BOARD OF WATER AND SOIL RESOURCES

Pollinator Habitat

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Document Purpose – This fact sheet is a companion to BWSR's Native Vegetation Establishment and Enhancement Guidelines and provides detailed considerations for project planning and design with an emphasis on vegetation selection, installation and management.

Introduction – Each year native and domesticated bees pollinate around 30% of crops in the United States with a value of approximately $23 billion. They also pollinate around 70-80 percent of flowering plants in the Midwest, playing a key role in their seed production. Native bee populations, which include more than 4,000 species in North America, have declined in recent years due to habitat loss and pesticide use among other factors. Populations of Minnesota's state bee, the Rusty patched bumblebee have declined around 80% over twenty years.

Site Selection – Adequate food, shelter, and nesting sites are all needed to support healthy pollinator populations. The following are key considerations for selecting areas for pollinators:

1) Look for areas away from pesticide and fungicide use, as well as areas that lack widespread disturbances that may impact pollinators.
2) Habitat complexes and corridors provide "safe zones" and natural passageways for pollinators, as well as nesting and forage sites, and sources of water.
3) Some bees have a relatively small flight distance and benefit from having water and food sources within 200 feet of nesting sites.
4) Ground nesting bees benefit from clump-forming native grasses. Bees that nest in tree and stem cavities benefit from farm hedgerows, windbreaks and tree lines, as well as man-made nest structures. As a general rule, plant communities that historically existed at a site will provide the most beneficial nesting habitat.

A native fly pollinating an aster

Habitat complexes and corridors are important nesting and food sources for pollinators.

General Planning Considerations – While honeybees and bumble bees are the most commonly known pollinators, they only make up about 2% of bee species in Minnesota. The remaining species are solitary bees that do not live in colony systems like Honey or Bumble bees (with division of labor and cooperative rearing of young). Supporting native solitary bee habitat is important, as their populations are also in decline. Pay attention to the various pollinators and their habitat needs in the landscape to help protect and enhance and expand their existing habitat.

Bees pollinating Marsh Milkweed

Other pollinators of concern include beetles such as the Longhorned beetle, flies such as the Syrphid fly, moths and butterflies. It is estimated that US butterfly populations have decreased around 20% over the last twenty years. Many of these pollinators have their own unique habits and needs, for

example, many moths tend to pollinate white or dull colored blossoms that flower at night. Some pollinator species are dependent on certain plant species for the completion of their lifecycle, such as Monarch butterflies' dependence on milkweed and the endangered Karner Blue butterflies' need for Wild Lupine. By establishing native flowering vegetation, one can support the intricate relationships forged between native pollinators and native vegetation and keep both populations healthy.

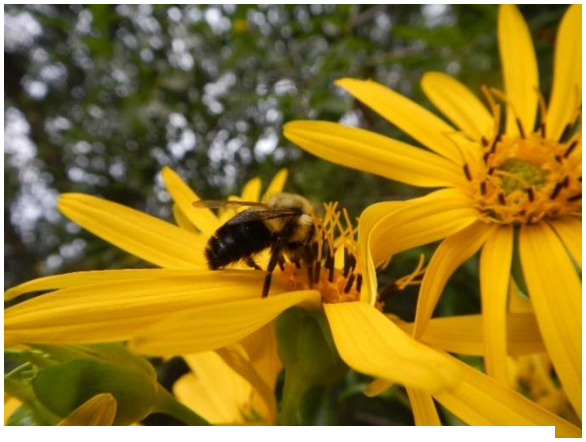
State legislation from 2013 states that "prairie restorations conducted on state lands or with state funds must include an appropriate diversity of native species selected to provide habitat for pollinators throughout the growing season".

Structural Design Considerations – In some cases ground nesting bees nest in dry hillsides with sparse vegetation. Side slopes of wetland embankments, stormwater ponds and raingardens can provide high quality habitat.

Plant and Seed Selection – Seed mixes for pollinators should include at least twenty-five species and have a high percentage of forbs (30-60% by seed count). At least 30% forbs is recommended for large acreage areas (over 50 acres) and at least 50% forbs is recommended for pollinator zones/plots of a few acres in size.

- Grasses are also important for community structure, nesting sites and to provide fuel for prescribed burning. Some butterflies also use grasses as a larval food source. Shorter grasses can benefit forb growth and pollinator use.
- It is recommended to include at least three flowering species in each bloom period so there is a continuous food source throughout the season (few early blooming species are typically included in mixes). It is also helpful to plant forbs in masses to make them easier for pollinators to find and to increase foraging efficiency. Including a wide range of flower colors and shapes will benefit a variety of pollinator species.
- Annual species that commonly establish from native seedbanks, such as jewelweed, fleabane, beggarticks and smartweeds, also provide important pollinator habitat. These species, along with annual cover crops, can often effectively compete with weeds and stabilize sites prior to the installation of seed mixes.
- In addition to herbaceous plants, flowering trees and shrubs can be an important source of pollen and nectar for pollinators, particularly early in the spring. Avoid clearing fallen or dead trees (unless the trees are inhibiting the use of ground nesting prairie bird species), as they help create nesting sites for a wide range of pollinators.

