PLANT MATERIALS TODAY

A Quarterly Newsletter of the Montana-Wyoming Plant Materials Program

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This is a quarterly field office newsletter to transfer plant materials technology, services, and needs. The plant materials personnel will be featuring short articles on project results, new cultivar releases and establishment techniques, seed collection, and field planting needs, etc. All offices are encouraged to submit articles about plant material-related activities relative to plant performance, adaptation, cultural and management techniques, etc. Direct inquiries to USDA NRCS, Plant Materials Center, 98 South River Road, Bridger, MT 59014, Phone 406-662-3579, Fax 406-662-3428; or Ron Nadwornick, State Resource Conservationist, USDA NRCS Montana State Office, Federal Bldg., Rm 443, 10 East Babcock Street, Bozeman, MT 59715-4704, Phone 406-587-6998, Fax 406-587-6761.

2008 Seed Collection Reminder

The Plant Materials (PM) Program is requesting seed collections of seven species in Montana and Wyoming. In 2008, continued collection is requested of *Pediomelum argophyllum* (synonym *Psoralea argophylla*), large Indian breadroot *Pediomelum esculentum* (synonym *Psoralea esculenta*), slimflower scurfpea *Psoralidium tenuiflorum* (synonym *Psoralea tenuiflora*), scarlet globemallow *Sphaeralcea coccinea*, prairie thermopsis *Thermopsis rhombifolia*, and American vetch *Vicia americana*. New to the list this year is the Montana state grass, bluebunch wheatgrass *Pseudoroegneria spicata* (synonym *Agropyron spicatum*.

When scouting around for likely sites in which to make seed collections, look for populations of healthy plants growing in harsher than normal conditions. Specific guidelines for seed collecting can be found in an online technical note at the websites mentioned below. Collections are needed from all areas in Montana and Wyoming.

A bulletin will be distributed electronically to each field office in Montana and Wyoming to provide guidance on accessing the seed collection instructions via each state's homepage. For immediate access to the respective guidance documents, species descriptions, and photos, go to the Montana or Wyoming NRCS homepage and click on Plant Materials, and then the Seed Collection List. Seed is subsequently planted in evaluation studies to test performance and utility for solving conservation problems outlined in the Plant Materials Long-Range Plans for Montana and Wyoming.

By Susan R. Winslow, PMC Agronomist.

Good Bye and Good Luck

Larry Sticka, a valuable employee for the last 10 years at the Bridger Plant Material Center (BPMC), has moved on to work at the John Deere dealership in Livingston. Larry's wife, Michel, obtained a teaching position in Livingston as the leader of their high school music department. Michel recently received national acclaim when she won an Emmy with her talented band of Bridger High School students. Larry was farm foreman at the BPMC and brought many years of farming experience with him when he first came to the Center in 1998 as he was raised on an irrigated farm/ranch near Belfry. During his tenure he participated in the implementation of new irrigation technologies, many upgrades in equipment and facilities, as well as improvements in specific cultural pratices and general field conditions. The BPMC staff wishes Larry and Michel the best of luck in their future endeavors and hope they'll stop back in from time to time.

By Roger Hybner, PMC Manager.

New PMC Employee with New and Improved Job Title

In our last newsletter there was an introduction to Beth Graham and her involvement in various projects at the Center. In April, Beth's job description changed as she became the new Project Leader for the DATR (Development of Acid/Heavy Metal Tolerant Releases) following Shannon Majerus' seven year reign as the DATR technician on staff at the PMC. This project is funded in cooperation with the Deer Lodge Valley Conservation District through a grant with the Montana Natural Resources Damages Project. Beth will focus on the continued selection of superior plant materials for restoration activities at the Anaconda Superfund Site and other impacted mining sites. Beth anticipates completing several research projects associated with plant selection and establishment, in addition to the duties of providing adequate supplies of foundation seed to commercial growers. Beth has been busy becoming familiar with all aspects of this project, and is enthused by the growing interest from seed growers and private nurseries, restoration professionals, agencies and the

public in the plant species that have been tested and released through the PMC this past decade. She will also continue to assist with Wyoming's Warren Air Force Base project and the intermittent work with NRCS through the National Older Workers Career Center.

By Beth Graham, DATR Project Leader.

