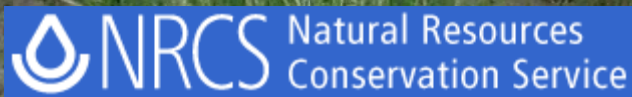


# ***Bridger PMC 2008***

***Opportunity Germplasm Nevada bluegrass***



**PLANT MATERIALS CENTER  
BRIDGER, MONTANA**

**History**

The Bridger Plant Materials Center (PMC) opened its doors in 1959 for evaluation, selection, and development of plant materials for Montana and Wyoming. From 1959 to 1970, the PMC operated on 80 acres of a 140-acre farm leased by the Carbon County (Montana) Conservation District. In 1970, the 104 Conservation Districts in Montana and Wyoming purchased the entire 140-acre farm. The USDA Soil Conservation Service leased 110 acres of this farm from 1970 to 1984. Due to an ever-expanding program, the Natural Resources Conservation Service now leases 130 acres from the Conservation Districts.

**Staffing**

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For additional information on plant materials, visit our website: <http://Plant-Materials.nrcs.usda.gov>

For specific details on plants, visit the Plants Database: <http://plants.usda.gov>

**Facilities**

The 140 acres are irrigated primarily by furrow irrigation; however, a small, hand-moved sprinkler system is used for establishment-year irrigation. Major buildings include:

- 40' x 80' metal seed cleaning building,
- 30' x 50' seed storage building,
- 50' x 80' metal building for shop and machinery storage,
- 26' x 52' office building,
- 19' x 31' greenhouse with 19' x 31' headhouse,
- 20' x 48' coldframe/lath house, and
- 30' x 40' laboratory.

**Reimbursable Projects**

National Park Service Cooperative Agreements

Since 1986, the Bridger PMC has maintained cooperative agreements with the National Park Service for native plant restoration relating to highway reconstruction. With funding from the Federal Highway Administration, the National Park Service is upgrading and realigning the major roads within national parks' boundaries nationwide. The Bridger PMC has assisted both Yellowstone and Glacier National Parks with numerous aspects of this work, including:

- identifying early successional or colonizing species that can be used to restore roadside disturbances,
- identifying species that lend themselves to be increased using traditional cultural practices,
- determining the method and timing of seed collection,
- determining seed cleaning methods,
- collecting, cleaning, inventorying, and storage of seed collections,
- developing germination and dormancy-breaking techniques for hard-to-propagate species,
- developing asexual propagation techniques for woody plants, and
- developing cultural techniques for seed, container plant, and bare-root production.



Seed production plots (varying from 0.03 to 0.40 acres) are established at the Bridger PMC and harvested using hand harvesting, a seed stripper, diapered swather, or a plot combine. Presently there are approximately 8 acres of seed production for the two national parks. For Glacier there are 79 species of grasses and 33 forb species in production. Yellowstone has 3 acres of 9 grass species (12 collections) and 1 forb species in production.

Not all Park Service collections are increased at the Bridger PMC. Although most collections made in the parks are sent to the PMC for cleaning, accessioning, and storage, some seed is returned directly to the respective parks for direct seeding or sent to commercial growers for seed or plant increase. Yellowstone and Glacier are making approximately 300 individual collections per year. To date, Yellowstone has made collections from 147 different sites from within Yellowstone National Park. Glacier National Park has made collections from 126 different sites, both from within the park and from adjacent National Forest Land.

Woody plant projects involve the collection, processing, storage, production, planting, and inventorying of native woody seed and plants. Most of this work involves the container production of species such as Wood's rose, snowberry, serviceberry, chokecherry, currant, Oregon grape, silverberry, and other species with conservation and revegetation applications. In some cases, the clonal propagation of plants is necessary through the use of stem cuttings. This research is being conducted in the PMC greenhouse under highly controlled conditions.

#### Yellowstone National Park Cooperative Agreement

Numerous projects are currently underway at the PMC for Yellowstone National Park that include seed increase fields of tufted hairgrass *Deschampsia cespitosa*, bottlebrush squirreltail *Elymus elymoides*, mountain brome *Bromus marginatus*, slender wheatgrass *Elymus trachycaulus*, green needlegrass *Nassella viridula*, bluebunch wheatgrass *Pseudoroegneria spicata* ssp. *spicata*, needle and thread *Hesperostipa comata*, sulphur-flower buckwheat *Eriogonum umbellatum*, and slender cinquefoil *Potentilla gracilis*.

