbed preparation and planting techniques, test chemical control of cheatgrass, and provide a display nursery to allow land users to view examples of varieties of grasses, forbs, and shrubs that are adapted to the general area.

The NRCS, IDARNG and SCD staff originally located two sites for the project. The first site (Orchard) is located northeast of the OTA. The second site, (Range 26) is located on the southern end of the OTR. A third site, (Christmas Mountain) was later located by NRCS and IDARNG staff as it was agreed that this northern site would provide opportunities to enhance objectives of the project. All three sites are in the Major Land Resource Area (MLRA), 11 B, Snake River Plains of the Northwestern Wheat and Range region of the Intermountain United States.

Orchard Site;

The Orchard site is located 3.8 miles south of the Boise Stage Stop exit of Interstate 84. The enclosure is on land owned by BLM. The NRCS has used this site for plant materials testing since 1990. This site has a Snotel Weather Station located within the enclosure. Major landuses are rangeland and wildlife habitat. The site is located within the Bruneau Resource area, Section 20, Township 1 South, Range 4 East (B.M.) The Topographic Quadrangle is Orchard, Idaho. The average annual precipitation is 12" with the greatest portion falling as snow and early spring rain and summers are hot and dry.

The soils on the Orchard Site are a Lankbush - Tindahay Sandy Loam with 0 - 2 percent slopes. The elevation of the site is 3200', the average air temperature is 50 degrees F, the frost free period is 135 days, and the soil pH is 6.6 - 7.3. The soils in this complex are very deep and well drained brown sandy loam with moderately slow permeability. The root zone extends to a depth of 60" or more and the available water capacity is high. The site is a Loamy, 10 - 12" precipitation, range site with a potential natural plant community dominated by bluebunch wheatgrass, thurber needlegrass, and Wyoming big sagebrush.

Range 26 Site;

The Range 26 Site is located on the southern end of the Orchard Training Range. The site is located within the Bruneau Resource Area, Section 25, Township 3 South, Range 2 East (B.M.) The Topographic Quadrangle is Big Foot Butte, Idaho. The greatest portion of precipitation falls as snow and early spring rain and summers are hot and dry. Plant growth begins about March 15 to April 15, and grasses and forbs usually mature by July 1. Shrubs generally grow all summer but at rates much reduced from the early season when soil moisture content is highest. Many sites within this portion of the OTA are burned over winterfat - shadescale rangeland, and the existing vegetation is cheatgrass, tumble mustard, sandburg bluegrass, and a few plants of bud sagebrush and winterfat.

The soils on the Range 26 site are a Garbutt - Weso - Trevino complex with 2-8 percent slopes. The Garbutt and Weso soil series are predominate, consisting of approximately 50% of the site respectively. The elevation of the site is 2800', the average air temperature is 52 degrees F., the frost free period is 140 days, and the annual precipitation is about 7-8 inches. The pH of this soil complex is 7.9 - 9.0.

The Garbutt soil is very deep and well drained light brownish grey silt loam with moderate permeability, high available water capacity, and potential rooting depth of 60" or more. The site is a Silty 7 - 10" precipitation, range site with a potential natural plant community dominated by winterfat, Indian ricegrass, and bottlebrush squirreltail.

The Weso soil is deep and well drained, pale brown loam. The potential rooting depth is 60" or greater. Permeability is moderate and available water capacity is high. The site is a Calcareous Loam 7 - 10" precipitation, range site with a potential natural plant community dominated by shadescale, bud sagebrush, Indian ricegrass, Thurber needlegrass, bottlebrush squirreltail, and sandburg bluegrass.

Christmas Mountain;

The Christmas Mountain site is located in the northcentral portion of the OTA, west of Christmas Mountain, and east of Brooks Road. The site is degraded, with primary plant vegetation of Wyoming big sagebrush, thurbers needlegrass, tumble mustard, pepperweed, Russian thistle and cheatgrass. The site is within the Bruneau Resource area section 32, Township 1 South, Range 2 East (B.M.) The Topographic Quadrangle is Christmas Mountain, Idaho.