Fabulous Field Day

On June 18th, the BPMC had their 49th anniversary Field Day with over 115 people in attendance. The attendees were separated into four groups and then went on tours of research plots and foundation seed fields, greenhouse and horticulture plantings, seed barn equipment and seed cleaning demonstrations, plus previewed a coming attraction of a new BPMC video. With the timely 4" of rain in May, the BPMC foundation seed fields and research plots were very green and lush, and that portion of the tour was led by Susan and Jim. They spoke on the various research projects occuring at the Center. Some of the research includes control of field bindweed in winterfat using three different herbicides, xeriscape turfgrass demonstrations, various native plant propagation projects for Glacier and Yellowstone National Parks and Warren Air Force Base in Wyoming, and work that is evolving from grasses and forbs to woodies for the DATR project on the mine tailings from the copper smelter near Anaconda and Butte. In addition, MSU graduate students, April Pearce and Jessie Wiese, talked about their research on pollinators of slender white prairie clover and establishment of wildlflowers using various herbicides, respectively.

Joe led the discussion and explanation of the horticulture trials and seed increases with a side trip to the woody plant establishment irrigation tube study. Roger led the groups into the air-conditioned office, which was very well received on that hot day, and showed the outstanding video Julia Sable (Media & Theater Arts graduate student at MSU-Bozeman) had produced outlining the who-what-when-where of the Plant Materials Program in the BPMC conservation scheme. Darren led the tour of the Seed Barn and its seed cleaning equipment, demonstrating various ways to clean weeds and other crops from different types of seed. The BPMC would like to thank the many particpants for attending and also Carbon County Conservation District, and the Soil and Water Conservation Districts of Montana, Inc., for sponsoring the delicious lunch prepared by Tara Schwend of Bridger. We hope to see you all back in 2010 for the 51st anniversary tour.

By Roger Hybner, PMC Manager.

Make Better Hay While the Sun Sets

It has been known for a long time that plants accumulate sugars in leaves during the day because the rate of photosynthetic production of sugar is faster than its export to other parts of the plant and faster than its conversion to structural cellulose and lignin carbohydrates. Hay producers can use this knowledge to increase the nutritive value of hay simply by mowing hay in the afternoon hours rather than the morning hours. Recent studies show the total nonstructural carbohydrates (sugars and starch) are significantly greater in alfalfa mowed after noon than when mowed in the morning, with peak content at 4:00 p.m. (figure 1). In addition, the concentration of structural carbohydrates in alfalfa hay measured by neutral detergent fiber decreases over the course of the daylight hours. These carbohydrates are not easily digested by livestock and do not add to the nutritive value of hay. Feeding trials show livestock can detect these differences. Steers, sheep, and goats fed alfalfa hay cut at different times during the day consumed more from the 4:00 p.m. hay than the 7:00 a.m. hay. Manure samples from these animals showed they were able to assimilate more of the hay as measured by dry matter disappearance when the hay was cut at 4:00 p.m. or later than when cut earlier in the day. This means animals can gain more weight per pound of hay consumed when the hay is cut later in the day compared to hay cut in the morning.

The results were the same regardless of whether the hay was the first, second, or third cutting. Total nonstructural carbohydrate content of alfalfa hay was greater in the afternoon cutting than the morning cutting when it was harvested in July, August, and September. Likewise, structural carbohydrate content was greater in the morning hay than the afternoon hay when it was cut in July, August, and September. Identical results were found in studies with tall fescue and switchgrass hay, and most likely apply to all hay species. Similarly, sheep intake of ryegrass and white clover increased when grazed over the course of the day. Intake rates of ryegrass were 2.5 and 2.3 grams dry mater per minute (g dm/m) at 7:30 and 11:30 am, respectively, and 3.2 g dm/m at 3:30 and 7:30 pm. Intake rates of clover were 3.5 and 4.2 g dm/m at 7:30 and 11:30 am, respectively, compared to 4.7 and 5.5 g dm/m at 3:30 and 7:30 pm, respectively. This has implications for forage harvest management. With the cost of fuel and fertilizer increasing, producers can get more for their money by cutting hay in the afternoon. The old adage of "make hay while the sun shines" still applies. However, an appropriate corollary might be "make better hay while the sun sets."

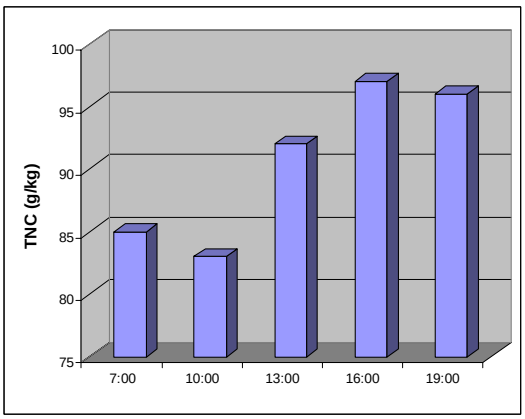

Figure 1. The amount of total nonstructural carbohydrates (TNC grams per kilogram of hay) of alfalfa harvested in the afternoon compared to alfalfa harvested in the morning (Burns et al. 2007, Diurnal shifts in nutritive value of alfalfa harvested as hay and evaluated by animal intake and digestion. Crop Science, 47: 2190-2197).

