The Natural Resources Conservation Service (NRCS) Montana Plant Materials Center (MTPMC) is one of 25 Centers nationwide using plants to solve natural resource problems. These problems include soil erosion and degradation, water quality deterioration, invasive species, native habitat disturbance, mining and logging impacts, wildlife habitat loss, wetlands damage, and other conservation issues. Our work reflects the current needs identified by our field staff in a needs assessment. The development of new conservation technologies, training, plant testing and selection, and Foundation seed production are the primary products of the plant materials program. The MTPMC serves Montana and Wyoming.

This document presents a brief overview of significant Year 2018 activities at the MTPMC and with the Montana-Wyoming Plant Materials program. For detailed information, contact the MTPMC staff or Montana-Wyoming Plant Materials Specialist. All photos in this Progress Report are USDA-NRCS unless noted otherwise.

Although the MTPMC addresses many resource issues, our current program emphasis is in the following areas:

- rangeland health
- cover crops and soil health
- technology transfer, training, and outreach
- pollinator and wildlife-friendly plantings
- woody plant establishment and selection
- native habitat restoration
- critical area revegetation

In 2018, the MTPMC staff, Montana Plant Materials Specialist, and several collaborators focused their efforts on summarizing and posting research findings in the form of final study reports and Technical Notes. The study *Effect of Container Size on the Survival and Growth of Plains Cottonwood Populus deltoides spp. monilifera Seedlings in a Riparian Planting in Eastern Montana*, was a collaborative study with the ARS-Ft. Keogh Livestock and Range Research Laboratory in Miles City Montana. The study compared the performance of seedlings grown in three container sizes, and investigated the effects of planting distance and elevation relative to the river near where they were planted. Although some benefits of deep pots were found, the results suggest that following established planting and maintenance procedures for plains cottonwood is adequate for targeted survival and growth in relevant conservation practices. There was no statistical difference in survival with distance from and elevation.
relative to the river but there was inconsistent but improved height and caliper growth with increasing distance from the river, presumably reflective of soil characteristics. Soil moisture tension data indicated wide differences in tension, and therefore moisture availability, over time. Differences were noted with depth in the soil profile and with distance and elevation from the river. For complete study findings see the final study report results on the MTPMC website.

Two pollinator studies were completed in 2018, including Spring Seeded Native Plants for Enhancing Pollinator Habitat and Dormant Seeded, Pollinator-Friendly Planting. The spring planting tested and compared the establishment of six forbs when grown as single species, in a grass-forb mix, and in alternate-rows of forbs and grasses. All six forb species had acceptable performance in the individual species plots, mixed species, and alternate-row plots. Lewis flax, western yarrow, white prairie clover and prairie coneflower had the greatest plant density in all plots, and black-eyed Susan performed well. For complete study findings see the final study report results on the MTPMC website. The dormant seeded study attempted to identify commercially available, pollinator-friendly forb species that establish well when seeded as a dormant fall planting. Purple coneflower, Maximilian sunflower, and silverleaf phacelia had the best overall performance of the six forb species when planted in individual, mixed, and alternate-row plots. These three species should perform well in dormant fall planted grass/pollinator mixes, although each species had decreased densities when seeded in a mix or alternate-row planting. For complete study findings see the final study report results on the MTPMC website.

In 2018, the MTPMC staff and Plant Materials Specialist continued working collaboratively on cover crop projects, partnering with Montana NRCS agronomists, Montana State University, and participating in Phase II of a national cover crop research study. Montana area agronomist Mark Henning completed final study reports for three cover crop projects he conducted with MTPMC staff in 2016 and 2017. The Evaluation of Cowpea and Mung Bean Varieties study attempted to identify well adapted warm season legumes for use in Montana and Wyoming in dryland cropping systems. Although there was no significant difference in biomass yields, there were significant differences in height and days to 50% flowering. ‘Iron & Clay’ cowpea was the tallest of the six tested varieties, whereas ‘Berken’ mung bean was the shortest. ‘Iron & Clay’ and ‘Black Stallion’ cowpeas never flowered, while the other varieties flowered and produced seed. All varieties exhibited excellent vigor and health, despite poor soil structure and soil compaction, and a lack of nodulation, demonstrating the potential for these species to do well in degraded soil. For complete study findings see the final study report results on the MTPMC website.

The Impact of Legume Seed Rate in Cover Crop Mix on Legume Presence and Production aimed to determine if higher seeding rates of cowpea and mung bean improved their establishment and biomass production in cover crop mixes. These species are used to add plant diversity and provide other benefits such as nitrogen fixation. Cowpea and mung bean were added separately to a six-way warm season cover crop mix at three rates (5, 10, and
20 pounds per acre) and planted under dryland conditions at the MTPMC. There were significant differences in stand count between species and seeding rates. Cowpea, at 20 pounds per acre, had the highest stand count, while mung bean, at 5 pounds per acre, had the lowest stand count. There were some significant differences in legume biomass between treatments. Twenty pounds of cowpea resulted in higher biomass production than 10 pounds of cowpea, as well as 5 and 10 pounds of mung bean. There were no differences among any of the mung bean seeding rates. For complete study findings see the final study report results on the MTPMC website.

