PHASE II

Assessment of Pollinator-Friendly Plantings on Montana Rangelands and Farms:
An On-the-Ground Approach to Determine Best Practices

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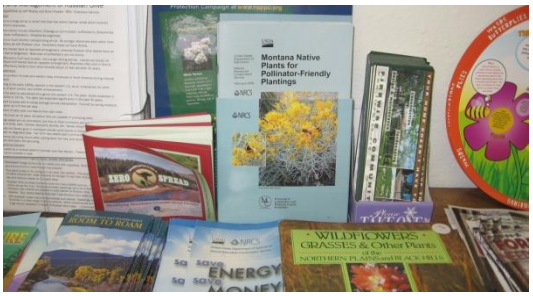
Author's Note: The contents of this report reflect the experiences of the landowners visited, opinions of numerous people interviewed, and outside research conducted to fill in the information gaps. This document is the Pollinator Partnership's *interpretation* of the information collected. The interpretations and recommendations given are *not* those of the NRCS nor the landowners and are solely the responsibility of the author and the Pollinator Partnership.

INTRODUCTION

With the disappearance of pollinator habitat to annual crop production, mono-culture pasture lands, and suburban development, conservation becomes crucial to the protection of these important creatures. Nearly 80% of the world's crops require animal pollination in order to produce the food that ultimately feeds families. Animal pollinators include species of bats, hummingbirds, moths, beetles, bees, flies and others. Of the thousands of pollinators in the United States and Canada, approximately 99% are insects (Xerces Society, 2003). The traditional large-scale strategy for pollinating crops requires domestic bees that are trucked across the country between production areas. In the wake of the recent Colony Collapse Disorder (CCD) events, which plague these domestic hives, the need for both managed bees and native pollinators is ever more apparent. Providing habitat for pollinators ensures that crops can be pollinated and that native plants can survive.

In 2005, former State Conservationist Dave White, a strong proponent of native pollinator conservation, introduced pollinator habitat as an important State Conservation Issue in Montana. This action lead the Montana Natural Resources Conservation Service (NRCS) to institute a cost-share conservation initiative for landowners who establish pollinator habitat either in the form of a pasture seeding or tree/shrub planting. Monetary compensation would be seen as an additional benefit to landowners participating in the Environmental Quality Incentives Program (EQIP) or the Wildlife Habitat Incentives Program (WHIP).

In April of 2005, after conversations with the Coevolution Institute's North American Pollinator Protection Campaign (NAPPC), Dave White and Missoula County Extension created an eight-page color brochure entitled, "Montana Native Plants for Pollinator-Friendly Plantings." This booklet was designed to promote the pollinator habitat incentive while educating the public. The free booklets were initially available, and remain available from: NRCS, University Extension, Conservation Districts, Farm Service Agency (FSA), some non-profits, plant nurseries, and select wildlife groups.



"Montana Native Plants for Pollinator-Friendly Plantings" seen at the Custer County Conservation District office in Miles City, MT

Since this pioneering program began in 2005 and circulating the educational booklet in February 2006, there had been no systematic on-the-ground assessment of the outreach impact or success in improving or restoring rangeland and crop borders for pollinators and their plants. In November 2007, the Coevolution Institute (CoE) applied for and received a USDA-NRCS Conservation Innovation Grant entitled, "Assessment of Pollinator-Friendly Plantings on Montana Rangelands and Farms: Measuring Success of Outreach Program, Replicating Habitat & Increasing Best Practices."

This grant awarded to the CoE was to be conducted in three phases: Phase I. Statewide Survey, Phase II. Field Visits, and Phase III. Education and Outreach

During Phase I, two main objectives were proposed: assess the effectiveness of the pollinator habitat conservation incentive through EQIP and WHIP, and evaluate the educational success of the pollinator booklet. To meet these two objectives, a questionnaire was drafted and mailed to all of the 2005, 2006, and 2007 Montana EQIP/WHIP applicants (approximately 600 people). The purpose of the statewide survey was aimed to better understand producer attitudes and education regarding pollinators, NRCS cost-share programs, and their personal experiences with planting pollinator-friendly habitat. The outcome of Phase I can be found in "Assessment of Pollinator-Friendly Plantings on Montana

Rangelands and Farms: Statewide Questionnaire Findings Report" released in May 2008, authored by Pollinator Partnership affiliate Rebecca Baril.

Of the 588 survey packets mailed out to Montana EQIP/WHIP applicants during Phase I, 142 questionnaires were filled out and returned (a 24% response rate). The general responses specified the key issues regarding pollinator plantings in Montana; the EQIP/WHIP application process, where to find seeds/seedlings, expense, survivability, pests, fencing, watering systems, and challenges as well as benefits to landowners. However, the information gained from these surveys was limited, and rather served as a starting point, giving direction for how the field visits of Phase II should be focused.
The remainder of this document explores the results of the Phase II field visits revealing the accomplishments and challenges of pollinator-friendly habitat establishment in Montana. In addition, there is a detailed explanation of the EQIP and WHIP cost-share programs determining the effectiveness of the pollinator-friendly initiative. This report summarizes the information gained from the field visits and gives future suggestions for how to improve and further implement pollinator-friendly habitat in Montana.

The results of this Phase II report will help to direct the final Phase of this project, Phase III: Education and Outreach. This phase will include the refining of educational materials, construction of a native plant display kiosk, and community presentations.

PROJECT OVERVIEW

Of the 142 questionnaires received during Phase I of this project, 33 people responded that they had participated in pollinator-friendly plantings. Of these 33 people, 21 responded "YES" to question 16, "Would you be willing to have us (the Pollinator Partnership) visit with you to discuss your experience, see your pollinator-friendly plantings, count pollinators and take some photographs?" This pool of 21 respondents was the starting point for deciding where and with whom to conduct the field visits.

In order to make broad assumptions about pollinator-friendly practices in Montana, the field visits would have to cover the experiences of a diverse group of landowners. From the original pool of 21 potential landowners, seven were chosen for the field visit due to their willingness to participate as well as their diversity of: approach to planting (Table 1), participation in NRCS cost-share programs (Table 1), and ecoregion (Figures 2&3, Table 2).

Table 1. List of field visit participants.

Name	Address	Type of Planting	Cost-Share?
Mike & Jeannie Anderson	5485 Spaulding Bridge Rd. Belgrade, MT 59714	Pasture Seeding	YES
Robert & Jane Banner	299 Hayes Cr. Rd. Hamilton, MT 59840	Interspersed	NO
Robert & Becky Bronec **Ames Ranch**	3000 Ames Rd. Carter, MT 59420	Shelterbelt	YES
Valerie Kurtzhalts	P.O. Box 688 Kila, MT 59920	Interspersed	YES
Charles R Noland	P.O. Box 234 Circle, MT 59215	Tree Plot	YES
Laura Schaap **Story Hills Farm**	261 Story Hill Rd. Bozeman, MT 59715	Shelterbelt	NO
Ray Sprandel **Sprandel Farms**	2035 W. Old Hwy 10 Terry, MT 59349	Tree Plot	YES

The field visits took place during June and July of 2008 (Figure 1). Each landowner was contacted to confirm their interest in this study and to schedule a convenient date for a field visit. Each visit lasted 4-8 hours consisting of: an interview with in-depth questions specifically developed for the field visits (Appendix 1), walking/driving the property to look at the pollinator-friendly plantings, taking photographs, and in one case, planting a shelterbelt (with Laura Schaap at Story Hill Farms). On two occasions (June 16 and July 10), photographer John Parker from Bozeman, Montana accompanied on the field visits to capture images of pollinator-friendly plantings implemented in Montana - landscapes and pollinators as well as flowering plants and people. All photographs from the field visits, including those from John Parker, were digitally passed along to Laurie Adams, executive director of CoE. Results of the information collected from the interviews and field observations are summarized and expanded upon in the remainder of this report.

Figure 1. Location road and county map showing the proximity of field sites and dates visited

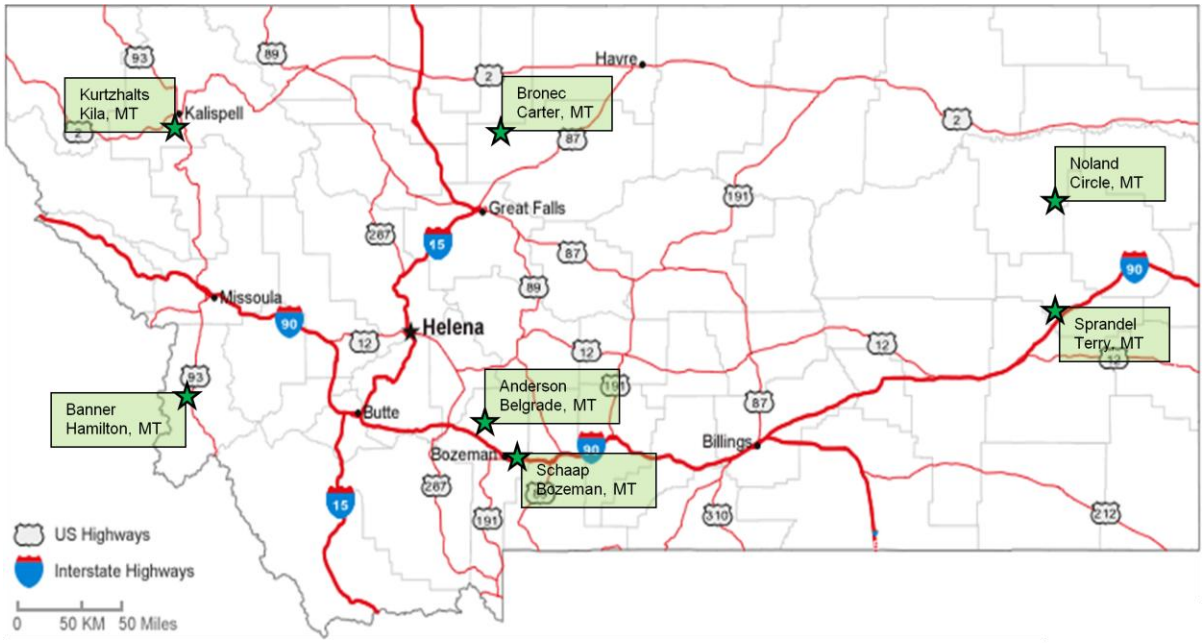


Figure 2. Bailey's ecoregion map showing the five ecoregions in Montana. Map Source: www. nationalatlas.gov

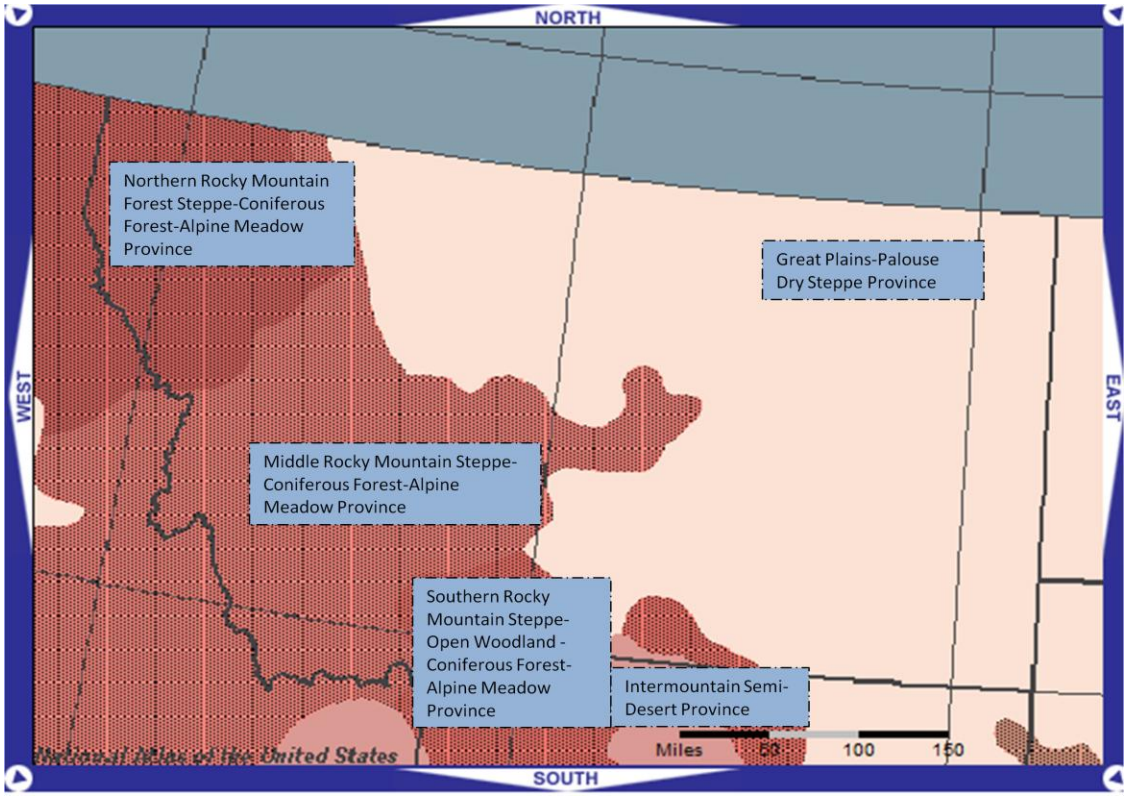


Figure 3. Average annual precipitation map of Montana with field site locations numbered corresponding to Table 2

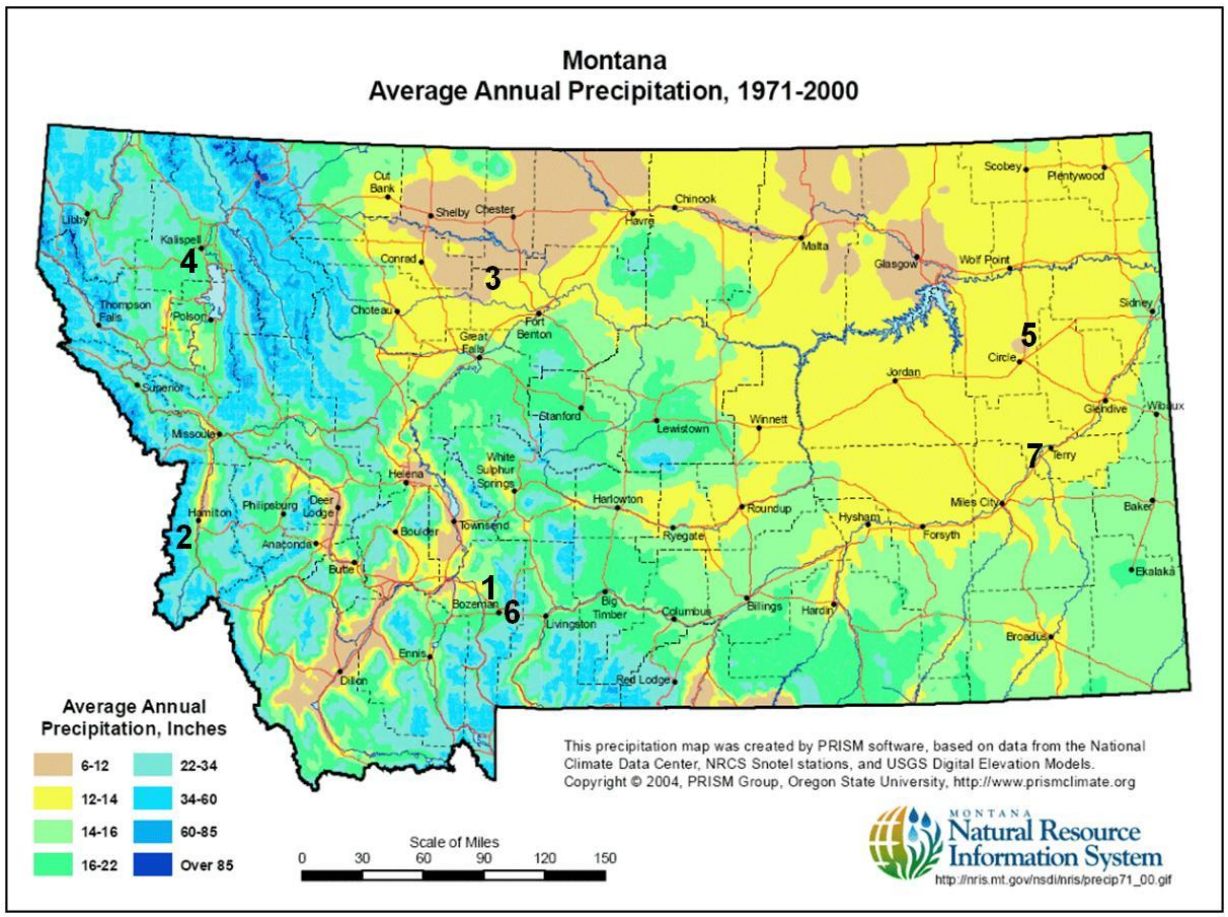


Table 2. Field sites with their specific regional data, numbered to correspond with Figure 3

Location Number	Last Name	MT County	Annual Precip.	Ecoregion
1	Anderson	Gallatin	14-16”	Middle Rocky Mountain Steppe-Coniferous Forest-Alpine Meadow Province
2	Banner	Ravalli	16-22”	Middle Rocky Mountain Steppe-Coniferous Forest-Alpine Meadow Province
3	Bronec	Chouteau	6-12”	Great Plains-Palouse Dry Steppe Province
4	Kurtzhalts	Flathead	14-16”	Northern Rocky Mountain Forest-Steppe-Coniferous Forest-Alpine Meadow Province
5	Noland	McCone	12-14”	Great Plains-Palouse Dry Steppe Province
6	Schaap	Gallatin	16-22”	Middle Rocky Mountain Steppe-Coniferous Forest-Alpine Meadow Province
7	Sprandel	Prairie	12-14”	Great Plains-Palouse Dry Steppe Province

PRODUCER PROFILES


Mike Anderson
Photo: John Parker

Mike & Jeannie Anderson ♦ Belgrade, Montana

History: Mr. and Mrs. Anderson bought this piece of property in 1975 with the intention of farming and ranching, but with little experience of this kind. With a smirk Mr. Anderson said: "I wanted to get into ranching in the *worst* way…and I think I've done it." After many years of a cow-calf and alfalfa operation, they now manage their land by leasing their farm ground and cows to neighbors.

Ecoregion: Middle Rocky Mountain Steppe-Coniferous Forest-Alpine Meadow Province

Type of Pollinator Planting: Pasture Seeding (25 acres)

Date of Seeding: 9-15-2007

Pasture Seed Mix:
Bluebunch Wheatgrass (55%)
Indian Blanket Flower (15%)
Maximilian Sunflower (10%)
Western Yarrow (10%)
White Prairie Clover (10%)

Date of Field Visit: 7-10-2008

The WHIP Plan: Many of the pastures in the uplands area of the ranch have been in crested wheatgrass for 30-65 years. Typical of crested wheat in this area, the pastures harden early and are not ideal for grazing in later summer/early fall. The Andersons were also interested in improving habitat for upland game birds. With the help of NRCS soil conservationist, Wendy Williams, the Andersons decided to apply for WHIP funding to work up some of the old crested wheat stands and plant them back to native rangeland. This first step in the 5-year plan was to work up and re-seed a 25 acre field including several pollinator-friendly forbs in the mix with bluebunch wheatgrass.

"I don't know why I wanted to do this," Mr. Anderson said taking his hat off then putting it back on again. "It's just nice to have natural things. It wasn't an economic decision." The WHIP program paid for approximately 50% of the project.

The Planting Process: The field had been in crested wheat for 65 years, and needed to be sprayed with Roundup (twice, because the first spray was not effective). As somewhat of an experiment, part of the field was spiked, worked, and disked. The other part was left alone to drill into the dead plant material. The pasture was fertilized then seeded with a ¼" air drill seeder into rows in September 2007.