By Jim Jacobs, PM Specialist.

Pollinators of Slender White Prairieclover

Interest in the characterization of native pollinator communities has increased since the discovery of colony collapse disorder, but there exists an alarming gap in the knowledge of native insect pollinators between natural and agricultural habitats (Committee on the Status of Pollinators in North America. 2007. Status of Pollinators in North America. The National Academies Press). Native pollinators are not well characterized either taxonomically or ecologically due primarily to a lack of monitoring systems as well as taxonomists specialized in their identification. The BPMC grows plants for seeds suitable for use in many conservation applications, such as disturbed land reclamation, roadside revegetation, saline seep restoration, and seed and forage production systems. Interest in the pollinators of a specific plant species grown at the BPMC followed the death of a 5-year old stand of slender white prairieclover (*Dalea candida*).

The overall objective of my research was to obtain baseline information on the pollinators of *D. candida* at the BPMC. The focus of my research was on pollination of *D. candida*. My specific objectives were to: First, determine the diversity and identify the potential pollinators on *D. candida* and other cultivated and non-cultivated angiosperm species present at BPMC. A total of 3,533 specimens (1,697 being honey bees) were collected using sweep nets and pan traps, comprising 102 taxa. Those taxa included 67 bee taxa (58 pollen foragers and 9 brood parasites). My second objective was to determine pollen load size and composition of insects collected on angiosperm plant species. Specimens collected off three plant species (western yarrow, slender white prairieclover, and prairie coneflower) exhibited high floral constancy, meaning these specimens had a high tendency to collect pollen from one plant species. Floral constancy can be used as an estimate of pollination. My third objective was to determine the general sizes of insects most important for pollination of *D. candida* at BPMC. Using exclusion experiments with different sized meshes (1, 3, & 5 mm) and a no-mesh control it was found that as the number of pollinators allowed to access the flowers increases so does the amount of pollination that occurs, measured as seed set. Large bodied pollinators also appear to be important in pollination. The last objective was to determine the composition of the community of cavity-nesting Hymenoptera species at BPMC through use of trap-nests to possibly enhance native pollinators. A total of 1,793 specimens emerged from the trap nests. Of those emerged, the vast majority were alfalfa leaf cutting bees (*Megachile rotundata*), which were not commonly collected using other methods. Because of this, trap nests could be used to enhance the trap-nesting community, but does not appear to be a feasible method of enhancing native pollinators.

The results of this 2-year study has led to better understanding of the insects likely to be effective pollinators of plants cultivated at the BPMC for seed production. Despite the large populations of non-native pollen-feeding insects (honey bees and alfalfa leafcutting bees), the habitat at BPMC harbors a diverse population of native bees that provide pollination services and solitary wasps that play roles as predators in the local ecosystem.

April Pearce is a graduate student in the Land Resources and Environmental Sciences Department at Montana State University in Bozeman. Her advisor is Dr. Kevin O'Neal.

By April Pearce, MSU Graduate Student.

Winter Desiccation

The Bridger PMC has received an unusually high number of calls this spring from landowners concerned about the appearance of their conifers. The symptoms they describe are very similar - brown needle tips that look as if they were exposed to severe heat or fire. In nearly all cases, the damage has been the result of winter desiccation. Signs of winter injury, especially desiccation, are common on conifers after a long, dry northern plains winter. Plants exposed to frequent, high winds and/or growing on light-textured (sandy) soils are particularly vulnerable. Desiccation occurs when trees can not maintain adequate levels of tissue moisture to prevent drying out. Desiccation is often misdiagnosed as winter hardiness injury, an inability of the plant to tolerate cold winter temperatures. Although the

symptoms sometimes overlap depending on severity, in general, desiccation of conifers is less severe and shows up as damage to the tips of the foliage. Dormant terminal buds are usually unaffected so new growth emerging in the spring appears healthy. In contrast, insufficient winter hardiness causes branch tip and bud mortality, and in severe cases, the entire plant dies. Terminal buds are often killed or emerging growth appears stunted.