The soils on the Christmas Mountain site are a Trevino - Minikota complex with 0 - 30 percent slopes. The elevation of the site is 3,400 feet, the average air temperature is 51 degrees F, the frost free period is about 135 days, and the annual precipitation is about 8 - 10". The pH of the soil complex is 6.6 - 7.8. The site is a Loamy 8 - 10" precipitation, range site and the potential natural plant community is dominated by Wyoming big sagebrush and thurber needlegrass.

The Trevino soil is a shallow, well drained pale brown very stony loam with moderate permeability, low available water capacity, and a potential rooting depth of 10 - 20 inches. The Minikota soil is a moderately deep, well drained brown silt loam with moderate permeability, moderate available water capacity, and a potential rooting depth of 20 - 40 inches.

In March the BLM was contacted to discuss site locations and project objectives. The NRCS and BLM entered into an agreement to allow IDARNG to provide the Cultural Resource Inventory. The BLM supplied the fencing materials needed for the planned exclosure at the Range 26 site. The fencing materials were installed around the Range 26 site in April 1997. At this time,

approximately one-half of the 300' x 300' enclosure was moldboard plowed. The site was again visited in September with the anticipation of further ground preparation. However, the lack of soil moisture prohibited the use of mechanical equipment and would only result in the acceleration of wind erosion. The only other activities conducted on this site was the hand removal of weeds.

In April 1997, areas within the Orchard site and Range 26 site of approximately 150' x 240' were moldboard plowed for fallowing purposes. At this time the existing enclosure fence at Orchard was repaired to prevent encroachment by livestock and/or rabbits. The site was again mechanically tilled and cultipacked for weed control and seedbed preparation during September. No further activities are required on this site until the scheduled fall planting of the test plots.

When the Christmas Mountain site was selected in June, the NRCS and BLM entered into agreements for the BLM to again provide fencing materials and for the IDARNG to provide the Cultural Resource Inventory. To prevent encroachment by livestock and rabbits, all fencing material was installed around the site in September 1997. No ground preparation activities were conducted as this site is selected for direct seeding and herbicide tests.

The NRCS provided to IDARNG staff a suggested planting list of regionally adapted accessions of native grasses, forbs and shrubs to be planted on the test sites for evaluation. The list was finalized, seed was ordered from NRCS PMC's, Agriculture Research Service, Forest Service, National Guard, Agriculture Research Canada, and commercial seed growers. The seed was cleaned and packaged for planting in the fall of 1997.

Demonstrate seedbed preparation and planting techniques; conduct tests on the chemical control of cheatgrass followed by planting:

Proper seedbed preparation is an essential element in the establishment of any seeding. One of the best ways to insure an ideal seedbed is to precede the seeding year by a season or partial season of summer fallow. Fallowing provides a finely granulated seedbed, weed control, and allows full recharge of the soil moisture profile. In late March of 1997 part of the test sites at Orchard and Range 26 were moldboard plowed by the PMC.

Final seedbed preparation typically involves both shallow tillage and packing to produce a weed free, finely granulated, yet firm seedbed. Packing is essential to insure good soil to seed contact and facilitates the capillary movement of moisture to the seed and developing seedling. In late September the Orchard site was cultipacked in anticipation of fall seeding. This operation was implemented for weed control and seedbed preparation. The Range 26 site was not disturbed because the very dry soil conditions present would enhance potential wind erosion. Very few weeds had established at Site 26 and weeding was conducted by hand to insure minimal soil disturbance.

With the development of zero and reduced tillage seeding equipment, availability of chemicals, and the use of broadcast type seeders, it is becoming more common to seed native plants into undisturbed soils. The Christmas Mountain site is selected for chemical tests and direct seeding without use of tillage equipment.