#### Glacier National Park Cooperative Agreement

The PMC currently has several projects in support of our cooperative agreement with Glacier National Park, including (1) using container production of grasses and forbs to reduce seed production intervals and increase product quality of species like Columbia needlegrass, bluebunch wheatgrass *Pseudoroegneria spicata*, eastern showy aster *Eurybia conspicua*; yarrow *Achillea millefolium*, and largeleaf avens *Geum macrophyllum*; (2) a germination study involving several alpine species to determine the effect of light or darkness on the ability of these species to germinate; (3) seed increase fields of several sedge *Carex* species, blue aster *Symphotrichum laeve*, Idaho fescue *Festuca idahoensis*, alpine timothy *Phleum alpinum*, and Columbia needlegrass *Achnatherum nelsonii*; and (4) container production of Oregon grape *Mahonia repens* for roadside restoration.

#### Development of Acid/Heavy-Metal Tolerant Releases (DATR) Project

The DATR project is funded by a State of Montana Natural Resource Damage program and an EPA Mine Waste Technology Program grant. The project is sponsored by the Deer Lodge Valley Conservation District and headquartered at the NRCS Plant Materials Center, Bridger, Montana. The DATR project's mission is to release plant materials that exhibit tolerances to mineland soils characterized by elevated heavy-metal concentrations and low pH.

The scope of the project encompasses (1) greenhouse testing of experimental acid/heavy-metal tolerant accessions growing in low pH and heavy-metal contaminated soil media; (2) comparative field testing of selected herbaceous seed mixtures; (3) comparative field testing of promising woody species; (4) establishment, production, and maintenance of seed increase blocks of superior performing plant materials; (5) release of superior plant materials; and (6) technology transfer of research results, best management practices, and products.

Results from a Greenhouse Comparative Evaluation Planting (CEP) study identified several superior plant ecotypes. Subsequently, four seed mixtures containing various blends of ten grass and four forb species were field tested in 2001 at two affected sites near Anaconda (upland site and lowland site). A control planting was established at the Bridger PMC. The Seed Mixture Treatment Study compared the four "local" seed mixtures (originating from seed collected within the Anaconda Smelter Superfund Site) to four "non-local" seed mixtures containing cultivars currently on the market. Limited data resulted from this study due to poor stand establishment at both the upland and lowland sites.

In the fall of 2000, a Woody CEP was installed near Anaconda on soils affected by acidity and heavy-metal contamination. This study tested 19 accessions of seven woody species. "Local" stock, originating at the Anaconda Smelter Superfund Site, was compared to "nonlocal" nursery stock of the same species from other areas of Montana, Colorado, Utah, and Wyoming. Both first and second growing season (2001 and 2002) results supported the use of "local" stock, which exhibited superior growth, vigor, and survival in six of the seven species tested. Overall, ponderosa pine and western snowberry were the hardiest species.

In the spring of 2003, three new trials were installed north of Anaconda within the 2002 Stucky Ridge Uplands Remedial Action area. This lime-amended area was chosen for the new study site, as past plantings on untreated soils did not produce adequate stands. The purpose of the study is to compare the performance of experimental plant material originated from contaminated minelands to cultivars presently on the market. Superior performing experimental plant material will subsequently be developed for the commercial market. The Bridger PMC will continue to establish, maintain, and increase superior accessions, while focusing attention towards establishment concerns at the Upper Clark Fork River Basin (UCFRB). Site factors, nursery practices and materials, available plant materials, transplant practices and field placement, were discussed as they all relate to the success of revegetating areas that present difficult site/environmental conditions.

Data collected from these studies has resulted in three plant releases. In 2002, Washoe Germplasm basin wildrye, Prospectors Germplasm common snowberry, and Old Works Germplasm fuzzytongue penstemon were released through the Montana Seed Stock Program and distributed to commercial seed growers through the Montana Seed Growers Association. In 2006 and 2007, two addition species were released—Copperhead Germplasm Selected Class slender wheatgrass and Opportunity Germplasm Nevada bluegrass. Potential future releases include ecotypes of silver buffaloberry, Wood's rose, western snowberry, tufted hairgrass, Indian ricegrass, alpine bluegrass, silverleaf phacelia, and pacific aster.

