Pollinator Plant Species Recommendations for New Mexico

To enhance pollinator populations, the LLPMC has been conducting field trials to develop recommendations on the plants that will provide the most abundant pollen and nectar for bees and other pollinators throughout the growing season. Advice on suitable pollinator plants is currently developed from broad-based regional guides, with little research-based information on the best choices for New Mexico. The aim of this project is to meet this need by testing a variety of plants (mostly native) for their ability to attract and sustain pollinators and other beneficial insects under New Mexico conditions.

The LLPMC has installed seedlings into a pollinator plant demonstration from 2010 through 2014 to assess native and introduced species for pollinator activity; the combined species (native plus introduced) numbers included 253 herbaceous perennials, 87 annuals and biennials, and 37 shrubs. We have been evaluating these species for pollinator use (abundance and diversity), plant survival, plant vigor, and duration and timing of flowering.

The results of these evaluations have been published in *Plant Materials Technical Note No. 71 (rev.) Revised Pollinator Plant Recommendations for New Mexico*, which will be revised as a final version in 2015 with additional species and information on germination treatments. One aspect of our findings, which might be of particular interest to those selecting pollinator plant species for conservation practices, is the ability of a species to self-sow under irrigated conditions. The following two tables summarize the self–sowing capability of the native species in our recommended list.

Native bee on tanseyleaf tansyaster (*Machaeranthera tanacetifolia*)

Self-seeding annual pollinator plant species in approximate order of self-sowing capability (high to low)

Species Name	Common Name
Lesquerella gordonii	Gordon's bladderpod
Dimorphocarpa wislizeni	touristplant (spectacle pod)
Gaillardia pulchella	firewheel
Machaeranthera tanacetifolia	tanseyleaf tansyaster
Helianthus petiolaris	prairie sunflower
Phacelia integrifolia	gypsum phacelia
Nama hispidum	bristly nama
Baileya multiradiata	desert marigold
Cleome serrulata	Rocky Mountain beeplant
Monarda citriodora	lemon beebalm
Verbesina encelioides	golden crownbeard

Self-seeding herbaceous perennial pollinator plant species in approximate order of self-sowing capability (high to low)

Species Name	Common Name
Gaillardia pinnatifida	red dome blanketflower
Helianthus maximiliani	Maximilian sunflower
Heliomeris multiflora var. multiflora	showy goldeneye
Thelesperma filifolium	stiff greenthread
Ratibida columnifera	mexican hat (brown)
Ratibida columnifera	upright prairie coneflower (yellow)
Argemone pleiacantha	southwestern pricklypoppy
Machaeranthera pinnatifida	lacy tansyaster
Coreopsis lanceolata	lanceleaf tickseed
Monarda fistulosa	wild bergamot
Oligoneuron rigidum	stiff goldenrod
Senecio flaccidus	threadleaf ragwort
Verbena macdougalii	MacDougal verbena
Verbena stricta	hoary verbena
Sphaeralcea laxa	caliche globeallow

Seeding Pollinator Plants under Irrigated Conditions at the LLPMC

Background

The NRCS has emphasized conservation practices to establish pollinator habitat by direct sowing of seed mixes containing species with diverse blooming dates.

In most of the arid and semi-arid Southwest, plantings on non-irrigated sites by broadcasting or drilling seeds are fraught with difficulty due to the low likelihood of precipitation patterns that will allow the establishment of native species.

Methods

We attempted to establish pollinator habitat at the LLPMC in 2014 under irrigated conditions using two different seed mixes:

1. A mix composed of the best pollinator plants from LLPMC evaluations
2. A commercial mix recommended by the Xerces Society (Applewood High Plains Pollinator Mix)

To help overcome the possibility of flood irrigation flows displacing shallowly planted seed, the seeding trials were installed on beds approximately 18" wide (top width) and 7" high to allow the top of the beds to be watered by capillary movement from the flooded furrows. The beds were prepared as follows:

1. Rototilled
2. Fertilized with 50 lb/acre P and K as well as 10 lb/ac N using a side dresser
3. Rototilled again
4. Soil bermed with a border disc
5. Beds formed with a bed maker
6. Beds deep-ripped with a straight shank subsoiler down the middle of each bed
7. Beds firmed and indented using a narrow cultipacker

Seed was broadcast at three estimated seeding rates (30, 60, and 100 seed/ft^2) using par-boiled rice hulls as an inert diluting medium. The seeding was conducted on May 8, 2014 after the last expected date of a hard freeze. After the seed was spread, a tractor-pulled lawn roller (no water weight added) was used to press the seed into the seedbed.