The Field Visit: In the midst of the interview we incurred a random stopover by Montana state conservationist Dave White, District Conservationist Eric Suffridge, and two members of the California Rice Coalition who also wanted to witness the success of the pollinator pasture planting. We all drove up to the field following Mr. Anderson on his 4-wheeler. The field was lush with green growth and blooming flowers. The sunflowers and sweetclover seen in the photos below are a common variety and tend to come out cyclically - years with abnormal weather patterns or after a disturbance (working up the field). Photographer John Parker, who was accompanying this field visit, was able to capture many of the lively pollinating insects moving from flower to flower.


Photo: John Parker


Photo: John Parker

Left: the seeded pasture plot, Right: the group discussing pollinator plantings.

Anderson: Outcomes from the Pasture Seeding

HELPFUL RESOURCES

Wendy Williams, NRCS soil conservationist in Bozeman, MT was instrumental in helping the Andersons carry out their WHIP contract requirements, helping the couple decide on an appropriate seed mix for the pollinator planting, as well as to find a local herbicide applicator. Mr. Anderson also consulted the NRCS booklet: Montana Native Plants for Pollinator-Friendly Plantings for ideas on pollinator-friendly plants.

FENCING & WATERING SYSTEMS

The 25 acre dryland pasture seeding is fenced off on one side with an old barbed 3-wire fence separating an old crested wheat stand that is grazed with cattle. Deer would have no difficulty jumping over and getting into the newly seeded pasture. The WHIP contract does not allow a newly seeded pasture to be grazed with domestic animals for 4-5 years, but does not require fencing from wildlife.


Photo: John Parker

PLANT SURVIVABILITY

Due to the cold, wet spring in the Gallatin Valley in 2008, the plants had not come up by April or May, making Mr. Anderson a little nervous that the plants were not viable or had winter killed. However, by the time of the field visit in July 2008, the stand was looking healthy. The bluebunch wheatgrass was still in the boot, maximilian sunflower was bolting, and there were signs of the prairie clover and blanketflower (too young to accurately identify). There was no indication that yarrow had come up as of the time of the field visit.

SUCCESSES

This is the first growing season for the pollinator planting, and it will take some time for the benefits to clearly manifest. Some of the expected positive outcomes of this planting will be for the leased bees that the Andersons keep on their property in return for honey. The added flowering plants, especially the late bloomers, should allow for a longer season of feeding for the bees and other native pollinators. By keeping this plot of land ungrazed, it may also improve habitat quality for upland game birds.

CHALLENGES

This was an abnormally prolific year for the grasshoppers. They stripped most of the sweetclover by the early fall, but seemed to be feeding on grasses, forbs, and weeds alike. There should not be significant damage from the grasshoppers, nor a draw for these pests over the years specifically because of the new seeding. Some typical rangeland weeds were seen sporadically while walking around the seeding plot but not in any relevant amount.


Photo: John Parker

Another concern may be the temporary erosion that occurs as a side effect of soil tillage. Where the field was worked up, there is a considerable difference in soil cover compared to the adjacent crested wheat stand just over the fence. By resting the new seeding from domestic grazing for 5 years, this should gradually increase the amount of litter cover.

ADVICE TO OTHERS

"Any time you can become a better steward of the Earth, you should; it's desirable to return things to their natural state. Improving wildlife habitat helps support all kinds of life – from insects to mammals - while making the landscape more beautiful."


Robert & Jane Banner

Robert & Jane Banner ♦ Hamilton, Montana

History: The Banners, originally from New York and Cape Cod, came out to Montana to elk hunt for their honeymoon, and they never wanted to leave. They eventually bought an old apple orchard 40 years ago in the late 1960s and have been in Montana ever since. The family raised sheep, Angus cattle, and horses while the children were young and more recently have grown wheat. During this time, Mr. Banner worked as a rangeland technician for the US Forest Service. In the last 10 years, the Banners have sold most of the animals except for some cut horses and 65 head of yearlings.

The EQIP Program: The Banners applied for and received EQIP funding for several projects around the property including: timber stand improvement for pine beetle damage, moving corrals away from the riparian area, 16 acre pasture re-seeding to native grasses, and noxious weed control with herbicide and biological control. There were funds available for shrub plantings, but the couple has been planting pollinator-friendly plants for the last 40 years and decided they would continue to do this on their own, rather than as part of a formal plan.

The Planting Process: According to Mrs. Banner there were hardly any trees, shrubs, or flowering plants around the house when they first bought the land. She made it her personal mission to create a wild space for many different creatures: bird, ducks, elk, deer, mountain lions, and even wolves. "They're all pests," jokes Mr. Banner. They began to plant trees and shrubs around the out buildings, riparian areas, and the house, "Here, there, everywhere!" says Mrs. Banner. She found most of her plants at sales throughout the years and maintains to have planted roughly 15 seedlings per year along with some native transplants and various flowers from seed packets.

The Field Visit: Mrs. Banner has planted many different types of native and ornamental trees, shrubs, and forbs scattered throughout the yard and on the hill leading back down the driveway. The tour around the property lead us to an impressive 20-ft tall serviceberry tree planted 40 years ago as a seedling (see picture to the right). There was also a small man-made pond surrounded with lilies and iris, a large garden, more tall native trees and shrubs, and of course wonderful landscaping around the house. When asked what future plans she had for the plantings, Mrs. Banner got a little bit of a distant but determined look on her face


Blue elderberry

Ecoregion: Middle Rocky Mountain Steppe-Coniferous Forest-Alpine Meadow Province

Type of Pollinator Planting: Interspersed

Date of Planting: 1970-present

Trees/Shrubs Planted:
Black Hawthorn
Blue/Black Elderberry
Chokecherry
Golden Currant
Rabbitbrush
Redosier Dogwood
Shrubby Cinquefoil
Western Snowberry
Wild Plum
Willow

Forbs:
Beebalm
Columbine
Dotted Gayfeather
Globemallow
Lewis Flax
Penstemon
Prairie Coneflower
Yarrow

Date of Field Visit: 6-22-2008


A tall, beautiful serviceberry tree

Banner: Outcomes from the Interspersed Plantings

HELPFUL RESOURCES

Mrs. Banner learned most of her landscaping and planting techniques by trial and error over the past 40 years. She does however, look for and collect various informative booklets at the Missoula Farmer's Market, Teller Wildlife events, and at nurseries that she has visited. She has found helpful the NRCS booklet: Montana Native Plants for Pollinator-Friendly Plantings.

FENCING & WATERING SYSTEMS

The only fenced trees on the property are a couple of apple trees leading back up the driveway surrounded by woven wire. The Banners just assume elk and deer foraging to be a part of life, though they would like to limit the amount of damage caused (and are certainly not afraid to scare them off with a shotgun). They are planning to try a deer soap deterrent in the near future. All of the plants are watered with the garden hose or sprinkler – if some are farther away than the hose can reach, then they're out of luck!

Yucca grazed by deer

PLANT SURVIVABILITY

Some seedlings have died due to plant stress during transplant, weak plants, soil type, and temperature differences. Mrs. Banner expects a 50% mortality rate, and to ensure that some survive, she tries to buy 2-3 of the same plant hoping that at least one will make it.

SUCCESSES

The Banners consider their plantings to have significantly improved the ecological integrity of their land. They especially feel that all of the flowers provide much needed food for native pollinators. They used to have a "bee tree" not far from their house, a feral bee hive in a giant cottonwood tree. The tree was old and fell over 8 years ago and the bees left the area. The Banners have not seen another bee tree since. Their diverse native and ornamental trees, shrubs, and flowers are the best habitat that they can provide to sustain native pollinators.

Native bee on an ornamental flower

CHALLENGES

Pest insects can do some serious damage to mature trees, especially aphids on the Mountain Ash and pine bark beetles on the pine trees. The limited plant survivability can also be extremely frustrating. The key is to look for plants that will grow in the same soil types and precipitation zones where they are going to be planted. Mrs. Banner has tried for years to grow a butterfly bush, with no luck. Sometimes it's best to let Mother Nature win.

ADVICE TO OTHERS

"For people who are truly starting from scratch and know very little, or even people who have been working the land for years, it makes sense to get ahold of the professionals: NRCS, extension service, people who know a lot about this stuff. They'll help with a plan for your land. We incorporated our plantings into our landscaping, but there are a lot of options out there depending on your goals; do you want a wind break, or a place for wild birds? Finding a reputable nursery where you can buy your plants is also very important."

Robert & Becky Bronec ♦ Carter, Montana


Becky Bronec

History: In 1910, Robert Bronec's grandfather was one of the first to homestead in the Carter area. The land, now known as the Ames Ranch, remained in the family rugged and relatively unchanged until Robert and Becky Bronec took over management of the property in 1985. They improved the trail-like driveway into a gravel road, developed a spring, began to use machinery, and improved the grazing system on the ranch. The land was well-cared for, but virtually treeless, with just one shelterbelt planted in the 1920s. Mrs. Bronec, originally from Michigan, is well educated on land health issues from working as a soil scientist for the NRCS.

Ecoregion: Great Plains-Palouse Dry Steppe Province

Type of Pollinator Planting: Shelterbelt

Date of Planting: 1985-Present

Trees/Shrubs Planted:
Caragana
Crabapple
Honey Locust
Lilac
Pines
Russian Olive
Serviceberry
Willow

Date of Field Visit: 7-29-2008

The EQIP Program: The Bronecs are progressive conservationists, and are always looking for ways to improve the health of the land with various projects. The EQIP cost-share program helps to turn many of their great ideas into actual projects on the ground. Their most recent EQIP project involves: improving and building water lines, pasture renovation, tame pasture seeding, crossfencing, and planting a new shelterbelt.

The Planting Process: Since 1985 the Bronecs have planted over 2000 trees on their property in the form of shelterbelts and interspersed tree plantings around the house. When putting in their first shelterbelt (see picture to the right), they were able to learn from the mistakes of the shelterbelt planted in the 1920s where the trees were too close together to benefit from the summer fallow. The caragana and Russian olive shelterbelt (spaced appropriately) was planted in 1985 on the west side of their driveway to protect the road from snow. Another shelterbelt was planted in 2005 as part of an earlier EQIP project. This year, ground preparation began for the next shelterbelt that will be part of the most recent EQIP project.

The Field Visit: Hay was previously stacked on the site for the future shelterbelt. In preparation for working up the ground and planting next year, Mr. Bronec spread out some of the bales that had fallen apart so as to be used for mulching and collecting moisture. During the field visit, Mrs. Bronec decided she would try planting some American plum in the new shelterbelt rather than the standard caragana and Russian olive. Besides the shelterbelts Mrs. Bronec has experimented with several different types of fruit trees, flowering shrubs, and forbs around the house and should be considered an expert for her region in what to plant and what not to plant. "Who doesn't love shade and natural beauty and flowering trees?" asked Mrs. Bronec. "You just have to be persistent and keep trying in order for things to grow out here…this is one of the toughest climates on Earth."

Top: shelterbelt west of the road, ideal for blocking wind and snow drifts. Bottom: site of the future shelterbelt, already being prepared with hay mulch.

Bronec: Outcomes from the Shelterbelt Planting

HELPFUL RESOURCES

The Bronecs listened to advice from people working at the state nursery regarding what to plant. They also picked up several brochures from the NRCS including: Montana Native Plants for Pollinator-Friendly Plantings. Lanny Walker, NRCS District Conservationist in Fort Benton and Judy Wargo, the Choteau County Extension Agent, were both great professional resources.

FENCING & WATERING SYSTEMS

The shelterbelts were only watered when they were first planted, and intermittently with a water truck. The Bronecs experimented with installing a drip system but it turned out to be too much work and maintenance, though they do have some drip tape on the pines west of the house. The shelterbelts are fed by rainwater only, and do quite well as long as the grass is kept under control by working between the shelterbelt rows. Some of the fruit trees need to be planted closer to the house to be watered with the garden hose. Even with water, Mrs. Bronec could not persuade her Nanking cherry to grow. There is no fencing around the shelter belt to keep deer from nipping the new buds and rubbing their velvet off on the trees. "I'm sure they probably caused some mortality and stunted the growth, especially in the pines."

PLANT SURVIVABILITY

Mrs. Bronec certainly did her fair share of experimenting with different tree species to find the ones that would grow in her climate zone. She found that bareroot trees work best in the shelterbelt, the secret being to plant during a wet year. She guesses that there was a 40% mortality rate in the shelterbelts, with the pine trees being even higher. It was difficult to replace the dead trees with new ones in the middle of a row. They had a hard time getting started even with water.

SUCCESSES

The shelterbelts help to create a microclimate and work well to protect the home area from wind and snow drifting onto the driveway. The trees create an ecological niche for wildlife, which have been thriving. The Bronecs have also seen an increase in birds given that the planted trees provide good nesting habitat and shelter. The birds will also eat pest insects that could potentially infest the trees and cause disease and even mortality. When asked about the presence of beneficial insects, Mrs. Bronec says, "There's always some insect activity. Everything always gets pollinated."

CHALLENGES

Herbaceous competition must be controlled in order to have a healthy and vigorous shelterbelt. A common and effective method of control is to till between tree rows. However, this method can cause recurrence of weedy vegetation and in some cases soil loss, especially on shelterbelts disked too deeply or planted on a slope (seen below, left).

Left: soil piled and lost with annual disking between tree rows, Right: weeds in the shelterbelt before tilling

ADVICE TO OTHERS

"*People need to look at their conservation plans and learn about the opportunities out there. You have to be persistent, keep trying different things and new methods. You can't just plant one apple tree out there and expect a bunch of bees, you have to also change cultural practices, like spraying less pesticides for example.*"


Valerie Kurtzhalts

Valerie Kurtzhalts ♦ Kila, Montana

History: The 28 acre parcel that Valerie Kurtzhalts purchased less than 10 years ago was historically logged, fortunately with minor damage to the topsoil. The land had been "used and neglected for years and years" by the time Ms. Kurtzhalts became the owner and started her tree farm. Her land is a natural wildlife haven, and therefore at the forefront of her concerns is good land management to improve wildlife habitat.

Ecoregion: Northern Rocky Mountain Forest-Steppe-Coniferous Forest-Alpine Meadow Province

Type of Pollinator Planting: Interspersed

Date of Planting: 2006-Present

Trees/Shrubs Planted:
American Plum
Black Hawthorn
Blue Elderberry
Buffaloberry
Chokecherry
Golden Currant
Larch
Ponderosa Pine
Redosier Dogwood
Serviceberry
Wood's Rose

Date of Field Visit: 6-21-2008

The EQIP Program: In order to qualify for EQIP, and also out of her own interest, Ms. Kurtzhalts took a Forest Stewardship 3-day training course put on by the Montana State University Extension Service. During this course she drew up a multi-year conservation and management plan for her property, splitting the area into 5 different management areas based on soil, topography, aspect, and management goals. In 2006 she began the first year of a long-term plan for extensive tree and shrub planting. Subsequent years of the project include: noxious weed spraying, biological control, fuel reduction, and native grass seeding.

The Planting Process: By the end of the planting project, there will be 8 acres of planted trees naturally interspersed. Ms. Kurtzhalts groups 3 of the same tree/shrub together in order to emulate nature and to ensure some survivability. This clumping of similar flowering plants also gives pollinators a larger target when looking for food sources. There were 425 bareroot seedlings planted in 2006, 300 planted in 2007, and another 300 in 2008.

The Field Visit: It was so obvious to see how passionate Ms. Kurtzhalts is about the health of her land: "I want to increase the diversity of what is on the property for wildlife." This includes planting native, naturally occurring species that are fruit and flower producing. Walking around on the property shows a very healthy system with native bunch grasses and plenty of wildflowers. Many of the native shrubs and forbs already on the property are considered pollinator-friendly: snowberry, redosier dogwood, and yarrow. These added tree/shrub plantings will only improve the quality of the habitat. During the peak of the day, pollinators were prevalent and flying from food source to food source, especially the honey bees near their hives. In the future, Ms. Kurtzhalts hopes to use her tree farm for educational tours to show other people what great possibilities there are for improving their own properties.

Top Right: landscape views showing a healthy snowberry patch.
Bottom Left: beehives on the property.

Kurtzhalts: Outcomes from the Interspersed Plantings

HELPFUL RESOURCES

Ms. Kurtzhalts feels that having multiple books and resources to consult is extremely important when deciding on what species to plant. She has several favorites: American Wildlife & Plants: A Guide to Wildlife Food Habits, A Field Guide to Wildlife Habitats of the Western United States, ABC and XYZ of Bee Culture, Plants of the Rocky Mountains, Wildflowers of Montana, and many, many other books and booklets.

FENCING & WATERING SYSTEMS

When each seedling is planted, a little bit of Terra-Sorb is sprinkled into the hole to increase the water holding capacity of the soil. The plants are watered only during the first year of establishment with an impressively long garden hose. After the first year, the plants survive only with rainwater, as the species were chosen for their ability to thrive in a dry climate. If they do not survive without extra water, they are not hardy enough to live on the property. The new plants are sheltered from browsing deer and elk with rigid seedling protectors.

A protected seedling

PLANT SURVIVABILITY

Approximately 50% of the seedlings died during each establishment year. The ponderosa pines did better than all of the others because they are best adapted to the hot, dry southwest aspect.

SUCCESSES

The management plan has been extremely helpful in handling multiple wildlife species with diverse needs. For example, the back 10 acres is comprised of deadfall from old beetle killed ponderosa pines, but is excellent habitat for grouse. By having specific management goals, Ms. Kurtzhalts has been able to create habitat for birds, game animals and pollinators. In fact, there are eight bee hives on the property, leased out during the summer (there used to be 24 hives, but there was a 70% mortality rate due to Colony Collapse Disorder). "My neighbor says he's had the best cherry crop in many, many years since the bees have been here." Once the new trees/shrubs are established enough to flower, Ms. Kurtzhalts may find that even native bees and pollinators will be drawn to the area.

The management plan ensures that all wildlife habitat is accounted for.

CHALLENGES

As a one-woman operation, planting 300-400 seedlings per year can be a daunting task. Even with just 28 acres, the time commitment can feel overwhelming, especially with a full-time job in town. This hot, dry southwest aspect is also a tough site to work with especially due to the more recent unseasonably hot summers. The survivability of the seedlings would probably be less fruitful without the first year of watering with the garden hose, so she is thankful for this option, though it is quite time consuming. "It's all part of doing the right thing by the land."

ADVICE TO OTHERS

"This is a great opportunity to restore forest health by increasing plant diversity and addressing weed and disease issues. There are good resources available through the state and federal government. I just wish more people would take advantage of these opportunities."

Charlie Noland

Charles Noland ♦ Circle, Montana

History: Charlie Noland bought this piece of property in the 1980s with the personal goal of creating a diverse, healthy, and sustainable wildlife ecosystem including a quiet place where his grandchildren could hunt snakes and ride horses. "When I signed up for CRP, I looked forward 10 years into the future and asked myself, *What do I want this landscape to look like?* And I decided that I wanted to have the best upland game bird habitat I could create." Mr. Noland's inspiring goals have lead to a beautiful, ecologically diverse, premium habitat for all wildlife species - upland game birds and pollinators alike.

The WHIP Plan: The extensive shelterbelt planting process began in 1997 as a CRP contract, during which Mr. Noland planted 7 linear plots, each with 7-10 rows of trees. Lining these plots up end-to-end would measure out to over 4 miles of tree plots; a total of more than 50,000 trees! This massive endeavor was financed by CRP (50%), Fish Wildlife and Park's upland game bird habitat program (25%), and out-of-pocket expenses (25%). The WHIP contract began in 2006 and was more specifically for pasture seeding with a mixture of forbs.