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#### Warren USAF Base and University of Wyoming Restoration Project

A cooperative effort between the Warren USAF Base, University of Wyoming, and Bridger PMC was initiated in 2002. The goal of the effort is to develop plant propagation and seed production protocols for several native grass and forb species for use in restoration activities at the base. The native plant species selected for testing were specifically chosen for their ability to support sensitive species habitat, compete with invasive weeds, and be locally adapted. Four studies were developed and are currently on-going at the PMC to address these issues. The first study is a dormancy-breaking experiment designed to determine how standard cold:moist chilling treatments influence percentage germination and germination rate of 14 species. The second study investigates the ability of several forb species to emerge from direct seeding. The third study compares the effect of duration of cold:moist chilling on percentage germination of green needlegrass and needle-and-thread. The fourth study was the graduate research project of University of Wyoming M.S. candidate Myrna Ulmer, and tested the effect of within-row spacing on the seed production of prairie coneflower.

Container plants that are the by-product of research are made available to commercial seed producers for field planting for seed production. In 2007, seedlings of black-eyed Susan and small sunflower were lined out at the BPMC for seed increase. In addition, seed produced at BPMC and Powell, Wyoming, Research Station was cleaned and inventoried for use by the air force base.

#### Foundation Seed Research Assistantships

All Foundation seed from the Bridger PMC is given to the Foundation Seed Programs at Montana State University and the University of Wyoming. Money generated by the sale of Foundation seed is used to fund research projects, particularly graduate research, related to the seed production, forages, and reclamation industries. The Director of the Montana State University Agricultural Experiment Stations and the NRCS State Conservationist mutually agree upon all funded projects.

April Pearce, working with Dr. Kevin O'Neal, is attempting to identify both pest and pollinator insect species on 'Antelope' white prairie clover. Once the two known pest species are identified, research on pest control options will be conducted.

Jessie Wiese, working with Dr. Fabian Menalled, is evaluating at two sites the effect of pre- and post-emergence herbicides in wildflower seed production fields.

## **Major Projects**

### Plant Materials Project for Development of Trees and Shrubs

Woody plant research at the Bridger Plant Materials Center is becoming an increasingly significant aspect of our program. The demand for trees and shrubs that can tolerate the severe conditions characteristic of the Northern Great Plains and the variety of applications for their use continues to grow. Woody plant research, like most plant studies, requires evaluation over the anticipated life or usefulness of the planting. This makes for slow progress. Many projects initiated 10, 20, or even 30 years ago are just now nearing fruition. As data is tabulated and summarized, selections of superior trees and shrubs will be identified and targeted for release. New pre-varietal release procedures allow the PMC to quickly provide superior selections to the market. To the land owner, this means plants that can better tolerate the severe environmental conditions in Montana and Wyoming, while performing such conservation functions as reducing soil erosion, providing wind and sun protection, preventing snow drifts, providing food and shelter for wildlife, riparian restoration, and more.

Two common threads running through our woody plant program are the GP-13 (Forestry subcommittee of the Great Plains Agricultural Council, now the Plains & Prairie Forestry Association [PPFA]) and MITOSIS (Montana Interagency Tree and/or Shrub Improvement Study) projects. The various GP-13 projects were coordinated through the ARS (Agricultural Research Service) at Mandan, North Dakota, and the Prairie Farm Rehabilitation Administration Shelterbelt Center at Indian Head, Saskatchewan. The goal of this program was to evaluate numerous superior collections of a species over much of the range of the Great Plains in an attempt to identify superior plants or ecotypes. The MITOSIS program is a multi-agency project that attempts to improve the quality, survivability, and diversity of trees and shrubs for windbreaks and shelterbelts for Montana. Trees from superior, old-aged windbreaks and shelterbelts, as well as plants performing exceptionally well on harsh sites, are incorporated into these studies for evaluation.