The Evaluation of Two Cowpea Varieties in a Cover Crop Mix study was based on earlier results indicating that the variety ‘Red Ripper,’ due to its’ prostrate plant habit, may perform better in mixes than the upright ‘Iron & Clay’ variety, which is commonly used in cover crop mixes. ‘Red Ripper’ and ‘Iron & Clay’ were added separately to a six-way warm season cover crop mix at 20 pounds per acre and seeded in a dryland planting at the MTPMC. There were no significant differences in stand count or biomass between ‘Red Ripper’ and ‘Iron & Clay.’ Relatively poor performance of cowpeas in this experiment was likely due to competition from warm season grasses in the mix, including sorghum-sudangrass, millet, and corn. Although cowpea biomass was a very small percentage of the total cover crop biomass, when cowpea biomass was added to the cover crop mix biomass, there were significant differences in total biomass between treatments, with the ‘Red Ripper’ treatment yielding higher (7514 pounds per acre) than the ‘Iron & Clay’ treatment (5033 pounds per acre). For complete study findings see final study report results on the MTPMC website.

Collaborative efforts at the MTPMC with Dr. Emily Meccage with Montana State University resulted in a final study report and Technical Note summarizing the findings of Seeding Date Impact on Production of Four Perennial Cool-Season Forage Species study. This study evaluated the impact of a delayed seeding date on forage establishment and yield. Two establishment dates were evaluated: early June 2015 (spring planting), and late July 2015 (summer planting). There was a significant impact of seeding date on plant count, with summer plantings having higher plant density compared to spring plantings. There was a trend for an effect of variety on weed count, with summer plantings having higher weed density compared to spring planting. There was no significant impact of seeding date on plant yields the year after establishment, but there was an impact of harvest and variety on plant yields. When water availability is not limiting, summer planting may be a feasible option for perennial forage establishment. For study findings see the final study report and Technical Note on the MTPMC website.
Two new studies were seeded at the MTPMC in 2018. In the first study, Shannon Filbey (Big Sky Watershed Corp intern) and MTPMC staff installed and evaluated Phase II of a nation-wide Plant Materials Program cover crop project testing numerous species and cultivars across the U.S. Eight species represented by 58 varieties, including rye (15), Balansa clover (2), red clover (8), hairy vetch (6), crimson clover (6), Daikon radish (12), black oat (2), and Austrian winter pea (7), were tested at Bridger. In addition to collecting standardized data for the national effort, biomass samples were again collected and weighed in 2018. Results are currently being analyzed and should be available in 2019.

In the second new study in 2018, area agronomist Mark Henning and MTPMC staff installed, evaluated, and sampled a malt barley and cover crop study testing the effects of cover crops on a conventional irrigated malt barley cropping system. The cover crop consisted of a simple 3-way mix of Crimson clover, forage collards, and flax. Although a July hail storm impacted production, preliminary results suggest the cover crop did not negatively impact barley production or quality. Results are currently being analyzed and should be available in 2019.

Field Plantings are an opportunity for Plant Materials staff to collaborate with NRCS field offices on studies or demonstrations to provide information applicable to conservation. Field plantings evaluate new plant species or planting technologies under a variety of soil, climatic, and land uses to assess their conservation potential under actual use conditions. In 2018, we evaluated 13 field plantings in Montana and Wyoming. Field Planting Reports summarize observations and evaluation results and provide useful information on lessons learned for incorporating into future plantings. Check out the 2018 field planting reports online.

Current Montana-Wyoming Plant Materials staff includes Monica Pokorny, Plant Materials Specialist (Bozeman) (monica.pokorny@mt.usda.gov), Joe Scianna, MTPMC manager (joseph.scianna@mt.usda.gov), and Darren Zentner, MTPMC farm foreman (darren.zentner@mt.usda.gov).

Need More Information?

There are several ways to obtain plant materials assistance and information in Montana and Wyoming. Begin by calling your local NRCS field or area offices, or the Plant Materials Specialist in Bozeman, Montana. For project specific, Foundation seed, or other Center information, call (406)-662-3579. MTPMC and Montana-Wyoming Plant Materials program information is available on-line. Access the MTPMC links at the Montana NRCS homepage at http://www.mt.nrcs.usda.gov/ or the national Plant Materials Program website at http://plant-materials.nrcs.usda.gov/.

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