The Planting Process: In preparation for the shelterbelt planting, the sites were summer fallowed for two years before using a 3-man team with a tree planter and 6-ft wide black plastic mulch to get the bareroot seedlings into the ground. After the initial planting year, weeds were controlled by tilling the soil. The following year, the ground was mulched with a rotary mower and hard fescue was planted in between the rows as a ground cover, which is an alternative to annual tilling for weed control. A Truax range drill was used for the pasture seedings.

The Field Visit: Seeing this improved landscape is an incredibly exciting experience. Wildlife is abundant, never difficult to catch a glimpse of a rooster, whitetail deer, or hawk. The multiple and diverse planting projects were clearly well-researched and skillfully constructed to add to the natural beauty and ecological function of the land. This is all complemented with Mr. Noland's enthusiasm for the natural world; constantly racing off to point out a newly blossomed globemallow plant, or a headed out bunch grass. The excitement was contagious.

Ecoregion: Great Plains-Palouse Dry Steppe Province

Type of Pollinator Planting: Tree Plots & Pasture Seeding

Date of Planting: 1997-Present

Trees/Shrubs Planted:
American Plum
Buffaloberry
Caragana
Rocky Mountain Juniper
Russian Olive
Snowberry
Wood's Rose

Pasture Seed Mix:
Alfalfa
Blue Flax
Bluebunch wheatgrass
Green Needlegrass
Indian Ricegrass
Little Bluestem
Sideoats Grama
Small Burnet
Sweetclover

Date of Field Visit: 6-25-2008


Left: one of the seven tree plots, Right: a newly seeded pasture showing the blue flax in bloom

Noland: Outcomes from the Tree Plots & Pasture Seedings

HELPFUL RESOURCES

Like any deep-down conservationist, Mr. Noland looks to Aldo Leopold, Rachel Carson, and Allan Savory for direction. For specifics on what to plant, he refers to NRCS Tech Notes and booklets, as well as plant materials from McCone County. Professional biologists Ray Mule and Pat Gunderson from Montana FW&P have also been great resources.

FENCING & WATERING SYSTEMS

None of the tree plots are fenced from critters, as they were planted specifically for wildlife habitat. Of course, there is a certain risk to leaving the young plants to the browsing whims of the deer, but some of the other pests such as rabbits are more difficult to fence out. The area is in an 11-14" precipitation zone, and the plants were chosen for their adaptation to a dry climate. The seedlings were never watered with supplemental resources. The black plastic mulch is designed for rainwater to penetrate through the barrier and down into the soil and prevents evaporation. The heat underneath the plastic also helps to create a microclimate and trap moisture near the roots. The plastic is laid in a furrow when the seedlings are planted and water can collect and run down the length of the plastic to each root system along the way.

A newly planted shelterbelt showing the black plastic mulch and how it can collect rainwater

PLANT SURVIVABILITY

According to Mr. Noland, the survivability of most trees is 92%, with most of mortality being from deer browsing or rubbing off their velvet. "Some live and some die, that's just the way it goes." The survivability of burr oak is exactly 0%. The deer just will not leave those plants alone; they would even rip off the rigid seedling protectors. Buffaloberry is another shrub that is tough to get started. It grows slowly and is extremely attractive to rabbits and deer. Other potential survivability issues might be with the wood's rose, which have recently been infested with tent caterpillars.

Deer browsing damage on juniper

SUCCESSES

In the last 12 years: pheasants have increased 10 fold, sharptail grouse have increased 4 fold, nesting doves increased 10 fold, and whitetail deer have moved in and nearly doubled their population. Beneficial insects and pollinators have increased, as has the population of hawks, owls, and raptors. Aesthetically, the land has improved and has become an ecologically preferred area. This has also had unintended benefits for the neighbors, as the plantings draw wildlife out of their crops and onto the Noland's property. The land is also used for public hunting, birding, and NRCS and school group tours. Mr. Noland is an active member of Pheasants Forever, a habitat group with the goal of preserving upland game species.

CHALLENGES

Planting the pastures back to native, warm season grasses is very expensive. In addition, the labor involved with putting down 21 miles of black plastic mulch and planting the seedlings is immense.

ADVICE TO OTHERS

"The breakeven with the new CRP is not economically justifiable. You would make more money haying, grazing, or growing crops. Creating habitat won't be economical, you just have to love it. Pick species that will grow in your area, be patient…it's a labor of love."

Laura Schaap ♦ Bozeman, Montana

History: The property was owned by an older couple who harvested hay out of the back field and ran a few head of horses. When Robert and Vivian Schaap bought it in 2002, they named it Story Hill Farms with the vision of growing more of their own food, implementing permaculture, and having a nice place for their grandchildren to grow up. The Schaap's daughter, Laura is involved with much of the land management aspects.

Ecoregion: Middle Rocky Mountain Steppe-Coniferous Forest-Alpine Meadow Province

Type of Pollinator Planting: Shelterbelt

Date of Planting: June 2008

Trees/Shrubs Planted:
Buffaloberry
Caragana
Currant
Elderberry
Nanking Cherry
Oregon Grape
Serviceberry
Snowberry
Wood's Rose

Date of Field Visits: 6-5-2008
6-16-2008

The EQIP Plan: Robert Schaap decided to sign up for EQIP after visiting with the NRCS office and seeing how program-oriented the organization was. "My eyes started to glaze over talking about the various programs, but without participating in a cost-share program, it was difficult to get the help we were looking for." The Schaap's EQIP plan consists of: predator-deterring fencing, stream restoration, noxious weed control, prescribed grazing, and pasture seeding. The shelterbelt planting is something that Ms. Schaap is doing on her own aside from the EQIP plan and is integrating with her garden plot.

The Planting Process: Ms. Schaap planted 50 caragana bareroot seedlings on the east fence of the 1 acre garden plot (at the time seeded to Austrian winter peas and white clover) to serve as a wind break. With this year's cool, wet spring in the Gallatin Valley, the garden plot was basically a mud puddle until mid-June. On one of the first dry days, the shelterbelt was planted on the east side of the garden in a slight arc to skirt wind around either side of the garden, which would be planted in early July. Each shrub was bought as a seedling and planted along with a shovel-full of mulch wood chips. Ms. Schaap will continue to intersperse native plants around the property built into the landscaping, and has already planted another shelterbelt on the south side of the driveway.

The Field Visit: During the first field visit, it was pouring rain, and ended up as more of an interview rather than a field tour. However, once the rains dried up in mid-June we were able to integrate the second field visit with the shelterbelt planting. It was an interactive day, consulting several different resources to decide upon how far apart to plant the shrubs, and in what order to place them. In the end, the shelterbelt was 15-ft wide by 200-ft long, with plans to add more shrubs throughout the growing season and throughout the years. Photographer John Parker was able to capture many images of the planting process.

Left: Gathering supplies, preparing to plant! Right: Planting the shelterbelt.

Schaap: Outcomes from the Shelterbelt Planting

HELPFUL RESOURCES

While deciding on plant spacing for the shelterbelt, it became quite apparent that different resources suggest different distances. In order to make an informed decision, consulting multiple resources is key. A few of the favorites: Gaia's Garden, Earth User's Guide to Permaculture, Carrots Love Tomatoes, Introduction to Permaculture, and booklets: Montana Native Plants for Pollinator-Friendly Plantings and Preventing Deer Damage.

FENCING & WATERING SYSTEMS

The Schaaps erected an 8-ft deer fence along the perimeter of the 1 acre garden plot to prevent any pest issues. Currently Ms. Schaap uses a temporary sprinkler system also hooked up to a fertilizer injector. In the coming years there are plans to install a permanent drip line coil.

Putting up the deer fence around the garden plot.

PLANT SURVIVABILITY

All of the plants that were put into the shelterbelt in June, are still alive and healthy, though a severe hail storm came through twice in August causing some foliage damage. It helped that these plants were purchased already in pots. Though more expensive, potted plants can have a higher percentage of survivability than the smaller, less expensive bareroot plants. Some of the plants selected for the shelterbelt on the south side of the driveway were bareroot and put into pots to live in the greenhouse while the ground dried out this spring, and those plants continue to do well in the ground.

SUCCESSES

One day this spring while working out in the field, Robert Schaap heard an incredible humming noise: "I have never heard anything like it. I thought to myself, *What in the world is going on?* Then I saw it. A wild swarm of bees." This is certainly an encouraging thought, and with the habitat and food source for pollinators increasing on this property, these sightings may continue.

CHALLENGES

The weather is always unpredictable. Due to the rain, the shelterbelt was planted one month later than planned. All of the plants were purchased beforehand, and lucky for the Schaaps they had a greenhouse in which to store and grow the plants while waiting for the ground to dry out. Keeping the area weed free can also be a challenge because of the amount of time required on a regular basis. The hard part is planning and organizing what it is that you want to plant, "Once the plants are in the ground, it's a big relief," says Ms. Schaap.

Waiting for the sun to dry up all the rain!

ADVICE TO OTHERS

"You have to want to do the right thing to move in a direction you can feel good about. Economics can't matter. It takes a lot of hard work – but I guess I'm not much for relaxing, either"
-Robert Schaap

Ray Sprandel ♦ Terry, Montana

History: Ray Sprandel's father bought this property, dubbed Sprandel Farms, in 1946 as part of the Buffalo Rapids Project after WWI. Ray took over management in 1978 and now farms alfalfa, wheat, a small plot of corn, and leases some land out for running cattle.

The WHIP Plan: Mr. Sprandel had been thinking about planting tree plots for years. Eagle habitat is a very important local issue, and Mr. Sprandel wanted to do what he could to improve habitat for eagles and other wildlife, including pheasants and pollinators. After deciding to apply for WHIP, Mr. Sprandel was not sure that his project would be funded. To his surprise the contract went through and he was able to put in two tree plots, 2-3 acres each, with 75% of the materials paid for by WHIP. "I probably wouldn't have done this without the cost share," he admits.

The Planting Process: Deciding what to plant was not a very difficult part of the process for Mr. Sprandel. He is a well-read man, familiar with what grows in his climate zone, and knew exactly what he wanted – lots of fruit trees. In spring of 2007, Mr. Sprandel and a hired man put in the bareroot trees using a tree planter and fabric mulch with similar trees grouped together in rows. The rows were spaced far enough apart for annual mowing and tilling to keep control of weeds, with the eventual goal of planting perennial rye and small burnet in between the rows for pheasant habitat.

The Field Visit: Between early morning irrigating and mid-morning hay bailing, Mr. Sprandel showed off the tree plots. The plot on the upland area was recently worked between the rows and freshly watered. The honeysuckle were brilliantly blooming, and everything looked healthy. The second tree plot in the bottoms had not been weeded out yet this year, so while Mr. Sprandel was bailing, Rebecca Baril, affiliate for the Pollinator Partnership spent a couple of hours hand pulling weeds out from the fabric mulch.

Ecoregion: Great Plains-Palouse Dry Steppe Province

Type of Pollinator Planting: Tree Plots

Date of Planting: April-May 2007

Trees/Shrubs Planted:
American Plum
Buffaloberry
Chokecherry
Honeysuckle
Lilac
Nanking Cherry
Pine
Sand Cherry
Skunkbrush Sumac
Various fruit trees

Date of Field Visit: 6-26-2008

Left: blooming honeysuckle
Center: a healthy looking skunkbrush sumac plant
Upper Right: the upland tree plot

Sprandel: Outcomes from the Shelterbelt Planting

HELPFUL RESOURCES

Mr. Sprandel has a library of more than 2000 books, many of them reference materials. One of his favorite plant books is the Complete Encyclopedia of Trees and Shrubs. "It's supposed to have everything in it." In deciding what to plant, Mr. Sprandel used not only books, but his own knowledge and experience from ranching and observation of wildlife browsing on various native trees and shrubs.

FENCING & WATERING SYSTEMS

As soon as the seedlings were planted, wildlife ravaged the delicate foliage. With two tree plots to fence, Mr. Sprandel decided to run an experiment: the upland tree plot was fenced with an 8-ft woven wire deer fence, while the tree plot in the bottom was fenced with two electric fences which serves as a visual illusion for deer. The plots are irrigated with gated pipe only when things are looking dry. The water runs down the furrow on the fabric mulch and can soak in where each tree was planted. Once the grasses between the rows are planted, he will irrigate the whole plot.

The electric deer fence on the bottom plot

PLANT SURVIVABILITY

Of the 1200 trees planted, there was an approximate 80% survivability. In general, the 2-year old seedlings fared better than the one-year old seedlings (though the 2-yr old were difficult to fit through the slits in the fabric). Before the fences had been erected, the skunkbrush sumac was grazed hard by the deer, but surprisingly recovered with little mortality. Most of the apricot trees died out along with a certain percentage of the buffaloberry. In the bottomland plot, the weeds coming through the plastic mulch have been shading out the new seedlings and also competing for water.

SUCCESSES

The plots have been in for just over a year now, and it is too early to see tangible improvements in wildlife habitat and native pollinator populations. However, Mr. Sprandel has had beehives on the property ever since he can remember and thinks he has seen a slight increase in the numbers of wild bees this past year as well as the number of doves. The increase in the number of native pollinators will eventually play into his potential long-term plan of growing seed alfalfa and making jam from the fruit on the trees.

CHALLENGES

The weeds in the bottomland plot are difficult to keep under control. Mr. Sprandel thinks than an herbicide application could help, but is fearful that it may hurt the trees, and would rather wait until they get bigger. The plot was placed under some old cottonwood trees, and the cottonball seeds that fall each year grow little cottonwood trees if they make their way into the slits in the fabric mulch. The cottonwoods outcompete the seedlings for space and water. In retrospect, planting underneath these old trees may not have been the best placement for this tree plot.

Cottonwood seedling competing in the tree plot's fabric mulch

ADVICE TO OTHERS

"These trees will provide a significant improvement for wildlife, not just deer and birds, but for all wildlife. The benefits are not economical as far as putting money in my pocket, I don't see that; it's more about feelings than anything. Doing the right thing."

RESULTS

RESULTS:

Part I. An In-depth Look at EQIP & WHIP Cost-Share
Part II. The Plant & Infrastructure Establishment Phase
Part III. Evaluating Success & Overcoming Difficulties

PART I. An In-depth Look at EQIP & WHIP Cost-Share

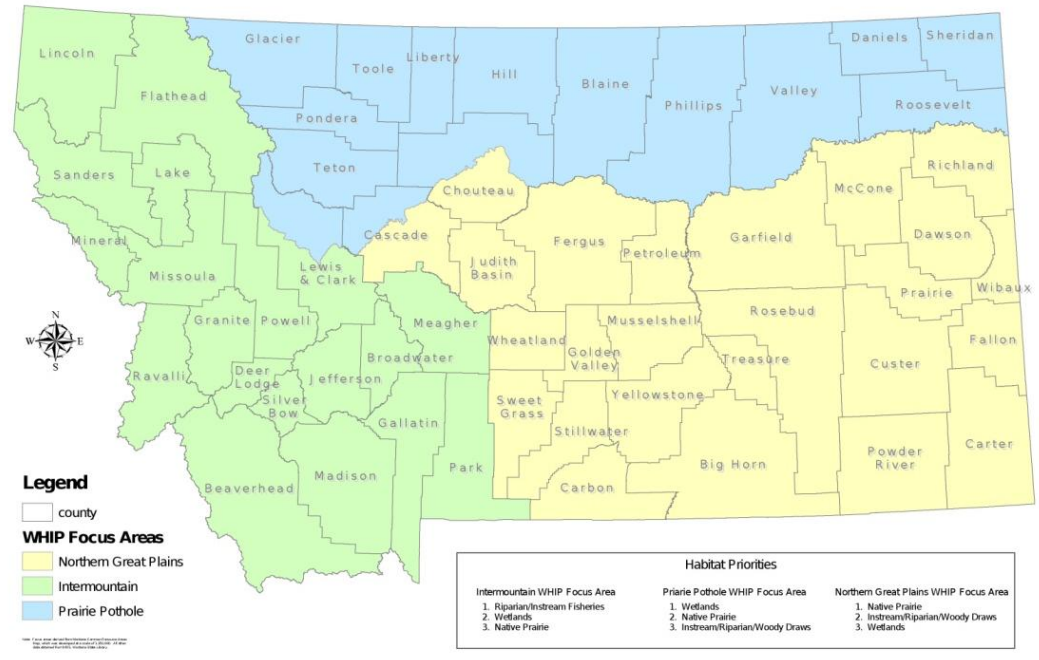
Background

The NRCS began their Environmental Quality Incentives Program (EQIP) cost-share in 1997 as a way to promote agricultural production and environmental quality as compatible goals (NRCS, 2004). The Wildlife Habitat Incentives Program (WHIP) cost-share began in 1996 to encourage the creation of high quality wildlife habitat that supports wildlife populations of National, State, Tribal, and Local significance (NRCS, 2004). The 2002 and 2008 Farm Bills reauthorized both programs with increased funding.

Since the inauguration of the programs, Montana farmers and ranchers have received over $125 Million towards EQIP and $3.5 Million towards WHIP. The two cost-share programs have a similar application process, with proposed conservation projects being ranked with National, State, and Local priorities. This "ranking criteria" scores the potential projects in the order of conservation importance and is the determining factor in deciding whether or not projects are funded through the cost-share program. The projects last between 1 and 10 years, with a maximum payment to any one landowner of $450,000 during the life of any farm bill (Mosley, 2008).

For the WHIP program, a statewide plan relevant to the goals of Montana is decided upon by the Wildlife and Wetlands Working Group of the State Technical Advisory Committee with input from Local Working Groups. For the ranking criteria, the state is broken into three focus areas with different wildlife habitat concerns: Intermountain, Great Plains, and Prairie Pothole (Figure 4). Projects with the most "conservation benefit" points determined by the ranking criteria, will be funded first and remaining projects will be funded in the order of highest points to least points until all funding has been allocated, some projects remaining unfunded. For the WHIP program, there are no specific ranking points relating to pollinator habitat, however, many of the questions refer to the restoration of declining or important native wildlife habitats, often involving the planting of flowering shrubs/trees as a shelterbelt or forbs in conjunction with a pasture seeding.

Figure 4. Focus areas for the Montana WHIP program with habitat priorities.



For EQIP, project applications fall into one of five categories of allocated funding: grazingland, dry cropland, irrigated land, forestland, and multiple landuses. Within these five categories, there are uniform National and State issues, and specific Local level ranking criteria questions (decided on by the Local Working Groups) to determine which projects are most urgent. Montana is one of few states in the nation to include pollinator habitat as a State Issue, addressed in the ranking criteria:

- "Does the application benefit pollinator species through the seeding of pollinator friendly seeding mixes on ½ to 5 acres of land? (Must be in accordance with Montana NRCS Biology Technical Note Number MT-20, December 2004.)"

- "Does the application benefit pollinator species through the seeding of pollinator friendly seeding mixes on more than 5 acres of land? (Must be in accordance with Montana NRCS Biology Technical Note Number MT-20, December 2004.)"

Other pollinator-friendly practices also qualify under ranking questions aimed at restoring native wildlife habitat and planting wind breaks or shelterbelts. Some conservation projects can be funded through Special Initiatives designated to address natural resource concerns that may not be confronted in other EQIP opportunities (NRCS, 2008). To this date, there has not been Special Initiative funding allocated to pollinator-friendly practices.

As in the WHIP program, projects are funded in the order of highest to lowest "conservation benefit" points, until all funding has been exhausted. In 2008, $25.5 Million was allocated towards EQIP, funding 771 projects, a 75% application acceptance rate. In contrast, WHIP received just $850,000. The amount of federal money that funds these programs changes annually, as does the ranking criteria which adapts to changes in conservation issues (Mosley, 2008).

Understanding the Cost-Share

With all of the intricate details of the EQIP and WHIP program ranking criteria, it is no surprise that the cost-share component is equally as complex. The general rule for cost-share is: NRCS pays 50-75% and the landowner pays the balance. Limited resource producers and beginning farmers are eligible for an additional 15% paid by NRCS. However, these percentages can be illusory at first glance because the percentages refer to the average cost of the implemented practice, not the actual cost to the producer. The following explanation will help to clarify this.