Cheatgrass *Bromus tectorum* is an annual grass which was introduced to North America from Europe. This plant is a poor erosion control plant due to its annual nature and shallow root system. Cheatgrass is not palatable after heading. It has a short life, low production, hairy leaves and unpalatable seed heads with objectionable awns at maturity. The awns make it undesirable as a forage plant for livestock and wildlife. Cheatgrass is an invader plant on range sites and every

effort should be made to replace this plant with higher producing and more desirable perennial plants wherever possible.

Native plants tend to be very poor competitors with weeds and controlling weeds in native plant stands can be difficult. The BLM has had success controlling cheatgrass with the use of "OUST" herbicide. The PMC has acquired enough of this chemical to conduct tests at all three test sites on the OTA. The PMC has the proper equipment to apply "OUST" and will conduct tests for cheatgrass control starting in the fall of 1997.

As soils and site conditions vary, seedbed preparation techniques require adjustment. As soil conditions change, seeding techniques may need to be adjusted to achieve proper placement of seed. Various planting techniques and seedbed preparation options will be tested by the Aberdeen PMC throughout this project. Information and conclusions will be communicated to IDARNG for site specific adaptations. On site demonstrations of seedbed preparation and planting techniques will be conducted in the fall of 1997 and the spring of 1998 by the PMC at the 3 test site locations on the OTA.

Test techniques for efficient collection of winterfat seed

Winterfat *Krascheninnikovia lanata* is one of the major native plants on the Southern portion of the OTA. It is recognized that additional populations of winterfat could be established on the OTA if seed were available. Native winterfat is sparsely populated and plant heights average about 8 - 12 inches. These conditions make hand collecting seed very difficult and time consuming. More efficient methods of collecting winterfat seed are needed.

In September 1997, native winterfat seed was collected from the OTA by hand and by using a mechanical "seed stripper" provided by the PMC. Hand collections are effective, but are not efficient. The use of the seed stripper was more successful in obtaining bulk seed, however this particular method also has drawbacks when considering efficiency of resources and bulk seed collections. With minor modifications, this machine would be more efficient, but it collects too much inert plant material along with the seed. By collecting extra inert plant materials, the seed cleaning process becomes extremely difficult and pure live seed is lost in the process. Additional seed collecting techniques will be studied throughout the project.

Assistance with the development of commercial seed production.

Native plants can best be described as conservative when it comes to seed production. These native plants have evolved for long term survival, and it makes sense that they put more energy into survival than into seed production. Interestingly, seed yields of many native grasses can be quite good when seed is grown under conditions of adequate moisture and fertility.

In order to achieve the goal of rehabilitating the OTA, large amounts of seed will be required. Commercial seed growers are needed to supply large quantities of quality seed and avenues need to be developed for seed availability and procurement.

Contacts have been made with other PMC's, BLM, and Forest Service for information on seed production contracts already in place between government agencies and private growers. As information is gathered, it will be edited to produce a contract that will fit the needs of the Idaho Army National Guard.

In August, the NRCS Plant Materials Specialist met with two "seasoned" seed growers in the Weiser, Idaho area. They expressed interest in producing tapertip hawksbeard, penstemon,

thurbars needlegrass, and bottlebrush squirreltail seed. There will be additional follow up with these growers and others to develop the desired production.

Installing a weather station at the Range 26 Site.

The purpose of installing a basic weather station at the Range 26 site is to collect climatic data for the southern portion of the OTA. Collecting accurate rain fall, humidity, wind, air temperature, and air speed measurements will enhance research efforts in producing native grasses, forbs, and shrubs for rehabilitation of vegetative cover on the OTA. Since climatic conditions vary between the northern and southern ends of the OTA, it makes sense to have available, the most accurate data within site specific areas of the OTA. Specific accessions of grasses, forbs and shrubs will be planted at the Range 26 site and will be evaluated based on climatic conditions at the site.