So why the spike in damage last winter? The most plausible explanation is that after several years of drought stress, trees and shrubs are in significant decline, especially those receiving modest or no supplemental irrigation. As the root system is reduced in size and surface absorbing area, it is less able to uptake water and nutrients at a level needed to maintain the aerial portions of the plant. In addition, last winter was more of a "normal" Montana winter with low temperatures, very little snow cover, frequent winds, and deep freezing of the soil profile in many areas.

So what can landowners do to reduce winter desiccation? Any step that improves the water balance of the plant or helps conserve tissue moisture is beneficial. Probably the single, most effective practice is deep fall watering. After conifers reach full fall dormancy, saturate the soil profile periodically until the soil begins to freeze. Modest watering over the winter months when temperatures are above freezing and the soil profile allows infiltration is also helpful. Avoid prolonged pooling of water in the soil around the base of the plant as this can reduce soil aeration, as well as cause frost heaving damage. Mulching 2 to 4 inches deep with bark (use large coarse material in windy locations) around the base of the tree and towards the drip line helps conserve soil moisture. Install wind protectors around seedlings and small trees. Applications of anti-transpirants (anti-desiccants) in the fall may also help reduce evaporative losses from foliage. These waxy emulsions provide a protective coating that helps needles and leaves conserve moisture. These recommendations apply to hardwood (deciduous) species as well. Although winter moisture loss from hardwood plants is less because the foliage is gone, branches still lose a significant amount of moisture during the dormant season.

Joe Scianna, PMC Research Horticulturist

Using Wildland Transplants

We often field questions from landowners, cooperators, and Field Office personnel on using wildland transplants for various conservation practices. For several reasons, wildland transplants are inferior to cultivated bareroot and container stock, and should not be used. There are, however, a few situations when wildland plants can be successfully transplanted, either directly to another field location or to a nursery for cultivation.

Wildland plants, especially large, well-established woody material, are nearly always inferior to cultivated stock. Most wildland plants are found growing under significantly more stress than cultivated plants, an important factor in transplanting success. Limited or excessive water, marginal nutrition, and the presence of insects and disease frequently reduce vigor. The root systems of wildland woody plants are typically long and coarse, with many less fibrous roots captured in the rootball than a comparable cultivated plant. Cultivated plants, in contrast, are usually root-pruned before moving and have relatively large and healthy root systems after transplanting. The root systems of containerized stock remain fully intact, so there is little or no transplanting shock after moving. Wildland plants grown on coarse, well-drained and/or rocky sites are very difficult to transplant with an intact rootball. Plants grown on heavy-textured, poorly drained soils can be unmanageably heavy. The larger the wildland plant, the smaller the transplanted root system relative to the amount of foliage and number of stems, and therefore, the greater the transplanting shock.

There are factors beyond the ability to successfully move a plant to consider as well. Digging wildland plants creates a disturbance that can lead to soil erosion and weed invasion at the original growing site. It may be necessary to replace soil, prepare the site, and sow an appropriate cover crop to stabilize the disturbance and create weed competition from desirable species. Written permission or proper permits should be secured before digging wildland plants on private or public lands. When scouting potential wildland plants, consider the ecological impact on the sampled population. Avoid transplanting from small or unique populations or from transplanting too many plants from a single population. It may be appropriate, however, to transplant wildland seedlings from future mining or construction sites when total loss of the population is inevitable.

There are several steps which can be taken to improve the probability of success using wildland plants. Target small herbaceous plants with fibrous root systems, these plants generally transplant more successfully than larger herbaceous plants and woody species. If possible, culture wildland transplants in a nursery or greenhouse prior to field planting. Another possibility is to irrigate, fertilize, and control insects and disease in the field before transplanting. Avoid transplanting coarse or taprooted species. Reducing the foliage area often helps balance the root:shoot ratio and improve transplanting success, but should only be done as a last resort. Some vigorous sprouting species of trees and shrubs such as willow *Salix*, cottonwood *Populus*, dogwood *Cornus*, alder *Alnus*, snowberry *Symphoricarpos*, silverberry *Elaeagnus commutata*,

Wood's rose *Rosa woodsii*, and chokecherry *Prunus virginiana* transplant well if dormant sprouts are properly transplanted to adequately moist sites, such as riparian areas.

Although it's hard to convince landowners that small, vigorous nursery plants will outgrow a large wildland transplant, that's often the case. Large stressed transplants often languish for years, producing little new annual growth, while cultivated seedlings flourish. Small, nursery-grown bareroot and container stock will often outgrow large wildland transplants in relatively few growing seasons.

Consider these factors when deciding whether or not to use wildland transplants. In most cases, time, labor, and material expenses plus reduced out-planting success will favor cultured plants.

Joe Scianna, PMC Research Horticulturist