The seeding was flood irrigated on a weekly basis throughout May, June, July, and August except during a period of heavy rains in July. When extreme desiccating conditions were encountered (i.e., hot and/or windy) during May and June, the seedbeds were irrigated with a gentle spray once a week (3 to 4 days after flood irrigation) using a water tank trailer to keep the surface soil moist.

Results

The plots were evaluated in mid-August 2014. Identification of species was possible for a few species, but many seedlings were still too young to distinguish among species. Palmer pigweed (*Amaranthus palmeri*) and stinkgrass (*Eragrostis cilianensis*) were present in all sampling plots, and they had vastly out-competed the seeded species. Due to the extreme variability among random sampling plot counts, it was clear that the only potentially useful information that could be gleaned from the sampling was an indication of which species seem to have emerged best under these conditions. The two following tables list the identifiable species which were most commonly counted in the sampling plots for each seed mix.

List of identifiable pollinator plant species in approximate order of frequency (high to low)

LLPMC Seed Mix	
Species Name	**Common Name**
Dalea candida	white prairie clover
Baileya multiradiata	desert marigold
Gaillardia pulchella	Indian blanket
Thelesperma filifolium	stiff greenthread
Machaeranthera tanacetifolia	tanseyleaf tansyaster
Ratibida columnifera	upright prairie coneflower
Monarda sp.	beebalm sp.
Achillea millefolium	common yarrow
Gaillardia pinnatifida	red dome blanketflower
Heliomeris multiflora var. multiflora	showy goldeneye
Applewood Seed Mix	
Species Name	**Common Name**
Thelesperma filifolium	stiff greenthread
Bouteloua curtipendula	sideoats grama
Linum lewisii	Lewis flax
Dalea purpurea	purple prairie clover
Penstemon angustifolius	broadbeard beardtongue (narrow leaved beardtongue)
Verbesina encelioides	golden crownbeard

Sites with a reliable source of irrigation offer a much better opportunity for establishing pollinator habitat plantings by seeding. However, there are still significant obstacles that can substantially reduce the possibility of establishing pollinator habitat under irrigated conditions. Some of these obstacles include:

Weed Competition

Competition from weeds is common in agricultural settings and can significantly reduce the chances of obtaining a good stand of pollinator plants from seeding. Unless special care has been taken to reduce the weed seed bank in the surface soil well

in advance of planting, this weed competition can result in little or no establishment of the desirable wildflower species. Intensive cultural practice may be required in agricultural soils with large weed seed banks including solarization, steam or hot water sterilization or chemical fumigation.

Timing of Seeding

Spring seeding is recommended in most situations because many of the desired species are summer annuals. In addition, the availability of irrigation water is typically in the spring in most surface-water irrigation districts. Dormant seeding in late fall or winter will be needed for certain species requiring cold stratification unless such species are not included in the seed mix, or it is reasonable for these species to persist in the seed bank from a spring seeding and germinate the following spring. Weather conditions during the spring in the Southwest can pose many impediments to direct seeding including: hot, dry, low humidity, and windy conditions which dry out the surface soil very rapidly; windblown sand abrading newly germinating seedlings; wind erosion causing either the uncovering of seed or the buildup of eolian deposits burying the seed. Extreme temperature fluctuations and late hard frosts can also reduce establishment prospects. These difficulties suggest that seeding after spring winds have subsided might increase establishment probabilities despite the higher temperatures that would generally be encountered. However, seeding in late June or later will necessarily restrict blooming to the late summer and fall during the first growing season.

Seed Displacement by Irrigation Water

Irrigation whether by flood flows or overhead sprinklers can displace surface-applied or slightly buried seed from the seedbed. If broadcast or drilled seed is placed near the soil surface, care should be taken to reduce or prevent seed transfer and the subsequent, possible, concentrated deposition of seed.

Soil Crusting

Soil properties including texture, low organic matter, and sodium content can enhance the chances of soil crusts forming which can restrict the emergence especially of smaller and less vigorous seedlings. These crusts can also reduce infiltration and air exchange between the soil and atmosphere (*USDA-NRCS Soil Quality Indicators: Soil Crusts*). Soil crusting is more common on fine-textured soils, such as silts, loams, and clays.