The NRCS developed an agreement with the Agricultural Research Service (ARS) to acquire a basic weather station for the Range 26 site. The ARS provided the technical assistance necessary in developing the type of weather station needed to meet the requirements of the IDARNG-PMC project.

NRCS purchased the weather station equipment with funds from the memorandum of agreement between the IDARNG and NRCS. The ARS installed the weather station and will collect and record data for IDARNG use. The data will be available on the Internet for use by interested parties. All maintenance of the station will be provided by ARS. The weather equipment will become IDARNG property following completion of the IDARNG-PMC project.

Assist in acquiring and testing and ATV with seeder/harrow.

Specialized planting equipment is needed for seeding small areas on the OTA. The terrain on these selected areas varies from gentle to very rough and remote. The varied geological conditions dictate the need for a mobile, durable, and "off-road" line of equipment. A broadcast type planter pulling a packer unit best fits the criteria of proper seed placement under these conditions. To facilitate use of seeding equipment, vehicles are required for transportation and field operations.

The Aberdeen PMC staff developed specifications for the equipment to be purchased and submitted the information to NRCS for procurement. All equipment will be purchased with funds from the memorandum of agreement between IDARNG and NRCS. Equipment will be tested and utilized throughout the project and become IDARNG property.

Selected Equipment

A) Broadcast planter and packer

Truax, Tye, Great Plains Manufacturing, and Carter Manufacturing were contacted about the availability of equipment suitable for the conditions in which the planter and packer would be used. The only company which had suitable equipment is Truax.

The WF-32 Wildflower Seed Planter and Packer manufactured by Truax is the most suitable equipment for the conditions where seeding will take place. This broadcast seeder is 32 inches wide with transport and safety lockouts provided. The planter provides 3 seed boxes with vertical row dividers, auger agitator, adjustable flute feeds, and independent rate adjustments for all seed boxes. The packer unit is 32 inches wide with billion style press wheels to press seed firmly into soil surface.

B) Utility Vehicle

The primary purpose of this vehicle is to pull the broadcast type planter on rough terrain. Secondary uses would be traveling in rough, remote areas to collect seed and/or environmental data.

The selected utility vehicle is an all terrain vehicle with four wheel drive. The engine is a 4 stroke, liquid cooled type with a USDA Forest Service approved spark arrestor muffler. A 12 volt D.C. battery and electronic ignition is provided. For operation in adverse weather conditions, this vehicle is provided with a cab and heater. The vehicle has a 13 cubic foot cargo bed with 800 pound load maximum. All factory warranties, parts and operating manuals, will accompany vehicle.

C) Transportation Trailer

To provide transportation for the planting equipment, a bumper pull, tandem wheel, dual axle trailer was selected. This trailer is 7' x 20' with a load capacity of 4,500 pounds. The trailer will be equipped with electric brakes and loading ramps.

All equipment will be delivered to the Aberdeen PMC. The PMC will test the equipment for operation prior to delivering to IDARNG. Any "special" operational techniques will be documented, and communicated to IDARNG. Field demonstrations, and training in the operation of equipment will be provided to IDARNG by the PMC staff.

Future Activities

The NRCS will continue research efforts in plant establishment techniques for tapertip hawksbeard and sharpleaf penstemon. The Bridge PMC is assisting in germination experiments for the penstemon. Seed will also be collected on the OTA as well as other selected off-range sites.

The Orchard Range and Range 26 sites will be seeded in the fall of 1997 if the soil moisture is adequate. Seedbed preparation and planting techniques will be demonstrated on site during the planting. Various methods of chemical cheatgrass control will be demonstrated on all three test sites on the OTA. The Christmas site will be seeded in the fall of 1998.

Research will continue on the collection of winterfat.

Contacts will continue with seed growers and government agencies to develop commercial seed production avenues for large scale production of native grasses, forbs, and shrubs.