### Plant Materials For Saline Soils

The Bridger PMC has been working on the development of salt-tolerant plant materials since 1975. Originally the Soil and Water Conservation Districts of Montana, Inc. (SWCDMI) accepted a grant from the Old West Regional Commission (Department of Commerce) to collect and evaluate salt-tolerant plants both from native and foreign origins.

Native collections were made throughout Montana and Wyoming and evaluated on a saline site at the Bridger PMC. Eventually field evaluation sites were established near Conrad, Fort Benton, Hardin, Malta, and Rapelje, Montana; and Powell, Wyoming. Trials were established to compare direct seeding with sprigging, and compare the establishment success and intra-specific competition within several seed mixtures. Tech Note—Plant Materials No.26 was written as a guide for species and establishment techniques that are best utilized on saline-alkaline soils.

## **Active and Anticipated Studies**

### Initial Evaluation Planting of Native Grasses and Forbs

The PMC installed a planting to evaluate the initial performance of wildland seed collections submitted mostly by Montana and Wyoming NRCS Field Offices from 1997 to 2004. The 22 grass and 79 forb accessions were dormant-seeded in November 2004 and weed barrier was laid down between rows to reduce competition from weeds. Evaluations will be conducted for 4 years on factors such as stand establishment and longevity, floral initiation, seed production, and weediness.

### Xeriscape Demonstration

There is presently a great interest in utilizing low maintenance/low water requirement grasses, both native and introduced, for landscaping. Plots of nine different grasses have been established under dryland conditions (Introduced--crested wheatgrass, Russian wildrye, sheep fescue, and Canada bluegrass; Native--thickspike wheatgrass, streambank wheatgrass, western wheatgrass, buffalograss, and blue grama). In the spring of 2001, 'Roadcrest' crested wheatgrass was added to the demonstration plots. Half of each plot is periodically mowed, while the other half is allowed to reach full growth. A vehicle is driven across the plots ten times every 3 weeks to evaluate trampling resistance.

In early May 2005, five grass mixture plots of two species each were broadcast-seeded at the south end of the existing demonstration area. The objective is to evaluate the performance of seven species that may be appropriate in a turf grass mix for very dry, drought-prone conditions. The simple mixes are (seeded north to south): 'Critana' thickspike and 'Rosana' western wheatgrass, 'Foothills' Canada bluegrass and 'Covar' sheep fescue, 'Bad River' blue grama and Covar sheep fescue, Foothills Canada bluegrass and 'Roadcrest' crested wheatgrass, and Bad River blue grama and 'Cody' buffalograss.

#### Saline Forage Species Comparative Evaluation

In the fall of 1996, drill-width replicated plots were established along a salinity gradient to compare 'Shoshone' beardless wildrye, 'Pryor' slender wheatgrass, 'NewHy' hybrid wheatgrass, 'Jose' tall wheatgrass, and 'Prairieland' Altai wildrye. The primary purpose of this study is to evaluate the performance of NewHy under saline conditions in comparison to the most commonly used salt-tolerant cultivars. Additional plans are to biannually take out a section of the Kentucky bluegrass lawn and establish native plantings for reduced water use and mowing.

#### Bur Oak Seed Source Study—*Quercus macrocarpa*

Bur oak is a native species widely distributed across much of the United States. Although found only in the far southeastern corner of Montana in uncultivated, natural stands, it is found in numerous small communities across the state as a street tree or landscape plant. Adapted to a wide variety of soil conditions, this species tolerates relatively high soil pH, is drought tolerant, and has few insect or disease problems. Capable of reaching heights over 100 feet on good sites, it normally attains a maximum height of about 50 feet in Montana. Like all oaks, bur oak is a strong-wooded species capable of surviving in environments that seem to support only weak-wooded, deciduous trees.

A 24-accession, replicated study was established at Bridger in June of 1994. The goal of this project is to identify well adapted accessions with better than average rates of growth and superior form for use in windbreaks. Annual evaluations have been taken each year since 1994. Performance data has already identified superior seed sources; final selections were made, and non-selected trees removed in April 2004. The final selection has been named Ekalaka Germplasm bur oak and is currently in the release process, with final release planned for October 2008.