The NRCS determines the **average cost** of the practice installation across the state, sometimes focusing on individual geographic areas. Jerry Schaefer, the NRCS Agricultural Economist who defines the prices thinks that, "prices are fair, but with any *average*, you're going to have [some producers who are] winners and [some that are] losers." This average cost includes all necessary components of the practice. For example, the average cost of a fence installation might be $1.00 per foot, which **includes**: installation labor, posts, wire, gates, etc. At 75% cost-share with 2008 prices, the NRCS will pay $0.75/ft. If the landowner installs a fence that costs $2.00/ft, NRCS will still only pay $0.75/ft, because the average cost of the practice was already pre-determined. As long as the actual cost of installing the practice is $0.75/ft or more then NRCS will pay $0.75/ft. However, if a landowner installs a fence for $0.60/ft, the NRCS will only reimburse up to the cost of the practice that is less than $0.75, in this case $0.60 (NRCS, 2008). The average costs are updated annually, and are typically not variable by region. In 2009, the Montana NRCS will move away from verbiage of cost-share "percentages", and move toward publicizing the defined monetary amount contributed towards certain practices so that applicants to the projects know exactly what they can expect for financial support (Schaefer & Mosley, 2008).

How are Landowners Influenced by these Programs?
The opportunity for farmers and ranchers to improve their operations while implementing conservation practices is hugely increased with the EQIP and WHIP cost-share programs. Not only can landowners receive partial payment for projects they were already planning on implementing, but the cost-share gives the extra incentive to try new practices, or those that may be more expensive and therefore previously out-of the-question.

Even with all of the obvious benefits of these programs, the complexities, nuances, and rules can be overwhelming and frustrating for landowners to the point where they are disinclined to participate. It is not just an application that the landowner fills out; there are multiple field visits, land health assessments, conservation planning, Tech-Notes, and rules on how you are allowed to implement certain practices to be in compliance with NRCS standards. As Charlie Noland, one of the participants in this MT pollinator project, says: "If you take Uncle Sam's money, sometimes you have to do what he wants." The mere fact that the NRCS is *government run* is enough to deter many applicants, not to mention the endless program name acronyms, complexities of funding allocation, and field practice specifications that must be followed in order to receive cost-share funding and not go against the contract. Robert Schaap of Story Hill Farms: "My eyes started to glaze over talking about all of the program names. I felt awkward being part of the cost-share, all I wanted was the expertise of the NRCS, but that's hard to get without signing up for a program." According to one California producer, the general perception of the NRCS is that it is "big, scary, and evil, receiving only 5% of the office foot-traffic compared with the Farm Service Agency which receives 95%."

The success of these cost-share programs is dependant upon the NRCS' ability to simplify the application process and program complexities at least to the point where it doesn't feel *government run* with multiple hoops to jump through. In addition, the NRCS must make employees available for producers who are interested in conservation practices without participating in the cost-share and all of the other program requirements that come along with it. Many NRCS staff are busy enough just keeping up with all of the contracts that they often do not have time for the ordinary landowner who only wants advice without the money.

How does this Relate to Pollinators?
Each of the participants in this MT pollinator-friendly project were applicants of the EQIP or WHIP program, with 5 out of 7 participants receiving a cost-share for the implementation of pollinator-friendly practices. Regardless of the State Issue ranking points for pollinator-friendly practices, most landowners were unaware of this opportunity. Only 1 out of 7 participants knowingly and purposely planted flowering plants specifically meant for pollinators, the others were planted for other wildlife, with benefits for pollinators as a positive side-effect.

The reason for the unawareness is that rarely does a landowner actually see the list of ranking criteria, and therefore is uninformed of the different, new, and innovative conservation practices that they can put into operation on their property; often in line with their own personal conservation goals. In Montana, there is not a publicized list of suggested conservation practices or cost-share potentials aside from the ranking criteria questions. Furthermore, the ranking criteria list is only available on the NRCS website, largely out of sight from many Montana landowners most of whom do not have a high-level of experience or access to navigating the Internet. In this case, project applicants have little opportunity to learn about the conservation issues most relevant to Montana other than interacting personally with an NRCS agent willing to discuss all of the options. Jeff Combs, the Montana program specialist for WHIP, suggests that NRCS agents are careful when discussing specific aspects of the ranking criteria with

program applicants to avoid "point-hunting," which may give some applications a better chance of being accepted. If the ranking criteria questions can be re-formatted into a list of potential cost-share opportunities, Montana landowners will be better served and important state and local conservation issues may have a better chance of being addressed.

When Carrie Mosley, Assistant State Conservationist for Programs, was asked, "In your opinion, do you think landowners know about the cost-share opportunities for implementing pollinator-friendly plantings?" she responded, "I'm sure they don't know. In fact, they probably don't even know what a 'pollinator-friendly planting' is." She continued on to say that educating their own NRCS employees through presentations, newsletters, and information campaigns would probably help to promote the pollinator habitat plantings.

At this time, the pollinator-friendly program success is determined by energetic and knowledgeable NRCS personnel. Landowners looking for conservation assistance contact their local NRCS field office. NRCS employees work closely with the landowner discussing conservation issues and coming up with possible solutions to meet the conservation need. For example, if a rancher wants to renovate a poorly-producing pasture, the NRCS employee can suggest a native seeding (notoriously expensive) mixed with forb seeds for pollinators in a portion of the pasture. If the conservation plan becomes a contract, then cost-sharing is available for installing the pollinator planting.

This was the exact suggestion made by Bozeman NRCS soil conservationist Wendy Williams to Mike and Jeannie Anderson of Belgrade, the only participants of this project who deliberately implemented a pollinator-friendly seeding. Wendy encourages people to set aside 10-12 acres for pollinators as part of their EQIP contract. She especially encourages people to plant odd areas around pivots for productive pollinator habitat to make use of the land usually irrigated with a hand line or left to dryland crops. "You could plant it to something that will add value," she says. So far, the Andersons are the only people in the area who have followed her suggestion. This could be due to the NRCS standards and specifications for installing and applying this conservation practice, referenced in the MT-Tech Notes and other NRCS materials. These materials define when and how a landowner is allowed to graze, hay, and plant these areas. In all fairness however, many Technical Notes and materials available from the NRCS are great resources for a successful planting.

Another potential issue discouraging some producers from participating in pollinator-friendly seeding practices is the lack of equipment. It may be easier for farmers than ranchers because farmers usually have the equipment on hand. Interseeding a pollinator-friendly seed mix into an existing barley field is easier than breaking up sod. For a rancher who does not seed grass on a regular basis and does not own the proper equipment, it can quickly become an expensive project. When changing the landuse from sod-bound forages to pollinator-friendly forage mixes, the cost-share assistance does not cover the seedbed preparation, which can be costly.

Without a helpful and involved field technician, many producers would be unwilling to do these practices (following NRCS standards) on their own. Wendy strongly believes in assisting landowners as much as possible through the planning and/or contract processes. She helps landowners find contract workers to do seeding, irrigation, fence-building, etc. She is constantly following up with phone calls and field visits, staying involved with each project for 3-6 years.

The initiation of pollinator-friendly plantings as an important State Conservation Issue was largely due to a push by former State Conservationist Dave White. The subsequent acceptance of pollinator-friendly

practices in Montana will be the result of NRCS employees pushing the issue beyond words on a page of ranking criteria, and making it an on-the-ground priority. Fortunately, the 2008 Farm Bill speaks specifically to pollinator habitat issues on a national level, also largely thanks to encouragement from Dave White (Brzostek, 2008). This will ultimately give individual states greater flexibility to promote pollinator-friendly plantings, and could bring the issue from a mere ranking criteria question to a full conservation plan.

When it comes to the pollinator-friendly plantings, reducing the chance of failure is the most important part, says Wendy Williams, “Reduce failure and people will do it.” Carrie Mosley agrees: “In looking back at the pollinator-friendly pasture plantings from the last years, many producers were only willing to do a small portion of an entire field.” The producers were skeptical of the benefits, and concerned about the success of the planting. The remainder of this report explores the many accomplishments and challenges of seven Montana producers who established pollinator-friendly habitat on their properties. This wisdom passed along from these experienced producers will hopefully encourage and guide other Montana producers to implement “best practices” for their own pollinator-friendly plantings.

PART II. The Plant & Infrastructure Establishment Phase

The First Step: Deciding to go for it

Many landowners want to improve wildlife habitat on their properties. Some of the more important wildlife species noted by participating producers are: Hungarian partridge, pheasants, grouse, songbirds, hummingbirds, bees, deer, and elk. The decision to begin such a project depends on three things: money, knowledge, and time.

- Money - The EQIP/WHIP cost-share programs allow for less concern about prices. Those producers who do not want to be part of the cost-share will see an increased financial burden in order to implement these practices. The payback will come in the form of overall land health improvements, increased production of animal pollinated crops, and pride from being a good land steward.

- Knowledge –The information is out there. Local conservation initiatives, extension offices, NRCS, and FSA are good resources to learn about the benefits, challenges, and specifics of implementing wildlife plantings. Additional resources include: books, neighbors, and local nurseries. Ultimately, the experience will be trial-and-error, but prior research will help to keep failure to a minimum.

- Time -The issue of time remains a difficult one to overcome. Conservation projects take time; there is no way around it.

As Robert Schaap of Story Hill Farms explains: "You have to want to do the right thing to move in a direction you can feel good about." The decision to take on a wildlife habitat improvement project is a personal one. Many of the producers suggest taking things slowly; doing one project at a time, spread out over several years or even decades. Nature works slowly, and so should we.

Types of Plantings

Habitually, the word *wildlife* refers to game birds and game animals. These species need nesting/fawning areas, protection from predators, and high-quality forage. Often this involves the planting of a shelterbelt, tree plot, or pasture mix. These areas without a doubt double as ideal pollinator habitat, the wildlife species often unintentionally forgotten. Though pollinators are often not the main focus for the plantings, they are direct beneficiaries.

Turning a *wildlife* planting into a *pollinator-friendly* planting. If landowners could take the needs of pollinators into consideration when designing their plantings, the wildlife habitat would be even more robust, ensuring pollination and long-term plant health. This would only require slight adjustment of the original design:

- leaning towards native rather than introduced plants
- picking a variety of species whose blooming times overlap to flower from April-October
- planting the same species in bunches
- choosing species that yield a variety of flower shapes, sizes, and colors
- limiting the amount of insecticides and herbicides used in and around the area

The reasoning behind these specifications for pollinator habitat will be explained in the following sections.

Table 3. Types of Plantings

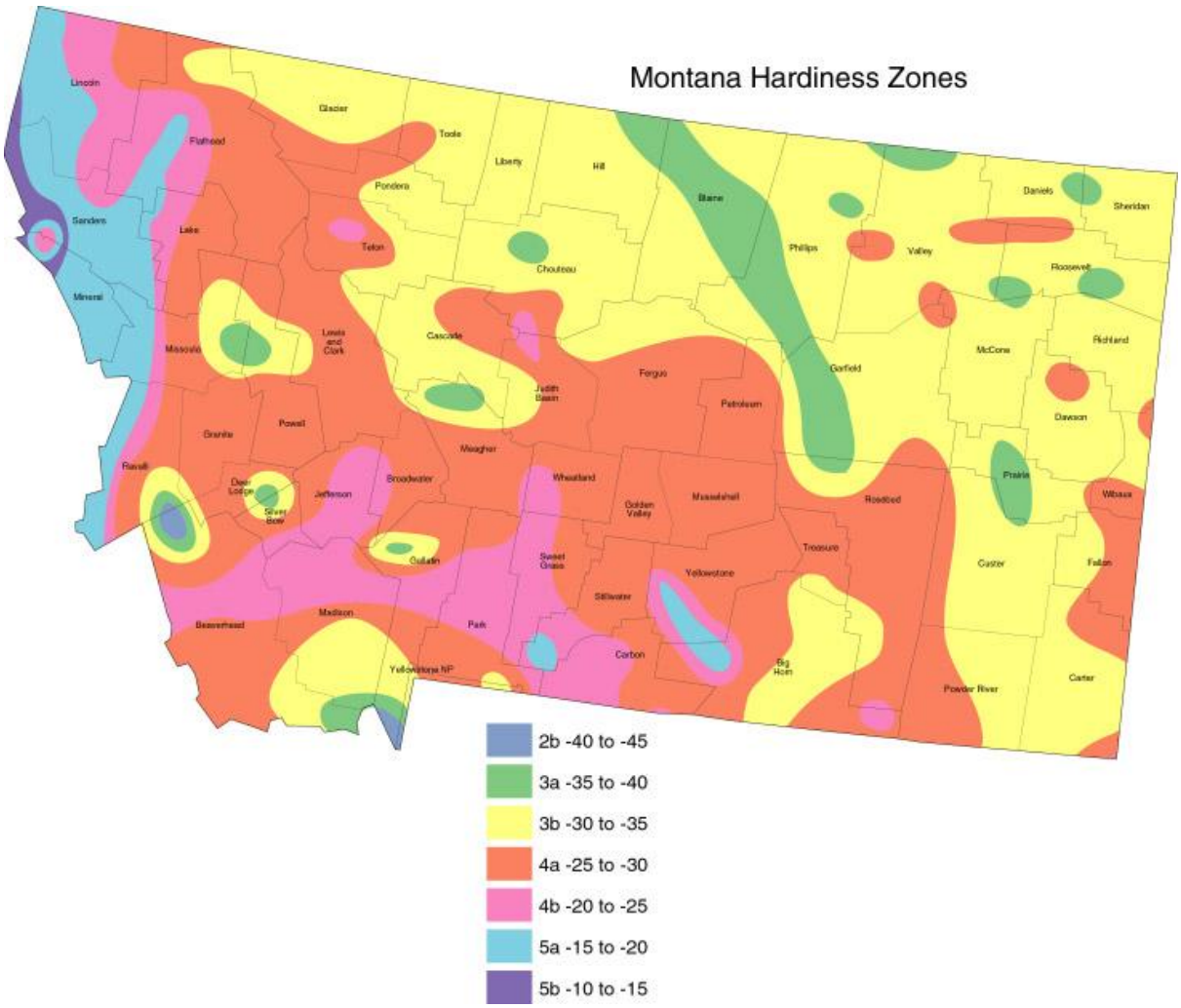
Pasture Seeding Many ranchers who want to move away from mono-cultures of introduced grass pastures (smooth brome, crested wheatgrass, Kentucky bluegrass, etc…) are looking more towards tame or native pasture seedings. A mixture of high forage quality grasses with forb seeds provides diversity for livestock grazing, land health, and of course opportunities for pollinators. ***Photo:*** **Circle, MT: native mix of warm and cool season grasses drilled in with blue flax, alfalfa, small burnet, and sweetclover.**	
Interspersed Trees and shrubs grow naturally interspersed throughout the landscape. This type of planting is best for areas around houses and within forests, and is most effective when same species are planted in groups to provide a larger target for foraging wildlife including pollinators. ***Photo:*** **Kila, MT: chokecherry and hawthorn seedlings (covered with rigid protectors) planted amongst a ponderosa pine forest.**	
Shelterbelt For areas that need protection from wind, shelterbelts are the best planting choice, while also providing key wildlife habitat. They are typically planted with pine, caragana, and Russian olive trees because they are robust and grow tall, however a diverse mix of native shrubs and trees could provide even more wildlife value. ***Photo:*** **Bozeman, MT: a native plant shelterbelt being established to protect a garden plot from eastern winds. A row of caraganas was also planted along the east side of the deer fence.**	
Tree Plot This is a large-scale shelterbelt that not only provides shelter from wind, but is also a wildlife haven providing many opportunities for nesting, hiding from predators, and foraging. Sometimes the main purpose is to integrate large tree/shrub areas into a rangeland setting or growing and harvesting fruit trees. ***Photo:*** **Circle, MT: this half-mile long tree plot has seven rows of trees/shrubs including caragana, Russian olive, rose, juniper, and American plum with hard fescue planted between the rows**.	

Decision-making: What to plant?

After deciding which method of habitat planting is the most appropriate for their operation and goals, landowners must next decide what types of trees, shrubs, or forbs to plant. The most important deciding factor will be their location: What type of climate do they live in? How much precipitation do they receive annually? What are the main soil types? What types of plants are naturally growing on their property? These factors determine what plants to choose. According to Charlie Noland in Circle, MT, "You have to pick species that are adapted to your area. Pick a species that will grow and thrive."

To determine what plants are appropriate for a specific area, agriculturalists, gardeners and landscapers use a plant hardiness zone map produced in 1960 by the US Department of Agriculture (USDA) most recently updated in 1990. The map details the lowest temperatures that can be expected each year in North America. These temperatures are referred to as "average annual minimum temperatures" and are based on the lowest temperatures recorded for each of the years 1974 to 1986 in the US, breaking the country into 10 zones (National Arboretum, 2004). Montana hardiness zones vary from 2b-5b (Figure 5). Many plants are categorized into a hardiness zone within which it will grow.

Figure 5. Montana Hardiness Zones, determined by lowest temperature recorded (°F)



Map Source: http://www.hort.purdue.edu/newcrop/cropmap/montana/maps/MThardy.jpg

In addition to hardiness zone, producers need to keep in mind tree/shrub diseases prevalent in their area as well as pest insects that may cause mortality in new or even established seedlings. For example, mountain ash is susceptible to fire blight and aphid damage. Knowing ahead of time what the pest issues may be will help to prevent unnecessary plant mortality. Also to keep in mind for producers who will not be fencing their plantings is to select *browse resistant* plants. No plant is entirely deer-proof, however deer do prefer certain plants over others. For a list of deer resistant plants, see Cashman Nursery's pamphlet "Preventing Deer Damage" in Appendix 3.

Remembering the pollinators is another important step in deciding what to plant. Pollinators need a season-long supply of nectar and pollen to support the various lifecycle timing of different species, and for some, storing up resources to overwinter. The right mix of plants will bloom all season with overlapping blooming times to provide this continuous food source. When picking species to plant, it is most difficult to find the very early and the very late blooming species, though these are the most critical to pollinator survival. The early blooms especially help social bees to get a good start in the spring. The later blooms support some solitary bees preparing to overwinter as adults or to construct brood cells for their young to overwinter. Lists of early, mid, and late blooming plants can be found in the Montana Native Plants for Pollinator-Friendly Plantings booklet and also in Tech Note MT-20 (Appendix 2).

In addition to blooming periods, it is important to choose an assortment of flowering plants with variation of features: height, colors, shapes, scents and sizes. This biodiversity will meet habitat needs for many different pollinator species. For example; flies typically prefer white or yellow flowers, while bees tend to favor blues and purples. Open flowers, such as dandelions and asters, have pollen accessible to generalist pollinators. Other pollinators, including nocturnal moths rely on scent more than color, although most night blooming plants are lighter colored (Xerces Society, 2003). Complex-shaped flowers, such as penstemon and lupine, will attract more specialist feeders. Furthermore, some bees are monolectic, being particular when collecting pollen by only foraging on one plant species. Other bees are polylectic and will collect from many different plants. The unique needs of individual pollinators explain why planting a variety of plants is the key to functional pollinator habitat.

A bee-mimicking fly drinking nectar from a sweetclover flower

Many flowering plants provide pollen and nectar for pollinators. However, research shows that native plants are four times more likely to attract native bees than non-native plants (Xerces Society, 2003). Native pollinators and plants evolved together, achieving the most effective pollen transfer to benefit plants with pollination and pollinators with forage. Non-native plants do not provide as high of forage quality as native plants do. Furthermore, some modern hybrid species produce little or no nectar or pollen as an unintended consequence of producing showy blooms (Xerces Society, 2003). Hybrids also tend to vary more in color within species, making it more difficult for pollinators to find the forage flower for which they are searching. By planting native in place of introduced plants whenever possible, the success of pollinator species will be enhanced.