Conclusions

The consequence of these obstacles is that even with reliable irrigation, wildflower seeding should be considered a practice with a fairly high likelihood of failure under the weather and soil conditions as found at the LLPMC in the spring of 2014. Because of the costs involved for seeding large areas, every precaution should be implemented before and after seeding to ameliorate these potential impediments. The high likelihood of seeding failures precludes recommending this practice under non-irrigated conditions because of the high cost of both native wildflower seed and the seeding operation itself.

Proliferation of Palmer pigweed (*Amaranthus palmeri*) and stinkgrass (*Eragrostis cilianensis*) in pollinator seed mix plots prior to mowing, July 2014

Appearance of LLPMC species mix plot in early October 2014 showing Indian blanket (*Gaillardia pulchella*) and tansyleaf tansyaster (*Machaeranthera tanacetifolia*) in bloom

Soil Health Study Results

In 2013, a soil health study began at the Los Lunas Plant Materials Center (LLPMC). It was planned in collaboration with the New Mexico State Resource Conservationist, the New Mexico State Agronomist, the New Mexico Area Agronomists, and the New Mexico State Water Quality Specialist. The goal was to compare the performance of selected cover crops. The study criteria included ease of establishment, forage nutrition value, and soil health benefits

The study design consisted of a split-plot, randomized, complete-block design with four replications and encompassed approximately 5.0 acres:

- Eight main plots contained the irrigation treatments; either adequate water to prevent wilting, or limited water which measured both the amount of precipitation and irrigation for a combined total of 20 inches.
- Four subplots per main plot contained the cover crop treatments. Each subplot was approximately 16 ft. by 280 ft. (0.10 acre).

The cover crop treatments include a mix of four warm-season species and forage radish (a cool-season species), a barley plot, hairy vetch only plot, and a control plot (a plot left fallow). The seeding rates included the mix at 26 seeds/sq. ft., barley at 13 seeds/sq. ft., and hairy vetch at 9 seeds/sq. ft.

The soil health characteristics that were monitored included soil moisture, soil temperature, soil compaction, soil bulk density, plant cover and plant density.

Irrigation application to the cover crop plots in February 2014

By November of 2013, the cover crops were too sparse and too short to provide adequate soil protection. This condition resulted from seeding in early September instead of in late July or early August, and by seeding at a lower rate instead of the recommended higher rate required to obtain a stand density of 10 plants per sq. ft. (desirable for ground cover on dryland in eastern New Mexico).

In the spring of 2014, soil movement in the study plots quickly became an issue. Damaging winds caused excessive soil erosion, and the insufficient cover could not provide protection. After consulting with all parties participating in the cover crop project, it was decided to plant winter wheat into the plots to protect them from additional wind erosion. The winter wheat was planted into the existing the plots on March 21, 2014. The study has been discontinued.

Assisting the National Park Service

The LLPMC continued interagency agreements for seed and transplant production with the National Park Service (NPS) include the following parks:

- Arches National Park
- Canyonlands National Park
- Glen Canyon National Recreational Area
- Grand Canyon National Park

The original seed collected for both the production fields and vegetative transplants was collected at the individual parks. The intent is to use these plant materials at the parks to restore severely degraded sites such as roadsides, trails, and abandoned historical mine sites.

For the four parks, seed of six native grass species was grown on a total of 7.41 acres. During 2014, the LLPMC grew nine native species for a total of 3,485 transplants for Glen Canyon National Park.

Grand Canyon spike muhly seed production field in September of 2014

Using a vacuum harvest process to harvest seed of the Grand Canyon National Park needleandthread production field in June of 2014

June 2014 photo of the Grand Canyon National Park muttongrass seed production field established in the fall of 2013 by the LLPMC

Cooperative Alfalfa Project

In cooperation with the NRCS Los Lunas Field Office, the NMSU Los Lunas Agricultural Science Center, and a Valencia County landowner/cooperator, the LLPMC initiated a project to determine the drought tolerance of an alfalfa field located in Tomé, New Mexico. This particular alfalfa field had not been irrigation since 2006. In 2012, this situation was brought to the attention of the NRCS Los Lunas Field Office and to Danny Goodson, Agronomist at the LLPMC.

The ability of this alfalfa planting to continue to grow and produce average or above average yields without supplemental irrigation is notable, although sub-irrigation from underground water is a possibility. The absence of irrigation applications to any crop, especially a high-value cash crop like alfalfa, could have a substantial economic impact on alfalfa growers in New Mexico.