A bur oak vegetative propagation study was initiated in 2002 in cooperation with a graduate student at Montana State University. Cheryl Moore was an MS candidate funded in part through our cooperative Foundation Seed graduate fund. Cheryl investigated conventional stem propagation protocols as well as etiolation, light quality, and hedging techniques. More than 2,000 cuttings were treated and tested. Modest but significant improvements in adventitious rooting were made with various hedging and etiolation treatments. The PMC is very interested in developing practical asexual propagation techniques for this hard-to-root species in order to clonally increase seed orchard trees and to facilitate commercial production.

#### Initial Seed Increase of Plant Materials for Biological Diversity in Rangeland and Restoration Seedings

Initial Evaluation Plantings were established at the PMC beginning in 1994. Approximately 68 accessions of three species have been evaluated at this field site. In the spring of 1998, after 3 years of evaluation, the most promising collections were planted in seed increase. In 2004, Great Northern Germplasm western yarrow *Achillea millefolium* var. *occidentalis* and Stillwater Germplasm upright prairie coneflower *Ratibida columnifera* were released. In 2008, a seed increase was established of blanketflower *Gaillardia aristata*.

#### Culturally Significant Plants

Sweetgrass tends to reproduce vegetatively and traditional, large-scale seed production techniques are rarely successful. In July 2001, transplants of 9063351 sweetgrass *Hierochloa odorata* were relocated in Field 4 to establish a vegetative increase block. Plant growth and development are being monitored, and various cultural techniques are utilized to optimize stand production. In May 2002, an Inter-Center Initial Evaluation Planting of six sweetgrass entries was established to compare the performance of regional sources. The 2002 and 2003 evaluation results indicate that the Montana entry is the top performer and the Michigan entry rates second. In 2004, Spirit Germplasm sweetgrass was released as a selected class of vegetative material.

#### Needlegrass Dormancy Study

Phase II of a dormancy-breaking study initiated in 2003 is being conducted at the Bridger PMC. The potential positive and negative effects of cold:moist chilling on the germination of needle and thread *Hesperostipa comata* and green needlegrass *Nassella viridula* are being studied in an attempt to improve field establishment of these important conservation species.

#### Slender Wheatgrass and Western Wheatgrass Dormancy Study

As a result of severe and erratic dormancy levels in several lots of slender wheatgrass and western wheatgrass, a replicated dormancy study was initiated in 2005. Duration of cold:moist chilling and light level are being compared to determine if testing protocols may be responsible and/or to develop cultural techniques to improve germination.

#### Tree and Shrub Irrigation Tube Study

A major investigation into the potential benefits of sub-surface applications of supplemental water on tree and shrub survival and growth was initiated at the Bridger PMC in 2005. This study is being conducted in conjunction field trials established by Miles City, Montana, Area Staff and funded through a Grazing Lands Conservation Initiative (GLCI) grant. A total of 480 trees, representing four species (bur oak *Quercus macrocarpa*, green ash *Fraxinus pennsylvanica*, ponderosa pine *Pinus ponderosa*, and Rocky Mountain juniper *Juniperus scopulorum*) are being tested with and without tubes, under fallow and vegetated conditions. In addition to improving seedling survival and growth, the study aims to improve water conservation, seedling drought tolerance, and efficiency of water delivery. Two-year results demonstrate a dramatic difference in seedling survival and growth depending on the presence or absence of vegetative cover, with fallow conditions resulting in vastly superior plant performance. In addition, green ash with tubes grew taller and had better vigor rating than surface-watered green ash on the fallow site.

#### Tree and Shrub Salinity Tolerance Study

A woody plant salinity and sodicity tolerance study was initiated in late 2005 to determine the effects of soil salinity on plant survival and growth. Eighteen species of trees and shrubs were installed across a salinity gradient in Field 26 at the PMC in May 2006. Data was collected in 2006 and 2007, with preliminary results suggesting that tree and shrub salinity tolerance is significantly lower than reported in the literature.

#### The Effect of Pre- and Post-emergence Herbicides on Seven Native Wildflowers

The control of broadleaf weeds in wildflower seed production fields is difficult due to a lack of specifically labeled herbicides. Seven species were dormant-seeded in two field plots, and six pre-emergence herbicide treatments were applied on one of the plots in late April 2006. Post-emergence herbicide treatments were applied to the second plot in 2007 and 2008. A similar study is being conducted in cooperation with MSU-Bozeman. Results may eventually aid in the selection and recommendation of appropriate herbicides on a variety of conservation applications.