Though native plants are preferred, the two most common species used for wind breaks are the tall and robust pine, caragana and Russian olive trees. They work very well in a shelterbelt, and can work even better in conjunction with native plants for diversity and pollinator habitat. Pines are wind pollinated and are not considered pollinator-friendly. Both Russian olive and caragana trees blossom and can provide a source of forage for wildlife including pollinators. However, special consideration needs to be taken with the Russian olive tree, as it is considered an invasive species. Russian olives will crowd out native species, and are especially detrimental to riparian areas. The NRCS does not endorse the planting of these trees and recently has started allocating federal funding for the reclamation of stream and river banks dominated by Russian olives (Mosley, 2008). An argument in favor of planting the trees is that they are very hardy and in some cases are one of the only species that will grow in harsh climates, most of the time in areas far away from any riparian areas. However, as they are good forage for birds, the seeds can be spread much further from their source than originally intended.



Left: caragana trees with seed pods, Center: Russian olive in bloom, Right: Russian olives taking over the banks of the Yellowstone River.

Prior to planting it will be important to find information on plant characteristics: hardiness, browse tolerance, 20-year height, appropriate row spacing, potential disease and pest issues, as well as general ideas on how to approach the planting project.

Resources for Plant Information

Appendix 4 lists field visit participants' favorite texts for increasing their general knowledge about native Montana plants and how to approach planting projects. In addition, many producers listed their own FSA, NRCS, extension agents, nurseries or knowledgeable neighbors as valuable information resources. In fact, Jane Banner does not usually consult any books and just reads the suggested planting method from the tag that came on the plant from where she bought it.

For those who need a more broad view of the planting possibilities, a comprehensive chart for plant growth and tolerance is listed in Appendix 5 from the Montana Department of Natural Resources and Conservation. In Appendix 6, observations from field visit participants regarding plant survivability concerns were summarized in a table of commonly planted species. Planting guides for individual ecoregions are available from the Pollinator Partnership website (www.pollinator.org). This website also includes a zip code search for determining the ecoregion in which you reside.

Regardless of how much research and information gathering is completed, there is no replacement for trial and error. Every piece of ground is different. As Becky Bronec of Carter, MT says: "You have to be persistent. Keep trying different things and new methods." Charlie Noland agrees: "It's a labor of love."

The native plant section at Cashman Nursery in Bozeman, MT

Buying Plants: Where to get them and what they cost

The landowners from the field visits all agree that buying plants from a reputable source will limit the amount of mortality in the trees and shrubs. Keep away from the Walmarts, Costcos, and Gurneys. Though plants at these places tend to be cheaper, you often suffer with quality. The best place to buy plants is at a farmer's market or local/state nursery. A list of recommended plant sources and nurseries in Montana, including those selling native plants and seeds are listed in Appendix 7.

It is most economical to buy bareroot one-year old seedlings at $0.50-$2.00 each. Regardless of participation in a cost-share program, these prices are extremely reasonable, especially when compared to more established potted shrubs costing $15.00-$30.00 each. Some larger trees/shrubs can cost over $100.00! The mortality on bareroot one-year old seedlings can be greater than buying two-year olds, however, two-year olds can be twice as expensive and also more difficult to punch through the plastic mulch when using a tree planter (discussed later). The key to buying bareroot plants, according to the producers, is that you have to be patient, in many cases you will be starting from a 6" tall plant. It may take ten years or more for your land to start looking the way you would like it to.

Some shrubs cannot be found as bareroot. In this case, buying the smallest, healthiest-looking potted shrub will be the most economical. For example, Laura Schaap found rabbitbrush shrubs at her local nursery 8" tall for $15 each. Though in her opinion this was way too expensive, she bought a few anyway because she needed a late-flowering shrub in her shelterbelt. In some cases there is opportunity for transplanting native plants from their natural environment to save on cost; however the success rate of this can vary. Jane Banner had luck transplanting serviceberry into her front yard. In contrast, Becky Bronec could not get a Rocky Mountain Juniper to successfully transplant. Again, it is a trial and error experience. It is also important to mention here that the ethic of transplanting shrubs within private lands is at the discretion of the landowner. However, transplanting from public lands is not always appropriate. Some tracts of public lands disallow the harvesting of any plants, even picking wildflowers. In areas where harvesting is allowed, it is important to be aware of the fragility of native plant populations and that in some cases over-harvest can mean the downfall of the species in that area.

For the most economical purchase of a potted tree or shrub, wait for a sale. Nurseries and farmer's markets often have an end-of-season or over-stock sale. Jane Banner has bought almost every single plant she established on her property from a sale. "I just bought what they had," she says. "Usually I buy about 15 seedlings a year. Added up over the last 40 years, that's a lot of plants!"

The most expensive pollinator-friendly planting out there is in conjunction with a native grass mix. The forbs themselves are not expensive and in fact add little to the cost of the seed mix. The real cost is in the native grasses, especially warm seasons. At Pawnee Buttes Seed out of Colorado, a foothills native seed mix is $180/acre for just the seed, not including labor and equipment use costs. Seed cost will vary depending upon grass species used, though in general, native mixes are notoriously expensive. This makes participating in a cost-share look attractive.

Putting the Plants in the Ground

The cost of individual plants is not high enough to shock producers and deter their planting. The real cost of establishing wildlife habitat is the time involved and the accessory materials, ranging from a $20 shovel to a $20,000 Rangeland Drill.

- Individual plantings: The traditional planting method is to dig a hole with a shovel or a jim-gem. The exact technique is a personal one. Jane Banner digs a hole and fills it completely with water before placing the plant inside and covering with dirt. Laura Schaap incorporates wood chip mulch in the bottom of each hole for some added nutrients. Bareroot seedlings do not need a large hole, simply a crack in the soil where the root can be slipped in. Valerie Kurtzhalts prefers to use a jim-gem for planting her bareroot plants and adds a few shakes of Terra-Sorb in the crack to increase the water holding capacity of the soil. **Photos*: Left: Terra-Sorb for increasing the water holding capacity of soil, Right: V. Kurtzhalts demonstrating how to use a jim-gem***

- Tree Plots and Shelterbelts: If the shelterbelt is small enough, it can be planted by hand using the same methods as individual plantings (above). However, many shelterbelts and tree plots involve several hundred or even several thousand seedlings planted in rows. For the most time efficient planting, many people choose to use a tree planter dragged behind a tractor. This is a 2-3 person job – one for driving the tractor and one for riding on the tree planter, placing the trees in the furrows as it moves along. The third person comes into the equation when black plastic mulch is used. The plastic is rolled off of the tree planter to be laid over the tree rows and packed down by the packer wheels. This third person makes a slit in the plastic for the seedling to later be popped through (this is why smaller one-year old seedlings are easier to plant than larger 2-year olds). The black plastic mulch is permeable to moisture, allowing rainwater to seep through but is kept from evaporating quickly. The furrow created by the tree planter and covered up by the mulch acts as a trough to catch rainwater. The mulch also operates as a barrier to weeds and to keep the soil warmer in the cold, aiding in early season growth. **Photos: *Top: a tree planter stored on a trailer at the Miles City Conservation District Office, free for area producers to borrow, Bottom: a newly planted shelterbelt showing the central furrow where rainwater can collect***

- Pasture Seeding: The equipment, seeding rates, ground preparation, and herbicide applications are all personal preference gathered from experience and suggestion. The NRCS Seed Rate Specifications and Recommended Cultivars can be found in Appendix 8. The least invasive seeding method is with a no-till drill, which seeds directly into an existing pasture. The previous stand is usually sprayed with Roundup in order to kill the existing plants and to reduce competition with the new stand. This seeding method does not disturb the soil as much as tillage, and allows ground cover to remain intact. This reduces erosion by keeping bare soil to a minimum and nutrients on the ground.

Photo: Charlie Noland's preferred tool, a Truax range drill

Regardless of planting method, the goal is for wildlife to have improved forage and shelter, or in the case of a shelterbelt to additionally act as a wind break. When considering the best scenario for pollinators, it will be important to clump at least three of the same plant species together. Habitat patches that are bigger, rounder, and closer to other patches will give pollinators the best ability to find their preferred forage and move easily from clump to clump (Xerces, 2003).

Native Indian blanketflower that has been planted in clumps for easy pollinator foraging

Types of Fencing

Once the plants have been positioned in the ground, it will not be long until the deer, elk, livestock, rabbits and gophers find their way to the new food source. Aside from using browse tolerant plants, fencing is one way to curb plant mortality from foraging and rubbing critters, at least until the plants are grown to the point where they can sustain the abuse. Fences can typically be removed after ten years. Some people prefer not to fence, saving money and labor, but incurring some plant loss.

- Rigid Seedling Protectors: For individual seedlings, rigid seedling protectors can be one way to deter foragers in the first and second years if growth. ***Photos: Left: staked down with a wooden pole woven through the plastic. Right: zip tied to a bolt***

- Woven Wire: For individual trees, the wire can be secured in a circle and held down with T posts. For fencing off larger areas, such as tree plots, the fence needs to be 8-ft tall to keep deer from jumping up and over and being trapped inside just where you would prefer they not be. A finer mesh can be used towards the bottom of the fencing to keep smaller rodents out. Some people prefer to use less expensive, but less effective plastic mesh fencing. ***Photos: Left: a new fence being erected around a garden plot. Right: a lone apple tree that has incurred damage from foragers prior to fencing*** **- notice the fine mesh wire around the bottom**

- Electric Fencing: This is an alternative to the expensive, high-profile woven wire fence. Deer and elk can be deterred with a permanent 6-ft tall 8 wire fence, with every other wire being a ground wire. Spreading peanut butter or molasses on the wire ensures a strong shock to the nose or mouth of the animal and can deter an entire herd from crossing the fence just by one animal experiencing the pain (Schmidt, 2000). For a more low-profile electric fence, a short double fence can be very effective. Remember that deer with their poor depth perception can jump high, but not necessarily both high and far at the same time. This low fence spaced 3 to 4-ft apart with varying wire spacing between the first and second fence can be enough to visually confuse and deter the deer.

Photo: A double electric fence setup around a tree plot in Terry, MT.

Ways to Water

The basic rules of photosynthesis require water in some form in order for a plant to survive, grow, and thrive. However, some plants are more sensitive and require more water than others. The water needs to fall onto a well-prepared ground surface in order to infiltrate the soil far enough to reach the roots. Bare soil tends to form a crust which repels rather than absorbs water. The best soil cover to accept water and prevent evaporation is plant litter and mulch.

- Rainwater: Choosing to plant trees/shrubs that are adapted to a specific climate zone will reduce the amount of supplemental watering that needs to occur. Charlie Noland of Circle, MT (11-14" precipitation zone) has planted 50,000 trees without a drop of water other than that which comes from the sky. Of course, plants will grow more quickly with water, but the infrastructure and time involved might better be replaced with patience. Preparing the soil surface to accept rainwater will help make the most of the natural resource. This includes mulching around individual trees. For tree plots or shelterbelts the black plastic mulch helps to collect rainwater, allows it to permeate, and also prevents evaporation. **Photo:** ***Noland cut and baled the rangeland before planting his tree plot. The bale is used as mulch around many of his planted trees***

- The Garden Hose: For plants in the vicinity of a house, the garden hose is a perfect watering method. For Valerie Kurtzhalts in Kila, MT the garden hose even helps water her interspersed planting project during dry times. (Her hose is several hundred feet long!)

- Drip Tape: This is one of the most practical methods for watering a shelterbelt or tree plot if there is a water source available. It is most commonly placed underneath mulch, stapled into position to drip directly next to the trunk of the tree/shrub.

- Gated Pipe: This works well with tree plots for producers who already have this equipment for field irrigation. The gated pipe can be situated to meander down the furrows created in the black plastic mulch, creating a canal of water that can slowly infiltrate. **Photos:** ***Left: a row in a tree plot showing the furrow, Right: gated pipe that was just removed from the tree plot***

PART III. Evaluating Success & Overcoming Difficulties

Establishing pollinator habitat is a long-term venture with subtle benefits. However, the hidden benefits are often realized on a large scale - the health and beauty of the ecosystem. Plant diversity brings a varied root zone into the soil, capturing water at different depths. The return of litter to the soil from falling leaves improves the soil nutrients. Birds are drawn to the plantings, eat pest insects, drop digested seeds in new places continuing the planting process naturally. The plantings will draw native pollinators and beneficial insects to the area, improving the production of nearby gardens and crops, especially alfalfa, with over 1.6 million acres harvested annually in Montana (NASS, 2008). Furthermore, many beneficial insects compete directly with crop pests, parasitizing their larvae, ultimately decreasing the pest populations.

All of these benefits are not always *seen*, but reverberate through the ecosystem. By improving the success of the plantings and working to reduce mortality, the benefits will become more apparent more quickly. For Charlie Noland, in the past 12 years since implementing tree plantings: pheasants have increased 10 fold, sharptail grouse have increased 4 fold, nesting doves increased 10 fold, and whitetail deer have nearly doubled their population. Due to the pollinator-friendly plants he incorporated into the wildlife habitat tree plots, beneficial insects and pollinators have increased, as has the population of hawks, owls and raptors.

As Becky Bronec said so perfectly, "You can't just plant an apple tree out in the middle of a field and expect a bunch of bees." It will take years to notice the direct positive benefits from the pollinator-friendly plantings. In the meantime, there will be a lot of maintenance and upkeep: weeds, water, pests, disease, ultimately the issue of survivability. The landowner participants in this project have had hands-on experiences in overcoming many of the difficulties associated with these plantings, and will continue to learn as time goes on. A table listing the specific survivability issues of common species planted by these producers can be found in Appendix 6; most of this being discussed in the following section.

Tree plot fruit trees in Terry, MT displaying the typical fate of most plantings - 50% mortality

Enjoying the Research

One of the most baffling parts of planting pollinator habitat is exemplified in the photo on the left: why does one plant die and another plant thrive? The answer is not always simple and easy to correct. Producers who have implemented plantings on their property are researchers. On a regular basis, they are watching to see what is going well, what needs attention, and how that compares with their planting and maintenance methods. They are researching the "best practices" of establishing pollinator-friendly plantings in Montana. They will continue to do more of what works and less of what does not work.

This last section of the report is dedicated to sharing some of this experience in the hopes of encouraging others to implement plantings by reducing their potential for failure.

Survivability

Expect that for every one plant established, one will die. This is the general consensus between all seven participants in this study. Mortality rates across the state varied on average from 10-50%. Part of the mortality problem lies in: choosing suitable species for the climate, buying plants from a reputable source, and watering as needed (explained in detail in Part II). The other part of the mortality or stunted growth problem is mostly due to pests: deer, rodents, and insects.

- **Deer.** As explained in Part II, there are certain plant species that are browse tolerant, and those that are not. According to the producers in this study, the following species should NOT be planted unless there will be deer fencing or a willingness to suffer some plant mortality:

Buffaloberry

Bur Oak

Skunkbrush Sumac

Deer especially love these species for foraging, making these plants difficult to establish without some form of shelter. Other species that are also well-loved by deer as a resource for rubbing their antlers include:

Willow

Juniper

Plum

Remembering that this habitat was purposefully created to encourage wildlife into the area (and by default this encourages pests), a certain amount of humor needs to be used when considering damage to plants. “Some live and some die, that’s just the way it goes,” remarks Charlie Noland. Not all plants will die in response to injury from foragers, and those that do can be replaced with a more browse tolerant species or possibly fenced the second time around.

For smaller scale plantings, there are some fenceless remedies to try for deterring deer and rodents. Many gardeners swear by Liquid Fence, a product sold in stores for spraying on and around plants. Other homemade remedies include a cayenne pepper based spray, soap or detergent mix, and even an egg and sour milk concoction. Creativity is recommended. The goal is to deter foragers before they become accustomed to the shelterbelts and tree plots as a regular food source, at least until the plants are established.

- Rodents: Rabbits and gophers can be frustrating to deal with. Gophers can dig out freshly planted seedlings, chew on roots, and prefer to burrow into freshly turned soil, right into your new planting. Rabbits enjoy the fresh, young leaves of new seedlings. With these pests, some plant mortality must be accepted, as they are more difficult to fence out. A smaller mesh fence around the bottom of a woven wire deer fence can help, as can some of the liquid repellents discussed above. Some landowners swear by their .22 rifles as a deterrent.

- Pest Insects: There will always be some injury, sickness, or death to plants associated with pest insect infestations. With many of the planted shrubs, the healthier they are, the more chance there will be for survivability through an insect infestation. Researching possible insect pests in specific areas before planting will help to narrow down the species best suited for resistance to outbreaks. If an infestation does occur, the local extension office will be the best resource for determining if action needs to be taken, or if the problem will clear up naturally.

Tent caterpillar infestations affected American plum and wood's rose shrubs on this property. The larvae can defoliate approximately 20% of each shrub. However, healthy shrubs will re-grow leaves to replace the damaged leaves, and often no action needs to be taken in the form of pest control.

Some Will Not Be Saved

Even with all of the forethought and effort in choosing the right plant species and protecting them from pests some plants will just die. As a general rule, some tree species are sensitive to change and difficult to establish, such as the Nanking Cherry. In a tree plot situation, Becky Bronec had experienced that it can be difficult to replace dead trees even with copious amounts of water. Replacement trees may need to be larger and more established than the original one-year old seedlings. If this still does not work, perhaps a particular tree species is not compatible with the soil type or growing conditions. Try something different.

Reducing Soil Loss by Increasing Ground Cover

The planting process inherently involves tillage or disturbance of soil. This is most apparent with large scale pasture seedings and tree plots rather than individual tree/shrub plantings. Soil loss is primarily a concern with ground that is sloped or highly erodible due to soil type or potential for strong wind or water events. In these cases, the goal is to keep the amount of soil lost during and after planting to a minimum, while preserving or encouraging ground cover either with live plants or dead plant material (litter). Ground cover helps plants to thrive by reducing the opportunity for soil displacement, competing with weeds, and cycling nutrients back into the soil. Too much ground cover can create difficult conditions for solitary bees preferring to nest in disturbed areas of bare ground. This is typically not an issue in rangeland situations, but is something to keep in mind while densely mulching around trees.

- Pasture Seedings: The most effective and traditional planting method involves an herbicide application, field tillage, and drilling the pasture mix into bare ground. This creates a clean, weed-free, firm seedbed for a successful planting. For soils that are susceptible to erosion, people interested in a no-till system, or concern for solitary bee populations nesting shallowly underneath the soil surface, there are a couple of other planting options that minimize soil disturbance:

  - Productive stand is sprayed with herbicide and heavily grazed/mowed/hayed to remove standing residual. Annual crop is planted, harvested, and the next year pollinator mix is drilled in to crop stubble.

  -Weak stand with significant bare ground present can be sprayed out, and the pollinator pasture mix can be directly drilled in after a waiting period using a no-till method. Seed-soil contact is essential for success in this type of planting.

  Increased litter cover will not only keep soil erosion to a minimum, but will also help to collect and infiltrate rain water and provide protected areas for new seeds to germinate. Litter cover can gradually be increased over time, even through domestic grazing. For the establishment years, using a light graze (less than 40% of the forage) will allow the residual plant material to return to the ground as litter for the next year. The NRCS requires at least ½ acre of pollinator-friendly plantings to remain completely undisturbed during the growing season for the benefit of the flowering plants and their pollinators. It can still be grazed or hayed in the dormant season. This ½ acre plot does not have to remain in the same area of the pasture; it can be rotated from year to year.

Left: litter cover in an old crested wheatgrass stand planted more than 50 years ago, protected from grazing. Right: a newly planted pollinator-friendly seed mix using traditional tilling methods, showing the initial lack of ground cover

- Tree Plots: Traditionally, the rows between tree plots and shelterbelts are tilled in order to keep weeds and grasses from competing with the trees for water. However, there are other methods of controlling competition without tilling the entire width of the row: tilling just 3ft on the edges of the rows, planting an annual grain between some rows on alternate years, removing the center row of disks before tilling, etc. This leaves some ground undisturbed and prevents the opportunity for soil loss. In fact, Charlie Noland has deliberately planted grass between his tree rows for ground cover, habitat, and to avoid annual tillage.