Monitoring wells were established in 2013 (*LLPMC 2013 Progress Report of Activities*) and monitored during a 12-month period that ended on June 6, 2014. The wells assisted in the determination whether any fluctuation of the water table had an impact on forage production of the alfalfa, and if water had been available to the plants at all times.

Twelve months of monitoring indicated no substantial fluctuation in the water table depth, especially during the growing season. Underground water would not have been a limitation to any alfalfa forage production. Precipitation data from the weather station located at the New Mexico State University Agricultural Science Center indicated a less than normal amount of moisture for this period. Plant production (as gathered from the producer) noted the alfalfa during the first cutting for 2014 was the same as in 2013.

The LLPMC recommends additional investigation to determine if it may be replicated at another location in the Middle Rio Grande area. Substantial conservation and economic benefits of limited irrigation applications, especially to a high water plant such as alfalfa should be of great interest to producers of this high-value crop. Please contact the LLPMC for additional information regarding this investigation.

Alfalfa drought-tolerance project in Tomé, New Mexico showing water table monitor well installation

'Windbreaker' Big Sacaton Cultivar

In 2014 the Los Lunas Plant Materials Center (LLPMC) produced two technical notes featuring the versatility of using 'Windbreaker' big sacaton (*Sporobolus wrightii*) for conservation of our natural resources both regionally and nationally. *Plant Materials Technical Note No. 72* defines big sacaton forage production as a potential bio-energy source. This species could be added to the list of native grasses being considered in helping to solve energy concerns in the future. *Plant Materials Technical Note No. 73* addresses the use of 'Windbreaker' big sacaton in herbaceous barriers and as vegetative mulch. The use of big sacaton should be considered when planning conservation practices such as windbreaks, shelterbelts, buffers, wildlife habitat improvement, wind and water erosion protection, odor reduction, visual or noise screens and pollinator habitat.

Chinese Agricultural Officials Visit the Los Lunas Plant Materials Center

A delegation of Chinese Agricultural Officials visited the LLPMC in October 2014. Attendees included Rick Strait and Chris Hamilton from the NRCS New Mexico State Office, Danny Goodson and David Dreesen from the LLPMC, and Mark Marsalis from the NMSU Los Lunas Agricultural Science Center (ASC). A tour of the LLPMC and ASC highlighted NRCS and ASC projects currently being conducted at the center which included:

- Pollinator species trial
- Greenhouse propagation
- Agronomic trials
- Seed processing operation
- Seed production

Chinese Agricultural Officials with Rick Strait (left) and Mark Marsalis (red cap) touring the Los Lunas Plant Materials and the NMSU Agricultural Science Center in October 2014

Welcome Our New PMC Manager, Bernadette Cooney

Please welcome Bernadette Cooney, Manager of the Los Lunas Plant Materials Center, who joined our team on December 1, 2014.

Bernadette's Note to Field Offices

The Los Lunas Plant Materials Center is here to assist you with customer and conservation needs. We welcome your ideas, questions, resource challenges, or any other issues that may arise. Please feel free to contact me at any time either by phone (505) 865-4684 or by e-mail: bernadette.cooney@nm.usda.gov. Together we can accomplish greater success.

Selected LLPMC Publications

The following LLPMC publications may be of interest:

- *'Windbreaker' Big Sacaton (Sporobolus Wrightii) A Bio-Energy Forage Source* (Technical Note No. 72)
- *'Windbreaker' Big Sacaton (Sporobolus Wrightii) for Use in Herbaceous Barriers and as Vegetative Mulch* (Technical Note No. 73)
- *Pollinator Plant Recommendations for New Mexico* (Revised Technical Note No.71)
- *Pocket Guide to Beneficial Insects of New Mexico* (Miscellaneous Technical Article)
- *Pocket Guide to Native Bees of New Mexico* (Miscellaneous Technical Article)
- *'Windbreaker' Cultivar Big Sacaton: A Foundation Class of Certified Seed* (Refereed Journal Article)
- *Deep-Planting of Longstem Native Riparian Shrubs* (Published Abstract)

Technical notes can be found at the website http://plant-materials.nrcs.usda.gov/nmpmc/publication.html or on the New Mexico Natural Resources Conservation Service website at http:/www.nm.nrcs.usda.gov/