#### Performance of New Conservation Grasses, Legumes, and Forbs in Montana & Wyoming

The performance and adaptation of 78 entries will be monitored in two plots that were established at the PMC on April 26 and May 3, 2006. The new plant materials, originating from areas in the Northern Great Plains, Inter-mountain West, and the Great Basin, are being compared against long-time commercial standards.

#### Tall Wheatgrass Biofuel ICEP

A tall wheatgrass bio-fuel Inter-Center Evaluation Planting was established at the Bridger PMC on March 13, 2008. Cultivars planted included 'Alkar', 'Jose', and 'Largo' from the United States and 'Szarvasi-1' from Hungary. 'Trailhead' basin wildrye was planted as a border to also look at its potential for biofuel production under irrigation. Starter fertilizer was applied according to soil sample recommendations with additional fertilizer applied as needed for forage production the year following establishment. The first harvest will occur immediately after heading for energy purposes and the second cutting will be utilized for dry hay or grass haylage. Forage yields will be taken on both harvests. In addition, Dr. Chengci Chen, MSU-Central Agricultural Research Center, is interested in analytical testing of the trial's cultivars for biofuel energy potential.

#### Alfalfa Salinity Tolerance Demonstration

Three released varieties of alfalfa will be planted in 2008 on a saline seep area of the Bridger PMC. As a result of seepage over many decades from an irrigation canal, the area ranges from 2 EC near the canal to 24 EC approximately 150 feet downslope. Two of the alfalfas were privately released as having salt tolerance and a public Montana State University release, Shaw, will be used as a check. Many producers are interested in salt-tolerant alfalfas to reclaim their saline seeps and recharge areas. In addition, future CRP and CSP plantings in eastern Montana may also benefit from information gleaned from the study.

#### Irrigated Grass and Legume Forage Trial

In the late summer of 2008, an irrigated grass and legume variety trial will be planted at the Bridger PMC. Approximately 16-18 grass varieties will be planted separately with two mixes included as well. In addition, the grass varieties will be planted in alternate rows with alfalfa, sainfoin, and birdsfoot trefoil to determine how each legume influences overall forage production. All entries will have four replications. Interest from producers in both Montana and Wyoming remains very high for this type of information.

### **Off-Center Trials**

#### Shell Exploration—Pinedale, WY

The purpose of this planting is to evaluate the performance of native species and seeding techniques in the revegetation of disturbances caused by the exploration and extraction of oil and gas reserves. Secondly, species' diversity to enhance wildlife habitat for sage grouse, mule deer, antelope, and other species will be determined. The planting includes 72 different entries of 32 grasses, 24 forbs, and 16 shrubs that were installed as replicated plots on a ½-acre area with a precision core-seeder. A broadcast seeder planted the same two mixes, each 1 acre. The site will also be used as an educational tool for public and private land managers, as well as other interested individuals.

#### Questar Exploration—Pinedale, WY

The purpose of this planting is to evaluate the performance of native species and seeding techniques in the revegetation of disturbances caused by the exploration and extraction of oil and gas reserves. Secondly, species' diversity to enhance wildlife habitat for sage grouse, mule deer, antelope, and other species will be determined. The planting includes 29 shrub entries of 25 species that were installed as replicated plots on a 0.43-acre area with single-row belt seeders. Five different bluebunch wheatgrass varieties were broadcast-seeded in an adjacent 0.23-acre plot to evaluate performance and adaptation.

#### Irrigated Forage Trial—Powell, WY

This study was established to compare the productivity of 40 native and introduced forage grasses under irrigation, as well as to examine relative production of seeding forage grasses in aftermath rows with a legume. In 2007, the best performing grasses in solid stands were entries of pubescent, slender, and intermediate wheatgrasses. In the alternate-row plots, pubescent wheatgrass and alfalfa yielded the most hay forage.