A traditional shelterbelt, planted on a slight slope, showing 20 years of soil erosion and displacement from annual tilling

Noland's 10 year old tree plot showing hard fescue between the rows and no sign of soil displacement

Noland's choice of grass was hard fescue, an early season bunch grass entering dormancy by the beginning of July. This grass forms a sod, ideal for competing with weeds, but also utilizes water resources that could be advantageous to the tree rows. Using the black plastic mulch improves water infiltration around the trees, and can somewhat counteract the resource competition with the fescue. However, this plastic will break down over time, and grasses will doubtlessly expand around the trees. Noland's tree plots, which have been planted for 10-12 years now, are a great opportunity to observe long-term competition with grasses. This competition will ultimately reduce tree vigor and flower production, but also diversifies habitat and reduces the need for tillage. Clearly, there are pros and cons to planting competing species between tree rows. It will be important to consider each planting project individually, working to seek a balance of project goals and ecological integrity.

In irrigated situations, planting competing species between tree rows is less of a concern. Ray Sprandel in Terry, MT has flood irrigating capabilities and has decided to plant perennial rye and small burnet for pheasant habitat. Warm season grasses would also be a good choice for perennial ground cover in this situation.

WEEDS

Digging a hole in the ground for a new seedling will disturb the ground enough for weed seeds to be stimulated to grow. This is a universal event that is just considered part of the planting process. The goal is to prevent weeds from taking over the newly planted areas and choking out the new seedlings, possibly causing mortality. There are a many methods of dealing with weeds that can help new seedlings outcompete the weeds:

- Weed Cloth or Black Plastic Mulch: This is laid down on the ground around an individual tree or along a tree row, the edges covered with rocks or soil. The fabric acts as a barrier to weeds, preventing them from receiving sunlight and from growing around the trees.

- Hand-Pulling: This works on a small scale (or large scale depending upon the patience of the person doing it). In tree plots or shelterbelts using black plastic mulch, if the slit for the seedling is cut too long, weeds can grow up through this space, very close to the seedling, directly competing.

- Mowing/Tilling/Grazing: For large scale tree plots or shelterbelts, mowing weeds in-between and around tree rows before seed production can help to slowly shrink future populations. Tilling controls the weeds annually, but also re-plants seeds and leaves a bare soil surface for more weed seeds to become viable with no other competition. Grazing with sheep or trained cattle can be effective on a pasture level depending upon the weed species.

- Irrigating: In areas with persistent weeds, irrigating the seedling can sometimes help it to grow and become competitive against weeds. Keep a watchful eye on the weeds to be sure that they are not solely benefitting from the added moisture.

Top: Before: a cottonwood tree growing as a weed through the plastic mulch Bottom: After: the cottonwood weeded out, revealing a buffaloberry seedling

- Ground Cover: As explained in the previous section on soil erosion and ground cover, a perennial grass planted in between tree plot or shelterbelt rows can prevent weeds from growing and taking over newly planted seedlings.

Left: a shelterbelt that had not yet been annually tilled, showing the extensive weeds growing between rows and around trees Right: a deceased fruit tree taken over by annual cheat grass

- Herbicides: In conjunction with pasture seedings and areas with relentless weeds (especially noxious weeds) it may be warranted to use an herbicide application. Roundup and Milestone are recommended by the producers who have found it necessary to use them.

A Word about Pesticides

Virtually all of the research looking into the effects of pesticides on pollinating insects has been conducted on domestic honey bees. Honey bees are not native to North America, but as pollinators they have become extremely important to the production of our national crops, and are therefore the pollinator of most concern to producers. The rates of *safe* chemical applications have been tested with honey bees in mind, which are much larger and more tolerant to chemical use than many of the smaller, more sensitive native pollinator species.

- Insecticides: Insecticides can have a disastrous effect on both native pollinators and honey bees drinking tainted nectar or absorbing airborne chemicals directly. The target pest species may not be the only insect affected by the chemical application. There can be side-effect mortality in pollinators as well as beneficial insects which act as natural controls for pest insect populations.

- Herbicides: This type of chemical application can affect pollinators directly when gathering herbicide-covered pollen or indirectly by reducing plant diversity beyond the target species. Many herbicides are generally aimed at broadleaf plants, most of which are flowering species. Furthermore, native plants are more sensitive to herbicides than introduced plants, and will be the first species to be negatively affected by a chemical application.

If there is a greater threat than habitat loss to pollinators, it is pesticides. Even if you limit the amount of chemicals applied on your property, pesticides can drift and spread from neighboring areas. Moreover, many pesticides degrade slowly, remaining as a lingering toxic hazard to pollinators and other wildlife (Xerces Society, 2003).

There are certainly cases where chemical applications are appropriate and even necessary (especially in the case of noxious weeds). It will be important to decide what situations can be dealt with using alternative methods. For example, hand pulling may be more time intensive than using a backpack sprayer, but will have less negative effect on plant and pollinator innocent by-standers. Cecil Tharp, Pesticide Education Specialist for Montana State University Extension, reminds producers to look at all of the options before going to a chemical, and to be sure to know the lifecycle of the pest and the economics of the situation. For additional information about a particular chemical, look for the Material Safety Data Sheet (MSDS) which has more information than the chemical label and does not often come with the product.

An important note to remember is that according to a recent Puget Sound Basin study, more pounds per year are applied in urban rather than agricultural areas. For the general population, chemicals have become the “quick fix” for unwanted insect pests and weeds.

Continuing the Research

Aldo Leopold wrote in *A Sand County Almanac*, "In June as many as a dozen species may burst their buds on a single day. No man can heed all of these anniversaries; no man can ignore all of them."

The seven producer-ecologists participating in this project will continue to conduct everyday research into the best approach to encourage wildlife and pollinators onto their property through habitat improvements. From their experiences and willingness to share successes and challenges, others will be encouraged and the future of native pollinators in Montana will be a bright one.

Advice to Future Planters

"Any time you can become a better steward of the Earth, you should; it's desirable to return things to their natural state. Improving wildlife habitat helps support all kinds of life – from insects to mammals – while making the landscape more beautiful."

– Jeannie Anderson, Belgrade, MT

"For people who are truly starting from scratch and know very little, or even people who have been working the land for years, it makes sense to get ahold of the professionals: NRCS, extension service, people who know a lot about this stuff. They'll help with a plan for your land. We incorporated our plantings into our landscaping, but there are a lot of options out there depending on your goals; do you want a wind break, or a place for wild birds? Finding a reputable nursery where you can buy your plants is also very important."

– Jane Banner, Hamilton, MT

"People need to look at their conservation plans and learn about the opportunities out there. You can't just plant one apple tree out there and expect a bunch of bees, you have to also change cultural practices, like spraying less pesticides for example. Who doesn't love shade and natural beauty and flowering trees? You just have to be persistent and keep trying in order for things to grow -the secret is to plant during a wet year."

– Becky Bronec, Carter, MT

"Creating habitat won't be economical, you just have to love it. We especially need pollinator habitat - over 2/3 of our crops need to be pollinated, so you'd better like pollinators! For plants, you have to pick species that will grow in your area and be patient…it's a labor of love."

– Charles Noland, Circle, MT

“You have to want to do the right thing to move in a direction you can feel good about. Economics can’t matter. We desired an area that worked in harmony with itself year after year. It takes a lot of hard work – but I guess I’m not much for relaxing, either.”

–Robert Schaap, Bozeman, MT

“The plantings worked out even better than I thought they would. The trees will provide a significant improvement for wildlife, not just deer and birds, but for all wildlife. The benefits are not economical as far as putting money in my pocket, I don’t see that, I wouldn’t have been able to do it without the cost share. It’s more about feelings than anything - doing the right thing.”

-Ray Sprandel, Terry, MT

“This is a great opportunity to restore forest health by increasing plant diversity and addressing weed and disease issues, to do right by the land. There are good resources available through the state and federal government. I just wish more people would take advantage of these opportunities.”

– Valerie Kurtzhalts, Kila, MT

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SUMMARY

During Phase II of this project, there was an immense amount of information gathered, collectively leading to understand best practices for implementing pollinator-friendly habitat in Montana. The involved landowners gave incredible insight into the reality of on-the-ground planting experiences. NRCS staff were willing to explain the cost-share programs and recount the history of policy and protocols.

The following bulleted summary outlines key information learned and gives suggestions for how to improve the implementation of pollinator habitat in Montana.

NRCS Programs

- State Issue: Moving beyond words on a page. Though pollinator habitat is considered a MT State Issue and is specifically written into the ranking criteria, there is little public knowledge about this conservation initiative. NRCS offices need to be educated on how to turn ordinary wildlife plantings into *pollinator-friendly* plantings, encouraging applicants to adjust their conservation projects to include the needs of pollinators. This will also help landowners to become aware of cost-share opportunities for pollinator-friendly practices.

- The Internet: A great piece of technology, but not the only way. Many farmers and ranchers are not computer savvy. Newsletters and one-page information sheets about the ranking criteria and the pollinator-friendly initiative (as well as other conservation initiatives) would be helpful to have in every field office and possibly sent out as a mailing.

- Creating a Special Initiative. There has not yet been Special Initiative funding allocated to pollinator habitat. This is something that can be explored in the future and can also be used as an information campaign, showing the importance of pollinators in our native MT landscapes.

- Survey Available NRCS Pollinator Materials: Organize and Combine. There are many variations of pollinator-friendly information sources and specifications available from the NRCS: Biology Tech Notes MT-20 and MT-32, Plant Materials Tech Notes MT-46 and MT-31, “Help pollinators help you,” MT Native Plants for Pollinator-Friendly Plantings, and probably many more. Organizing these materials on the website and/or combining the information into one or two sources will greatly help landowners and NRCS employees to understand pollinator concepts. This will reduce confusion of NRCS cost-share requirements as well as provide the best information for improving pollinator habitat by having a successful planting.

Pollinator-Friendly Plantings

- Many are Already Doing This! There are many landowners around Montana who have implemented a planting project aimed at improving *wildlife* habitat without realizing that pollinators can benefit as well. With additional information on pollinators, future planting projects can be adjusted to include the needs of pollinators.

- Turn Wildlife Plantings into Pollinator-Friendly Plantings: The specifics of this were covered in detail in this report, but the main points are listed below. Many landowners understand the concept of how to implement wildlife habitat, but may need to be educated on how to plant for the additional needs of pollinators:
    - Lean towards native rather than introduced species
    - Pick a variety of species whose blooming times overlap to flower from April-Oct
    - Plant the same species in bunches
    - Choose species that yield a variety of flower shapes, sizes, and colors
    - Limit the amount of pesticides used in and around the area

For a Successful Planting

- Plant What Will Grow. Most plants are adapted to particular climate zones. Do your research! Figure out what plants will thrive in your ecoregion and in your soil type. This will reduce a majority of plant mortality issues and the need for supplemental water.

- Buy From a Reputable Nursery. Plants from a trustworthy source are less likely to die due to stress and disease. Ask neighbors and friends for names of their favorite nurseries, or ask at the local conservation district office (they can often buy wholesale at cheaper prices).

- Have Patience. It takes time for plants to grow. Buying pre-potted plants may help decrease the waiting time, but they will be exponentially more expensive. Bareroot seedlings will be cheaper and slower growing.

- Expect 50% Mortality. There are many factors that interact to cause mortality; some completely out of your control. From the beginning, if you expect that half will die, you will be better prepared and less disappointed.

- Maintain Ground Cover. As much as possible, keep litter and desirable live plants covering the ground. This will help with water and nutrient cycling as well as reduce soil displacement in areas prone to erosion. For tree plots and shelterbelts consider alternatives to annually tilling the full width of the space between rows.

- Be Creative. There will be many issues surrounding the health and longevity of the planting: weeds, disease, deer, rodents, drought, etc. Doing research, talking to neighbors and professionals will help to get you started on dealing with the issues. However, the best solution will often be discovered through trial and error.

Phase III and Beyond: Where to go from here?

The results from Phase II will lead directly into Phase III: Education and Outreach, which culminates with the construction of a native plant kiosk for public display. However, there are many more ways in which to promote pollinator-friendly plantings after this project has been completed.

- Construction of Native Plant and Pollinator Information Kiosk. This will be located in Bozeman, MT along the urban Galligator Trail. This kiosk will be created with the help of the Gallatin Valley Land Trust and be on public display by Pollinator Week in June, 2009. As an educational tool, the kiosk and surrounding native plants will bring awareness of the importance of native pollinators to the public, inspiring them to get involved by creating habitat and/or learning more about the issue.

- Field Tours. This was a suggestion made by project participants. Field tours will educate NRCS employees and producers on how to implement pollinator-friendly habitat in the field.

- Community Involvement. This was another suggestion made by project participants. Have a community planting day on a nearby ranch. Local landowners wishing to begin planting can contact 4-H groups, boy scouts, or girl scouts for help with planting while providing educational opportunities for the youngsters. The more hands, the better!

- Public Talks. These talks can be to the general public, school classrooms, conservation groups, NRCS, and even the Montana Technical Advisory Committee and Local Working Groups. These talks would help to promote pollinator-friendly plantings, educate about specific concepts, as well as generate interest in pollinator conservation.

By the end of Phase III, Montana will hopefully become a successful case study for promoting pollinator habitat conservation through NRCS cost-share programs. With the information gained from this project, we hope to encourage other states to offer pollinator-friendly habitat cost-share opportunities by promoting the issue at the State and Local level. Perhaps in the near future, this important issue can become of National importance through the cost-share ranking criteria, greatly increasing the potential for native pollinator populations to rebound. Through further public education, planting pollinator-friendly habitat may become the norm.

APPENDIX

LIST OF APPENDICES:

APPENDIX 1. Field visit interview documents: questions, plant lists, and data forms

Pollinator-Friendly Planting Field Visit Date:

Producer Name:_____ Location:_____

Things to Do:

- Pictures (people, insects, landscape and plants)
- Some Insect Collection
- Look at soil erosion in planted areas vs. non planted areas
- Take pictures of watering and fencing systems
- _____

Questions :

1. Is this project part of a cost share through NRCS WHIP/EQIP? YES NO

   If yes, tell about the project, how the plantings fit in, and what the general application and cost-share experience was like. If no, tell about why not (did they know about it?) and why they decided to plant.

Specific wildlife species for which shelter belts are being planted (and why):

_____

2. What was the decision process in deciding which species? What resources were used (NRCS staff, MT plant books, MT Native Plants booklet)? How helpful were these resources?

3. What was the experience finding seed/seedlings? What are the preferred sources? Cost specifics (if they don't mind).

4. General Comments about plantings:

   Checklist-

   - Plant Survivability

   - weed suppression

   - examples of soil erosion improvement

   - pests (grasshoppers, gopher, deer, etc)

   - beneficials (wildlife, birds, bees, etc..)

Checklist Continued:

- do beneficials like certain plants more? Which insects and which plants?

- benefits to operation (monetary and ecological)

5. Stories?

Field Visit Notes on Planted Trees/Shrubs/Forbs **Producer:_____**

NATIVE
Aster, Hairy Golden
Aster, Smooth
Beebalm, Wild
Blanket flower, (Indian)
Chokecherry
Cinqefoil, Shrubby
Columbine, Colorado
Coneflower, Prairie
Coneflower, Purple
Currant, Golden
Dogwood, Redosier
Elderberry, Blue
Flax, Lewis
Gayfeather, Dotted
Globemallow
Hawthorn, Black
Penstemon, Fuzzytongue
Penstemon, Rocky Mtn.
Plum, American
Prairie Clover, Purple
Prairie Clover, White
Rabbitbrush, Green
Rabbitbrush, Rubber
Rose, Wood's
Sagebrush, Big
Sagewort, Cudweed
Sagewort, Green
Serviceberry
Snowberry, Common
Snowberry, Western
Sumac, Skunkbrush
Sunflower, Maximilian
Sunflower, Perennial Prairie
Willow
Yarrow, (White)

INTRODUCED
Cherry, Nanking
Sanfoin
Cherry, Sand
Lilac
Crabapple
Caragana
Alfalfa
Clover
Burnet, Small
Trefoil, Birdsfoot
Milkvetch, Cicer
Sweetclover, White
Sweetclover, Yellow

OTHERS??

- ✓ Place a check mark next to the plants that you have intentionally planted (not ones already growing on the property).
- ✓ The “Others” category is for you to fill-in additional plants that you have planted, but are not mentioned on the other lists.

Field Visit Notes on Specifics of Plant Needs, Costs, and Survivability.

Plant	Cost Expensive	Cost Cheap	Most Sensitive Needs Water	Least Sensitive Drought Tolerant	Easy to Establish	Difficult to Establish	Browse Tolerant	Browse Sensitive	Blooming	Other: Planting Approach/Seed Source

- Write in plant name on the left for which there is a notable uniqueness that will be defined by this chart (example: the plant is really expensive, or it is extremely browse sensitive).
- Place a check mark in the boxes to the right that are specific to each plant
- Under the heading “blooming” write in the time period: early, mid, late.
- Add any pertinent information in the right-hand column.

APPENDIX 2. Habitat Development for Pollinator Insects
NRCS Biology Technical Note, MT- 20 (Rev. 3), March 2008

United States Department of Agriculture
NATURAL RESOURCES CONSERVATION SERVICE
Biology
Biology Technical Note No. MT-20 (Rev. 3)
March 2008

BIOLOGY TECHNICAL NOTE

Habitat Development for Pollinator Insects

Two-thirds of the world's crop species depend on insects for pollination, which accounts for 15-30 percent of the food and beverages we consume. Pollinators (insects, some birds and bats) are key to the function of many terrestrial eco-systems because they enhance native plant reproduction. Native plants provide food and cover for numerous wildlife species, help stabilize the soil and improve water quality. As a group, pollinators are threatened worldwide by habitat loss and fragmentation, pesticides, disease, and parasites. This has serious economic implications for humans and for native eco-system diversity and stability.

The NRCS can assist landowners with habitat enhancement for pollinators by encouraging them to establish an array of plants that flower throughout the entire growing season to provide a source of nectar for adult pollinators and a diversity of herbaceous material for immature pollinator life stages.

Herbaceous plantings should include one grass adapted to the site and at least one **different** forb or shrub from each of the three flowering categories, i.e., early, mid, and late which are listed below. Page 3 shows alternative species example mixtures emphasizing pollinator-friendly plants.

	Early Flowering Group	Mid Flowering Group	Late Flowering Group
Native:	Lewis Flax	Indian blanket flower	Indian blanket flower
	Yarrow	Maximilian sunflower	Maximilian sunflower
	American plum	Prairie coneflower	Prairie coneflower
	Black hawthorn	Purple prairieclover	Purple prairieclover
	Chokecherry	Rocky Mountain penstemon	White prairie clover
	Golden current	White prairieclover	Dotted gayfeather
	Red-osier dogwood	Common snowberry	Globe mallow
	Serviceberry	Western snowberry	Yarrow
	Skunkbush sumac	Yarrow	Big sagebrush
	Willow	Wood's rose	Cudweed sagewort
	Shrubby cinquefoil	Shrubby cinquefoil	Green sagewort
	Wood's rose	Red-osier dogwood	Shrubby cinquefoil
			Rubber rabbitbrush
			Green rabbitbrush
Introduced:	Alsike clover	Alfalfa	Birdsfoot trefoil
	Strawberry clover	White clover (ladino)	Cicer milkvetch
	White sweetclover	Small burnet	Sanfoin
	Yellow sweetclover	Yellow sweetclover	
	Sanfoin	Sanfoin	
	Caragana		
	Nanking cherry		
	Sand cherry		
	Lilac		
	Crabapple		

Pollinator habitat plantings must remain undisturbed throughout the growing season (until after the first killing frost in the fall) so that flowers are available as a nectar source to adults and succulent herbage can be utilized by larvae. Maintenance treatments, such as grazing, burning, or haying may be required outside of the flowering period. Native and introduced species are generally not compatible in the same planting. Alfalfa, if used with native species, must be limited to no more than five percent of the seed mixture. Other introduced species, such as small burnet and sainfoin, must be used with caution. Plantings should be at least one-half acre in size.