### **Releases**

The PMC cooperatively tests, with numerous partners, a variety of plant materials under a broad range at environmental conditions. The top performers are made available to commercial growers through the foundation seed programs at Montana State University-Bozeman and the University of Wyoming-Laramie. Since the PMC was established more than 50 years ago, there have been 30 releases of 17 grasses, 8 trees/shrubs, and 5 forbs. The 27 species have utility in a variety of conservation applications, such as forage production, range renovation, mineland revegetation, salinity tolerance, windbreaks and shelterbelts, wildlife habitat, and energy-efficient landscapes.

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FIELD ROAD	<b>Field 8</b> 4.78 ac Woody species evaluation	.5 ac Woody Dmo. 2006	FIELD ROAD	<b>Field 14</b> Rocky Mtn. Juniper Orchard 2.77 ac 4/25/80 Irrigation Tube Study .48 ac 5/6/05		FIELD ROAD	<b>Field 19</b> 3.6 ac Ponderosa Pine Orchard 5/30/89 Xeriscape Demo	Silverberry DATR Prosp. snowberry Chokecherry
	<b>Field 5/6 E</b> 6.64 ac Critana thickspike wheatgrass 4/12/05	<b>Field 7E</b> 2.25 ac Bozoisky-Select 4/27/04		<b>Field 12</b> 3.8 ac Open Range .8 ac 4/15/03 Goshen prairie sandreed 3 ac 4/16/03	<b>Field 13</b> 5 ac Hayes barley 4/11/08		<b>Field 17</b> 3.8 ac Trailhead basin wildrye 4/6/95	<b>Field 18</b> 2.5 ac Pryor 8/12/05 1.4 ac Delaney sainfoin 5/15/07
	<b>Field 5/6W</b> 4 ac. 4/11/08 Hayes barley misc. plots .98 ac YNP-GNP SI	<b>Field 7W</b> Open Range BB .05 ac Legume/forb Demo .06 ac		<b>Field 10</b> 0.4 ac Open Range Grass Demo .10 ac 4/26/06 1 ac Strip-till plot	<b>Field 11</b> 3 ac Hayes barley 4/11/08		<b>Field 15</b> 3.5 ac Hayes barley 4/11/08	<b>Field 16</b> 2.1 ac Garrison 3/22/00 1.85 ac Delaney sainfoin 5/15/07

SOUTH RIVER ROAD

FIELD ROAD	<b>Field 4</b> NPSISI Warren AFB SI Spirit swtgrs	<b>Field 9</b> Office and Buildings	FIELD ROAD	<b>Field 20</b> Living snow fence .96 ac Shoshone 11/2/05 1.75 ac Hayes barley 4/11/08 1.67 ac DATR-YNP-GNP SI 1.28 ac Shoshone 11/08/04	
	<b>Field 3</b> 1.98 ac Snowberry Thornless rose GNP SI Irrig. Tube Study			<b>Field 21</b> 3.85 ac DATR-YNP-GNP SI Rosana BB Biofuel trial	
	<b>Field 2</b> 1 ac Barley YNP .3 ac PMC IEP .16 ac Breeder's Blocks .45 ac	<b>Field 1</b> 1 ac Wytiana MSU/PMC herbic studies YNP SI 1.4 ac GAAR 0.29 ac		<b>Field 22</b> .44 ac Water-Use study 5/25/05 Hayes barley 4/11/08 1.46 ac GNP/DATR Critana BB	<b>Field 23</b> .54 ac Hayes GP-13 bur oak 6/17/94 DATR creeping juniper 0.6 ac 5/29/02
<b>Field 24</b> 5 ac Hayes barley 4/11/08	<b>Field 26</b> .68 ac Woody/alfalfa saline study	<b>Field 25</b> 3.5 ac Sudangrass 6/2/08	<b>Field 28</b> 3.0 ac Sudangrass 6/2/08	<b>Field 29</b> 2.0 ac Rosana western whtgrass 4/6/04	<b>Field 30</b> 5.15 ac DATR western snowberry Wood's rose silver buffalobery Woody ISI thornless honeylocust Amur maple 5/17/76
<b>Field 25</b> 3.5 ac Sudangrass 6/2/08	<b>Field 31</b> 5.0 ac Sudangrass 6/2/08				

Bridger, Montana  
Plant Materials Center  
2008



Not to Scale