To complete the habitat requirements of pollinator species, intersperse the kind of diverse plantings described above with various sources of cover, such as rock and log piles or trees with exfoliating bark and cavities, as well as a source of water (bird bath, damp, sandy area, small pond, etc.).

Alternative Native Species Mixture Emphasizing Pollinator-Friendly Plants
Northern Rockies

Genus	Species	Common	PLS #/Acre	% Mixture	Total #PLS
Psudoroegneria	spicata	Bluebunch wheatgrass	6	40	2.4
Elymus	trachycaulus	Slender wheatgrass	6	10	.6
Elymus	lanceolatus	Thickspike wheatgrass	6	30	1.8
Penstemon	eriantherus	penstemon	1.5	5	.075
Linum	lewisii	Flax	3	5	.15
Gaillardia	aristata	Blanketflower	7	5	.35
Achillia	millefolium	yarrow	.5	5	.025
				TOTAL	**5.4**

Alternative Native Species Mixture Emphasizing Pollinator-Friendly Plants
Eastern Plains

Genus	Species	Common	PLS #/Acre	% Mixture	Total #PLS
Pascopyrum	smithii	Western wheatgrass	8	40	3.2
Nassella	viridula	Green Needlegrass	5	34	1.7
Elymus	trachycaulus	Slender wheatgrass	6	10	.6
Dalea	candidum	Prairieclover	3	5	.15
Helianthus	maximililiana	sunflower	1	1	.01
Ratibida	columnifera	Coneflower	1.2	5	.06
Liatris	punctata	Gayfeather	6.4	5	.32
				TOTAL	**6.04**

Alternative Introduced Species Mixture Emphasizing Pollinator-Friendly Plants
Statewide

Genus	Species	Common	PLS #/Acre	% Mixture	Total #PLS
Thinopyrum	intermedium	Pubescent wheatgrass	10	80	8
Onobrychis	viciifolia	Sainfoin	34	10	3.4
Sanguisorba	minor	Small burnet	20	5	1
Lotus	corniculatus	Birdsfoot trefoil	3	5	.15
				TOTAL	**12.55**

APPENDIX 3. Preventing Deer Damage Pamphlet by Cashman Nursery

Preventing Deer Damage

2055 Springhill Road
PO Box 10242
Bozeman MT 59719
406-587-3406

CASHMAN NURSERY & Landscaping

Deer do more damage to our customer's trees, shrubs, and flowers than any disease or physiological problem. Besides selling your house and moving to the middle of town, what can you do to keep the deer from eating all your plants? Even homes on the outskirts of town with other houses around them are affected because deer come into town to feed at night. You probably never see them - you just see damage they do to your plants. Although deer can come into your yard and feed anytime of the year, they seem to do the most damage in the fall when their other food supplies diminish. Bucks like to rub their antlers on the bark of young trees in the fall and can do considerable damage and even kill the trees.

Commercial Repellants

Several repellents are sold which are supposed to keep deer from eating when sprayed on the leaves. Liquid Fence, Plantskydd and Deer Away are three we sell. Coyote urine in small containers can be purchased to hang in tree branches. Research has shown that commercial repellents will deter deer, but if the deer are hungry enough, they will eat the treated plants. The repellents should be reapplied often because they will be washed off by precipitation.

Household Remedies

Strong smelling bars of soap. Strong smelling soap such as Irish Spring are used as deer repellents. Put the soap in a net bag or punch a hole in the soap and tie it to the outer branches of the tree.

Blood meal. The smell of blood meal sprinkled around a flower bed or garden seems to keep the deer away. We have tried this around tulips, vegetable gardens and a perennial garden with some success. The blood meal needs to be reapplied often because it washes into the ground. Blood meal has the added advantage of supplying your plants with organic nitrogen.

Human hair. Net bags filled with human hair repel deer because of the human scent.

Hot pepper sauce. Spraying hot pepper sauce on trees can also be effective.

Fencing. The only sure way to keep deer away from your plants is to fence them. A fence around your whole yard that is too tall for the deer to jump over is one way to do it. We fence individual trees with 6' (4") hardware wire used for fencing. If you live in an area with lots of deer it may be the only way to keep your plants from being eaten.

Wrapping the trunks of trees in the fall. If you do not choose to fence your young trees, at least wrap the trunks early enough in the fall to prevent the bucks from rubbing their horns on them.

Motion-activated yard lights. Some people have tried yard lights with some success.

Your dog. Keeping your dog out at night may help to keep the deer away if your dog barks or chases them out of the yard. Barking dogs can, however, be hard on your neighbors.

Deer are creatures of habit. They quickly establish eating patterns that are difficult to break. Take measures to minimize the deer browsing before they become used to your yard as a source of food.

Deer Proof Plants

No plant is totally deer proof. If the deer are hungry enough, they will eat anything. However, they do prefer some plants to others. We have listed some of the safer plants to use when you have a deer problem. We have also listed the plants which deer love to eat.

Deer Resistant Plants

Conifer Trees

Spruce
Ponderosa Pine
Lodgepole Pine
Douglas Fir
Juniper

Deciduous Trees

Aspen
Birch
Black Ash
Box Elder
Cottonwood
Elm
Green Ash
Hawthorn
Honeylocust
Russian Olive
Willow

Shrubs

Barberry
Canada Buffaloberry
Caragana
Currant, Gooseberry
False Spirea
Honeysuckle
Lilac
Mockorange
Ninebark
Potentilla Varieties
Sage
Smooth Sumac
Viburnum, Nannyberry

Annuals

Balsam
California Poppy
Canterbury Bell
Cineraria
Floss Flower
Godetia
Marigold
Shirley Poppy
Snapdragon
Zinnia

Plants Deer Love

Deciduous Trees

Apples and Flowering Crabtrees
Plums and the Plum Family
Mountain Ash

Evergreens

Arborvitaes
Pines

Shrubs

All Roses
Purple Leaf Plum
Winged Burning Bush
Cotoneaster
Red Twig Dogwood

Bulbs and Perennials

Tulips
Tall Phlox
Gladiolus
Creeping Phlox

Vines

Bittersweet
Clematis
Honeysuckle

Ground Covers

Carpet Bugle
Lily of the Valley
Dead Nettle
Pachysandra
Large Periwinkle
Periwinkle
Wild Strawberry

Herbs

Rue
Oregano
Mint

Perennials and Bulbs

Beard Tongue
Bee Balm
Begonia
Blanket Flower
Bleeding Heart
Blue Fescue
Candytuft
Catnip
Columbine
Coreopsis
Crocus
Crown-pink
Daffodil
Daisy
Daylily
Dead Nettle
Euphorbia
Ferns
Foxglove
Iris
Johnny Jump-up
Lamb's Ears
Lavender
Lupine
Marguerite
Pincushion Flower
Pinks
Poppies - Oriental and Icelandic
Purple Coneflower
Saxifrage
Sea Lavender
Serbian Bellflower
Silver Mound
Snow in Summer
Snow on the Mountain
Speedwell
Squill
Thyme
Yucca
Yarrow

APPENDIX 4. Helpful resources for producers before and during the planting process; a compilation of participants' favorite plant and conservation books

Books

- Carson, Rachael. Silent Spring. Houghton Mifflin, 1962.
- Hemenway, Toby. Gaia's Garden: A Guide to Home-Scale Permaculture. Chelsea Green, 2000.
- Kershaw, Linda, A. MacKinnon, J. Pojar. Plants of the Rocky Mountains. Lone Pine, 1998.
- Leopold, Aldo. A Sand County Almanac, and sketches here and there . Oxford University Press, 1949.
- Morrow, Rosemary. Earth User's Guide to Permaculture. Kangaroo Press, 2006.
- Savory, Allan and J. Butterfield. Holistic Management: A New Framework for Decision Making. Second Edition. Island Press, 1999.
- Wasson, Eric. The Complete Encyclopedia of Trees and Shrubs. Thunder Bay Press, 2003.
- Brenzel, Kathleen. Western Garden Book. Sunset Editors, 2001 Edition.
- Davis, Frances, A.C. Martin, H. Zim. American Wildlife and Plants: A Guide to Wildlife Food Habits. Dover Press, 1989.
- Benyus, Janine. Field Guide to Wildlife Habitats of the Western United States. Fireside, 1989.
- Morse, Roger. The ABC and XYZ of Bee Culture: An Encyclopedia of Beekeeping. A.I. Root, 1990.
- Schiemann, Donald A. Wildflowers of Montana. Mountain Press, 2005.
- Taylor, Ronald, B. Spring, I. Spring. Rocky Mountain Wildflowers. The Mountaineers Books, 2003.

Booklets/Technical References

- MT Native Plants for Pollinator-Friendly Plantings. USDA-NRCS. February, 2006.
- Seeding Rates and Recommended Cultivars. NRCS Plant Materials, Technical Note MT-46. April, 2007.
- Restoration of Woody Plants within Native Plant Communities. NRCS Plant Materials, Technical Note MT-31. June, 1999.
- Preventing Deer Damage. Cashman Nursery. Bozeman, MT.

Websites

- Pheasants Forever: www.pheasantsforever.org

APPENDIX 5. Growth Characteristics, Tolerance Levels, and Wildlife Habitat Ratings From the Montana Department of Natural Resources & Conservation

GROWTH CHARACTERISTICS, TOLERANCE LEVELS AND WILDLIFE HABITAT RATINGS

Common Name	20-Year Height (feet)	Spacing within rows	Growth Rate[1]	Tolerance Ratings[2] Drought Tolerance min. precip. (inches)	Tolerance Ratings[2] Saline Alkali soil Tolerance	Wildlife Ratings[3] Birds Nesting	Birds Food	Mammals Cover	Mammals Browse	Comments
SHRUBS										
Buffaloberry, Silver	10	4-8	M	E-10	E	E	E	E	E	Native, thorny, very hardy. Forms thickets. Fruit makes excellent jelly.
Caragana	12	4-8	R	E-9	G	E	F	F	P	Our hardiest shrub. Excellent drought tolerance & rapid growth. Great for windrows.
Cherry, Nanking	6	3-6	M	G-11	F	E	E	F	E	Used on leeward side of windbreak. Fruit edible & good for jelly. Showy flowers.
Cherry, Sand	2-3	2-4	M	G-11	F	G	E	F	F	Small, short lived shrub. Excellent bird plant. Fruit excellent for jellies & jams.
Chokecherry	12	4-8	M	G-11	F	E	E	E	F	Native. Used for wildlife habitat & erosion control. Suckers to form thickets.
Cotoneaster, Centennial	8-10	4-6	M	E-10	G	E	E	F	P	Large, attractive, hardy shrub. Fruit is bright red when ripe. May be fire blight resistant.
Currant, Golden	6	4-6	M	G-11	F	G	G	F	G	Native. Rapid growth rate. Drought & cold tolerant. Used for wildlife & windbreaks.
Dogwood, Red Osier	8	4-6	R	P-18	P	E	F	E	G	Native. Deep red bark. Used for wildlife & stabilization. Usually needs irrigation.
Honeysuckle, Blue-leaf	8	4-8	M	G-11	G	E	E	G	P	Resistant to witches-broom aphid. Fruit readily consumed by most birds.
Lilac, Common	8	4-8	S-M	G-11	F	E	P	E	P	Used in windbreaks & wildlife habitat. Showy purple flowers. Long-lived. Suckers.
Lilac, Late	10	4-8	M	G-12	F	G	P	G	P	Non-suckering, pinkish flower. Use in windbreaks. Not as drought-tolerant a Lilac.
Plum, American	10	4-8	M	G-12	F	E	G	G	E	Large fruit provides excellent wildlife food and is edible. Suckers to form thickets.
Rose, Woods	4	3-6	M	G-11	P	E	E	E	E	Showy pink flowers. Used for wildlife habitat. Suckers aggressively.
Sagebrush, Wyoming Big	3	3-6	S	E-8	G	F	P	F	E	Very cold and drought tolerant native shrub. Valuable winter browse.
Saltbush, Fourwing Gardner	20	2-4	S	E-5	E	G	P	G	E	A cold, drought and alkaline tolerant native shrub. White-gray foliage adapted to a variety of soil types.
Sand Cherry	2-3	2-4	M	G-11	F	G	E	F	F	Small, short lived shrub. Excellent bird plant. Fruit excellent for jellies & jams.
Serviceberry	10-14	4-6	M	G-12	P	G	E	G	G	Native; preferred wildlife food plant for many species. Showy white blossom.
Silverberry	4-6	4-6	M	G-12	G	G	G	F	F	Native bottomland species. Very aggressive spreader. Excellent for erosion control.
Snowberry, Western	2-4	4-6	M	G-12	F	F	G	P	F	Common natives. Persists exceptionally well through drought, fire, and heavy grazing. Western snowberry is the dominant snowberry in Eastern MT.
Sumac, Skunk	8	4-6	S	E-9	G	E	F	E	G	Very drought-tolerant once established. Excellent wildlife habitat. Slow grower.
Willow, Sandbar	10	3-6	R	P-15	G	G	F	G	G	Grown from native collections. Drought-tolerant for willow but requires regular water source. Suckers aggressively.
Willow, Sandbar (YS County)	10	3-6	R	F-14	G	G	F	G	G	Grown from a slightly saline collection site that was atypically dry for willows.
Willows, Booth, Drummond, Pacific, Planeleaf, Sitka, Yellow	6-12	2-8	R	P-20	F	E	F	G	G	Native streamside species from various Western Montana watersheds. Use for stream bank stabilization, fisheries, and wildlife habitat. Most require planting in true riparian habitat for good survival.
DECIDUOUS TREES										
Alder, Sitka	12	6-10	F	P-16	F	G	P	G	F	Multi-stemmed mountain species. Nitrogen fixer. Adapts to poor soils. Prefers moist sites.
Alder, Thinleaf	16	6-10	F	P-16	F	G	P	F	F	Multi-stemmed mountain species. Nitrogen fixer. Adapts to poor soils. Prefers moist sites.
Ash, Green	18	8-12	M	E-11	G	G	F	F	G	Drought, cold and alkaline resistant. Used in windbreaks. Very adaptable.
Aspen	30	6-10	R	P-15	P	G	P	G	F	Forms thickets from root suckers. Showy fall color. Best at mid to high elevations.
Birch, River	20	6-10	R	P-16	F	G	F	F	F	Native streamside birch distinguished by its smooth, deep red bark.

GROWTH CHARACTERISTICS, TOLERANCE LEVELS AND WILDLIFE HABITAT RATINGS

				Tolerance Ratings[2]		Wildlife Ratings[3]				
				Drought	Saline	Birds		Mammals		
Common Name	20-Year Height (feet)	Spacing within rows	Growth Rate[1]	Tolerance min. precip. (inches)	Alkali soil Tolerance	Nesting	Food	Cover	Browse	Comments
Cherry, Black	15	6-12	M	G-12	F	F	G	F	F	Nice ovoid shape. Unpalatable to grasshoppers. Not adapted to alkaline soils.
Cottonwoods	30-45	8-15	R	P-16	F	F	P	P	F	Noted for rapid growth on moist sites. Used for windbreaks, stabilization and wildlife.
Crabapple, Midwest	15	6-10	R	G-12	F	F	G	F	F	Showy spring flowers, small fruit. Good fall/winter bird food. Very adaptable and hardy.
Elm, Siberian	25	8-15	R	E-11	G	F	F	P	P	Very drought-tolerant. Rapid growth rate. Very short-lived. Disease prone.
Hackberry	20	8-12	M	G-12	G	G	P	F	G	Drought resistant. Tolerates most soil types. Subject to frost damage when young.
Hawthorn, Arnold	15	6-10	M	G-12	F	E	E	G	G	Vigorous, dense small tree. Excellent for wildlife & windbreaks. Adapts to heavy soils.
Hawthorn, Black	15	6-10	M	F-15	F	E	E	E	F	Native bottomland tree. Thorny habit provides excellent cover. Birds prize fruit.
Maple, Amur	14	4-8	M	G-12	F	F	P	F	F	Brilliant fall color; adapts well to all but heavy or alkaline soils.
Oak, Bur	16	8-14	M	G-12	G	G	E	G	E	Hardy, long-lived tree. Acorns excellent wildlife food. Very drought tolerant once est..
Poplar, Prairie Sky	30-45	6-10	R	F-14	F	F	P	P	F	Cottonless, drought and cold tolerant. Narrow upright form similar to Lombardi Poplar.
Willow, Golden	30-40	8-15	R	F-14	F	F	F	F	F	Large, graceful, fast-growing tree. Needs irrigation. Twigs are golden yellow in color.
EVERGREENS										
Fir, Douglas	15	8-14	M	F-14	P	G	F	P	P	Higher moisture needs for good growth, but survives drought periods. Used in windbreaks and reforestation.
Juniper, Rocky Mountain	14	6-12	M	E-10	G	G	G	G	E	Excellent in wildlife plantings. Very drought and alkali tolerant. Transplants well.
Larch, Western	20	8-14	M-R	P-15	P	F	F	P	P	Used mostly for reforestation plantings in Western Montana. Drops needles in winter.
Pine, Austrian	17	8-14	M-R	F-12	F	G	F	F	P	Excellent in windbreak. Adapts to many soil types. Susceptible to needle blight disease.
Pine, Limber	12	6-12	S	E-10	P	G	F	F	P	Very hardy and slow growing. Use where other evergreens can't survive.
Pine, Lodgepole	17	8-14	M	F-14	F	G	P	F	P	Used mostly for reforestation and reclamation of mid to high altitude sites.
Pine, Ponderosa	17	8-14	M	G-11	F	G	F	F	P	Most drought-tolerant pine. Used for windbreaks and reforestation. Very long-lived.
Pine, Scotch	17	8-14	M-R	G-12	F	P	G	P	P	Relatively rapid growth. Adapts to most sites. Used for Christmas trees, windbreaks.
Pine, White	15	8-14	M	P-16	P	G	F	P	P	Excellent reforestation species. High stumpage value. Grown from rust resistant seed.
Spruce, Black Hills	12	8-14	S	F-12	F	E	F	P	P	Similar to Blue Spruce. Slower growing, but better cold tolerance. Medium height.
Spruce, Colorado Blue	15	8-14	M	F-12	F	E	F	P	P	Excellent for windbreaks; dense crown. Few are actually blue. Slow initial growth.
Spruce, Engelmann	14	8-14	S	P-15	P	E	F	G	P	Used mostly for reforestation and reclamation of wet, high elevation sites.
GRASSES										
Basin Wildrye	6	2-6	M	E-9	G	E	G	P	F	Large, cool season bunchgrass. Excellent for upland game birds.
Bluebunch Wheatgrass	3	2-4	M	E-10	F	P	P	P	F	Densely tufted, cool season bunchgrass. Use for stabilization. Very palatable.

[1] Growth rate: R = Rapid, M = Moderate, S = Slow

[2] Relative Tolerance Ratings: E = Excellent, G = Good, F = Fair, P = Poor. Drought tolerance = relative ability to tolerate drought conditions; minimum precipitation = least amount of annual precipitation that can be expected to result in satisfactory survival and growth in windbreaks with cultivation, planted in well-drained soils with good moisture-holding capacity and gently sloping terrain. Saline/Alkali Tolerance = relative ability to tolerate saline/alkali soil conditions.

[3] Wildlife Habitat Suitability Ratings: E = Excellent, G = Good, F = Fair, P = Poor

APPENDIX 6. Listing of specific plant survivability concerns; a compilation of producer participant experiences. Those plants without markings did not stand out to either extreme in these categories

Native Plant Common Name	Most Sensitive, Needs Water	Least Sensitive, Drought Tolerant	Difficult to Establish	Browse Tolerant	Browse Sensitive
Aster, Hairy Golden					
Aster, Smooth					
Beebalm, Wild					
Blanket flower, Indian					
Buffaloberry			x		x
Caragana				x	
Cherry, Nanking			x		
Chokecherry	x				
Cinqefoil, Shrubby					
Columbine, Colorado	x				
Coneflower, Prairie					
Coneflower, Purple		x			
Currant, Golden	x				
Dogwood, Redosier	x				
Elderberry, Blue	x				
Flax, Lewis					
Gayfeather, Dotted					
Globemallow					
Hawthorn, Black		x			
Honeysuckle		x		x	
Juniper, Rocky Mtn.				x	
Oak, Bur			x		x
Penstemon, Fuzzytongue					
Penstemon, Rocky Mtn.					
Plum, American					
Prairie Clover, Purple					
Prairie Clover, White					
Rabbitbrush		x			
Rose, Wood's				x	
Sagebrush, Big					
Serviceberry	x				
Snowberry, Common					
Sumac, Skunkbrush		x			x
Sunflower, Maximilian			x		
Sunflower, Perennial Prairie					
Willow	x				
Yarrow, (White)			x		

APPENDIX 7. Listing of recommended native plant and seed sources in and around Montana

PLACE	NURSERY	CONTACT
Bozeman, MT	Cashman Nursery	(406) 587-3406
Corvallis, MT	Moeller Nursery	(406) 961-3389
Greeley, CO	Pawnee Buttes Seed Inc.	(970) 356-7002
Hamilton, MT	Bitterroot Nursery	(406) 961-3806
Havre, MT	Wild Horse Seeds	(406) 265-5443
Helena, MT	Chadwick Nursery	(406) 442-3931
Kalispell, MT	Glacier Nursery	(406) 755-2248
Manderson, WY	Wind River Seed Co.	(307) 568-3361
Missoula, MT	Montana Conservation Seedling Nursery	(406) 542-4244
Plains, MT	Lawyer Nursery	(406) 826-3881
Threeforks, MT	Circle S Seeds	(406) 285-3269
Townsend, MT	Townsend Seeds	(406) 266-4444

For a zip code search for local nurseries, go to Garden Guides on the web: www.gardenguides.com

APPENDIX 8. Seed Rate Specifications and Recommended Cultivars.
NRCS Plant Materials Technical Note, MT-46. April, 2007

SEEDING RATE SPECIFICATIONS AND RECOMMENDED CULTIVARS AND GERMPLASM FOR ALL VEGETATIVE PRACTICES IN THE MONTANA FOTG. ALL SEEDING RATES ARE FOR PURE STANDS OF INDIVIDUAL SPECIES. WHEN SEEDING MIXTURES, USE A PERCENTAGE OF THE SEEDING RATE FOR EACH SPECIES IN THE MIXTURE

SPECIES	ORIGIN	SEEDS/LB.[1]	PLS LBS./ACRE[2] FOR FULL SEEDING[12]	COOL/WARM[3] IRR/DRY SPRING/FALL	CULTIVARS	PREFERRED CULTIVARS
Grasses						
alkali sacaton	N	1,758,000	1.0	W/D/NP	COMMON	
bluegrass, big	N	882,000	2.0	W/D/NP	Sherman	
bluegrass, Canada	I	1,600,000	2.0	C/I/NP	Foothills, Reubens, Talon	Foothills
bluegrass, Canby	N	900,000	1.0	C/D/NP	Canbar	
bluegrass, Kentucky	N	2,156,000	3.0	C/I/NP	COMMON	
bluegrass, Sandberg	N	900,000	2.0	C/D/NP	High Plains	
bluestem, big	N	130,000	6.0	W/D/S	Bison, Bonilla, Champ, Sunnyview	Sunnyview
bluestem, little	N	260,000	4.0	W/D/S	Badlands, Blaze, Camper,	Badlands
bluestem, sand	N	113,000	8.0	W/D/S	Garden, Goldstrike	
bromegrass, smooth	I	125,000	5.0	C/I or D/NP	Lincoln, Manchar, Rebound	
bromegrass, meadow	I	93,000	10.0	C/I or D/NP	Fleet, MacBeth, Montana, Regar, Paddock	
bromegrass, mountain	N	80,000	10.0	C/I or D/NP	Bromar, Garnet	Garnet
buffalograss (bur)	N	48,000	10.0	W/D/NP	Bison, Plains, Tatanka, Cody, Bismarck (veg)	Tatanka
fescue, hard	N	565,000	3.0	C/D/NP	Durar, Serra	Durar
fescue, Idaho	N	450,000	3.0	C/D/NP	Joseph, NezPurs, Winchester	Nezpurs
fescue, sheep	N	680,000	3.0	C/D/NP	Big Horn, Covar	Covar
fescue, spike	N	200,000	4.0	C/D/NP	COMMON	
fescue, tall	I	242,000	4.0	C/I or D/NP	Alta, Kenmont, Fawn, Forager	Forager (endophyte free)
foxtail, creeping	I	720,000	3.0	C/I/NP	Garrison, Retain	Garrision
foxtail, meadow	I	500,000	4.0	C/I/NP	COMMON	
grama, blue	N	825,000	2.0	W/D/S	Alma, Bad River, Birdseye, Willis	Bad River
grama, sideoats	N	191,000	4.5	W/D/S	Butte, Pierre, Trailways, Killdeer	Pierre, Killdeer
hairgrass, tufted	N	2,500,000	1.5	C/D/NP	Peru Creek	
Indiangrass	N	170,000	5.0	W/D/NP	Tomahawk	
Indian ricegrass	N	235,000	6.0	C/D/F	Nezpar, Paloma, Rimrock	Rimrock

[1] See Page 6 for calculations and formulas for Pure Live Seed (PLS), pounds per acre and respective seeds per row foot in 12-inch or less row spacing.

[2] See Page 6 for calculations and formulas for pounds per acre and respective seeds per row foot in 12-inch or greater row spacing.

[3] C = Cool Season, W = Warm Season, I = Irrigated, D = Dryland, S = Spring Preferred Seeding, F = Fall Preferred Seeding, NP = No Seasonal Seeding Preference.

SPECIES	ORIGIN	SEEDS/LB.[1]	PLS LBS./ACRE[2] FOR FULL SEEDING[12]	COOL/WARM[3] IRR/DRY SPRING/FALL	CULTIVARS	PREFERRED CULTIVARS
Grasses CONTINUED						
needleandthread	N	115,000	6	C/D/NP	COMMON	
needlegrass, green	N	186,000	5	C/D/F	Lodorm	
nuttall alkaligrass	N	2,108,000	1.0	C/I/NP	COMMON	
orchard grass	I	464,000	3.0	C/I/NP	Chinook, Latar, Potomac, Paiute	
prairie cordgrass	N	183,000	5.0	W/D/NP	Red River	
prairie junegrass	N	2,315,000	1.0	C/D/NP	COMMON	
prairie sandreed	N	273,000	4.0	W/D/S	Goshen, Pronghorn	Goshen
reed canarygrass	N	602,000	4.0	C/I/NP	COMMON	
ryegrass, perennial	I	247,000	4.0	C/I or D/NP	Friend, Linn	
sand dropseed	N	5,680,000	1.0	W/D/NP	COMMON	
squirreltail, bottlebrush	N	192,000	5.0	C/D/NP	Sand Hollow	
switchgrass	N	389,000	3	W/I/S	Dacotah, Forestburg, Sunburst	Sunburst
timothy	I	1,300,000	2.0	C/I/NP	Climax, Drummond, Engmo	
wildrye, Altai	I	80,000	12.0	C/D/NP	Ejay, Pearl, Prairieland	
wildrye, basin	N	125,000	6.0	C/D/NP	Magnar, Trailhead, Washoe	Trailhead
wildrye, beardless	I	181,000	6.0	C/D/F	Shoshone	
wildrye, Canada	N	115,000	7.0	C/D/NP	Mandan	
Wildrye, Dahurian	I	72,600	12.0	C/D/NP	James, Arthur	
wildrye, Mammoth	I	47,000	15.0	C/DNP	Volga	
wildrye, Russian[4]	I	170,000	5.0	C/I or D/NP	Bozoisky-Select, Mankota, Swift, Vinall, Bozoisky II	Bozoisky-Select
Wheatgrasses						
beardless	N	109,000	6.0	C/D/NP	Whitmar	
bluebunch	N	139,000	6.0	C/D/NP	Secar, Goldar, P7	Goldar
crested, fairway	I	200,000	4.0	C/D/NP	Ephraim, Fairway, Parkway, Roadcrest, Ruff	
hybrid (quack x bluebu)	I	134,000	8.0	C/I or D/NP	Newhy	
intermediate	I	79,000	10.0	C/I or D/NP	Amur, Greenar, Oahe, Rush, Reliant	Rush
pubescent	I	80,000	10.0	C/I or D/NP	Luna, Manska, Greenleaf	Manska
Siberian	I	163,000	5.0	C/D/NP	P-27, Vavilov	
slender	N	140,000	6.0	C/D/NP	Pryor, Revenue, San Luis	Pryor
standard crested	I	188,000	5.0	C/D/NP	Douglas, Nordan, Summit	
standard x fairway	I	175,000	5.0	C/D/NP	Hycrest, CDII, Hycrest II	Hycrest
streambank	N	152,000	5.0	C/D/NP	Sodar	
tall	I	79,000	10	C/D/NP	Alkar, Jose, Largo, Orbit	Jose
thickspike	N	145,000	6.0	C/D/NP	Bannock, Critana	Critana
western	N	93,000	8.0	C/D/NP	Rodan, Rosana	Rosana

[4] Minimum row spacing (width) is 18 inches.

SPECIES	ORIGIN	SEEDS/LB.[1]	PLS LBS./ACRE[2] FOR FULL SEEDING[12]	COOL/WARM[3] IRR/DRY SPRING/FALL	CULTIVARS
Introduced Legumes					
alfalfa[5]	I	225,000	5.0	N/A[10]/I or D/NP	SEE FOOTNOTE #5
alsike clover	I	700,000	3.0	N/A/ I or D/NP	COMMON
birdsfoot trefoil	I	418,000	3.0	N/A/ I or D/NP	Empire, Leo
white clover (ladino)	I	800,000	4.0	N/A/ I or D/NP	COMMON
milkvetch, cicer	I	134,000	7.0	N/A/ I or D/NP	Lutana, Monarch, Windsor
red clover	I	272,160	4.0	N/A/ I or D/NP	COMMON
small burnet	I	42,243	20	N/A/D/NP	Delar
sainfoin	I	18,500	34.0	N/A/ I or D/NP	Eski, Melrose, Remont, Shoshone
strawberry clover	I	300,000	3.0	N/A/I or D/NP	COMMON
sweetclover, white	I	262,000	4.0	N/A/ I or D/NP	COMMON
sweetclover, yellow	I	258,000	4.0	N/A/ I or D/NP	COMMON

[5] Alfalfa should have a fall dormancy rating of three (3) or less.
See the latest Certified Alfalfa Seed Council Fall Dormancy and Pest Resistance Ratings.

SPECIES	ORIGIN	SEEDS/LB.[1]	PLS LBS./ACRE[2] FOR FULL SEEDING[8,9,12]	COOL/WARM[3] IRR/DRY SPRING/FALL	CULTIVARS	PREFERRED CULTIVARS
Native Forbs and Legumes[8,9]						
Globe Mallow	N	500,000	2	N/A[10]/D/NP	COMMON	
Indian Blanket Flower	N	157,000	7	N/A/D/NP	COMMON	
Lewis flax	N	286,690	3	N/A/D/NP	Appar, Maple Grove	
Maximilian sunflower	N	250,000	1	W/D/NP	Prairie Gold, Medicine Creek	Medicine Creek
prairie coneflower	N	737,000	1.2	N/A/D/NP	Stillwater	
purple prairieclover	N	275,000	3	N/A/D/NP	Kaneb, Bismarck	Bismarck
Rocky Mtn. Penstemon	N	478,000	1.5	N/A/D/F	Bandera	
dotted gayfeather	N	136,000	6.4	N/A/D/NP	COMMON	
white prairieclover	N	278,000	3	N/A/D/NP	Antelope	
Western yarrow	N	4,500,000	0.5	N/A/D/NP	Great Northern	

SPECIES	ORIGIN	SEEDS/LB.[1]	PLS LBS./ACRE[2] FOR FULL SEEDING[8,9,12]	FT[2] PER PLANT @ FULL SEEDING RATE	COOL/WARM[3] IRR/DRY SPRING/FALL	CULTIVARS
Shrubs/Trees[8,9]						
American plum	N	870	1.0	50	N/A[10]	COMMON
antelope bitterbrush	N	15,400	1.0-2.0	~2	N/A	COMMON
big sagebrush	N	2.4-3.2 x 10^6	1	.016	N/A	COMMON
black cottonwood	N	NI	N/A	NA	N/A	COMMON
black hawthorn	N	22,600	0.5-1.0	~2.6	N/A	COMMON
box elder	N	13,400	0.25-0.5	~8.6	N/A	COMMON
Buffaloberry	N	40,00	0.5-1.0	~1	NA/D/F	Sakakawea
bur oak	N	75	25	23.2	N/A	COMMON
chokecherry	N	4,790	1.0-2.0	~6.1	N/A	COMMON
common juniper	N	36,500	<1.0	1.2	N/A	COMMON
common snowberry	N	76,000	1.0-3.0	~.29	N/A	COMMON
cudweed sagewort[6]	N	3.0-4.5 x 10^6	<0.25	.05	N/A	Summit
curlleaf mt. mahogany	N	51,900	.05	16.8	N/A	COMMON
forage kochia	N	400,000	.1	1.1	N/A	Immigrant
fourwing saltbush	N	49,000/24,500[7]	.25/.50[7]	3.6	N/A	Wytana
Gardner's saltbush	N	111,500	0.5	0.78	N/A[10]	COMMON
green ash	N	17,260	<0.25	10.1	N/A	COMMON
green rabbitbrush	N	782,000	<0.5	0.11	N/A	COMMON
green sagewort	N	4.5-4.7 x 10^6	<0.5	0.02	N/A	COMMON
horizontal juniper	N	29,500	<1.0	1.5	N/A	COMMON
narrowleaf cottonwood	N	NI[11]	N/A	N/A	N/A	COMMON
Ponderosa Pine	N	12,595	N/A	N/A	N/A	Hunter Select
Plains cottonwood	N	350-447,000	N/A	N/A	N/A	COMMON
redosier dogwood	N	18,500	1	2.3	N/A	COMMON
Rocky Mountain Juniper	N	27,100	<1.0	1.6	N/A	Bridger Select
rubber rabbitbrush	N	693,000	<1.0	0.06	N/A	COMMON
serviceberry	N	82,000	0.5-1.0	~.71	N/A	COMMON
shrubby cinquefoil	N	>1,000,000	<1.0	.04	N/A	COMMON
silverberry	N	3,800	1.0-2.0	~7.6	N/A	COMMON
skunkbush sumac	N	20,300	1.0-2.0	~1.4	N/A	Big Horn
western snowberry	N	74,400	1.0-3.0	~.39	N/A	TRAPPER

Shrubs/Trees CONTINUED[8,9]						
SPECIES	ORIGIN	SEEDS/LB.[1]	PLS LBS./ACRE[2] FOR FULL SEEDING[8,9,12]	FT[2] PER PLANT @ FULL SEEDING RATE	COOL/WARM[3] IRR/DRY SPRING/FALL	CULTIVARS
willow	N	2-3 x 10^6	N/A	NA	N/A	COMMON
winterfat	N	48,000/160,000[7]	<.5	1.8	N/A	Open Range
Wood's rose	N	50,000	0.5-1.0	~1.16	N/A	COMMON
yucca	N	25,000	<1.0	1.7	N/A	COMMON

[6] Also known as Louisiana sagewort.

[7] Fourwing saltbush Dewinged/winged. Winterfat fluffy/naked.

[8] Shrubs, forbs, and trees will not be planted at a full seeding rate.
The purpose of including tree and shrub species is to add species diversity and mimic a native plant community.

[9] Maximum mixture rates determined for % species composition averaged from Montana Ecological Site Descriptions.

[10] Not Applicable.

[11] No information.

[12] Standard drilled seeding rate will be doubled for broadcast and critical area seeding.

Pounds per acre and seeds per foot for various row spacings can be calculated as follows:

ROW SPACING (INCHES)	PLS POUNDS / ACRE	SEEDS / ROW FOOT
6	Same as 12-inch rows	Multiply 12-inch row spacing seeds/foot by 0.5
7	Same as 12-inch rows	Multiply 12-inch row spacing seeds/foot by 0.58
9	Same as 12-inch rows	Multiply 12-inch row spacing seeds/foot by 0.75
10	Same as 12-inch rows	Multiply 12-inch row spacing seeds/foot by 0.83
14	Divide lbs./acre at 12-inch row spacing by 1.17	Same as 12-inch rows
18	Divide lbs./acre at 12-inch row spacing by 1.50	Same as 12-inch rows
20	Divide lbs./acre at 12-inch row spacing by 1.67	Same as 12-inch rows
21	Divide lbs./acre at 12-inch row spacing by 1.75	Same as 12-inch rows
28	Divide lbs./acre at 12-inch row spacing by 2.33	Same as 12-inch rows
30	Divide lbs./acre at 12-inch row spacing by 2.50	Same as 12-inch rows
35	Divide lbs./acre at 12-inch row spacing by 2.91	Same as 12-inch rows
40	Divide lbs./acre at 12-inch row spacing by 3.33	Same as 12-inch rows
42	Divide lbs./acre at 12-inch row spacing by 3.50	Same as 12-inch rows

CONTINUATION FROM PAGE 1:

[1] Bulk seed is used for drill calibration, and is either counted within the row or ft^2 or weighed for a given unit area. Bulk seed required for applying the proper PLS rate is calculated by:

-- Percent PLS = Percent Germination X Percent Purity ÷ 100

-- PLS lbs./acre seeding rate ÷ (Percent PLS ÷ 100) = bulk seed (lbs./acre)

-- PLS seeds/linear or ft^2 ÷ (Percent PLS ÷ 100) = bulk seed/linear or ft^2

Pounds per acre and seeds per foot within a row for various row spacing can be calculated as follows:

-- Seeds per linear foot for 12 inches or less between rows

Seeds/lb. X PLS seeding rate (lbs./acre) ÷ 43,560 ft^2/acre X desired between-row spacing (inches) ÷ 12 inches/foot = PLS seeds/linear row foot or ft^2

[2] All seeding rates are shown as PLS lbs./acre for 12 inches between-row spacing.

-- Row spacing wider than 12 inches, the PLS lbs./acre is calculated:

Pounds PLS/acre rate in a 12 inches between-row spacing (recommended seeding rate) X [12 inches ÷ actual between-row spacing (inches)] = PLS lbs./acre.

Reference: Montana Plant Materials Technical Note MT-30, Drill Calibration.

Note: Bulk or PLS seeds/linear row foot will be less in a 12-inch or less between-row spacing while bulk or PLS lbs./acre remains constant. Bulk or PLS seeds/linear row foot (~20) will remain constant in 12-inch or greater row spacing, but bulk or PLS pounds per acre will decrease.

The constant within row seed density provides interspecies competition against weed establishment, increases planted seed establishment and survival for wind and water erosion and provides an initial population to obtain a site occupancy balance with the existing environmental conditions. Decreasing the PLS seeds/linear within row foot in less than one foot row spacing, i.e., 10 seeds per linear foot in 6 inch rows, still provides ~20 seeds per square foot.