Plant species can be selected for projects to support specific insects, such as planting milkweed species for monarchs (and a variety of pollinators), lupine for Karner Blue Butterfly, or basswood for a variety of bee species. The following are key pollen and nectar sources for pollinators in the spring, summer and fall. Species should be selected that are native to the area and well adapted to site conditions.



Bumble bee on Cup plant

Commonly Used Native Species in Pollinator Projects

Spring:	Willows, Basswood, Dogwoods, Viburnums, Juneberries, Plums, Cherries, Blueberry, Lupine, Bloodroot, Buttercups, Dutchman's breeches, Columbine, Virginia bluebells, Spiderwort, Lobelias, Golden alexanders
Summer:	Buttonbush, Dogwoods, False indigo, New Jersey tea, Wild rose, Prairie clovers, Milkweed, Wild bergamot, Giant hyssop, Penstemons, Bush clovers, Canada milkvetch, Culver's root, Hedge nettle, Evening primrose, Ironweed, Leadplant, Coreopsis, Canada tick trefoil, Lobelias, Obedient plant, Turtlehead, Mountain mint, Partridge pea, Yellow coneflower, Cup plant, Joe-pye weed and Blazing stars.
Fall:	Asters, Sneezeweed, Grass-leaved goldenrod, Gentian, Boneset, Goldenrods, Sunflowers

Plant Source Considerations – Local seed and plant sources are recommended for pollinator habitat projects to protect nearby native prairie populations and to provide plant species that have flower characteristics and bloom times that are compatible with local insect populations. **It is important that plants are purchased from nurseries that do not use pesticides as part of their production process.**

Wild bergamot in a conservation planting

Vegetation Establishment – Thorough weed control is essential prior to establishing pollinator habitat. In many cases, projects are seeded into fields that were previously in soybeans or corn, as agricultural production can help ensure that weeds are sufficiently controlled. However, these areas may have agricultural chemicals in the soil. It is important that pesticides (such as neonicotinoids) that persist in the soil were not used prior to planting, as they can be taken up into plant tissues and affect pollinators. Individual pesticides should be investigated to determine their persistence in the soil. If chemicals have been used it is recommended to crop without chemicals for a year or two or to plant a temporary cover crop such as oats for at least a year.

Whenever possible organic site preparation methods should be used. A Xerces Society guide has been developed on this topic to guide pollinator projects. When converting pastures or fields dominated with perennial weeds such as smooth brome grass, quack grass, reed canary grass and Canada thistle, project partners should discuss different site preparation strategies that can be used. In some cases herbicide application and tilling may be needed to achieve sufficient control of large areas of aggressive species prior to planting. In residential yards it is recommended to cut away the sod prior to planting seed to remove weed roots and weed seeds; or use cardboard and wood chips to suppress grasses.

Beyond bees, many other insects, like this sand wasp, are useful pollinators

Drill or broadcast seeding of pollinator mixes is often conducted in the fall to allow forbs to naturally stratify over winter and compete with grasses in the spring. Some forbs that are important for pollinators such as sneezeweed, Dutchman's breeches, bugleweed, wild bergamot, evening primrose, smooth blue aster, mountain mint and aromatic aster do not require pre-stratification and can be successfully seeded in the spring. If broadcasting seed, an exposed seedbed must be prepared (seeding is not successful into

woodchips or dead sod). Light raking and/or rolling can be used after broadcast seeding to help ensure good seed to soil contact and prevent the loss of seed from wind and birds.

Operations and Maintenance – The maintenance of pollinator plantings can be challenging due to the high forb diversity and difficulty of removing weeds such as thistles without harming native plants or pollinators. Key steps for the maintenance of pollinator plantings involve:

- Mowing annual and biennial weeds to 5-8 inches as needed during the first one to two years of establishment provides sunlight and decreases competition for seedlings. After the site is established mowing can be used to help control noxious weeds. Spot mowing is recommended to maintain insect refugia and vegetative cover should be maintained into the fall for overwintering habitat.
- Hand pulling of weeds is an effective strategy for smaller plantings. This is often most effective after rainfall when weeds are easier to pull.
- Prescribed burning is often initiated after the third year and can help to maintain diversity and to control woody species. Burning should only be conducted on 1/4-1/2 of large sites each year to minimize impact on insects, and patchy burns are ideal to provide areas of refuge. Burns are often conducted in the fall or early spring to promote floral diversity and minimize impact to pollinators.
- Conservation grazing following grazing plans can be used to reduce the percent of cool-season grasses in conservation plantings and promote floral diversity. Separate grazing units are often needed to effectively manage the timing and duration of grazing.

Early spring prescribed burn

- Biocontrol of invasive species may also be a long-term maintenance strategy to minimize herbicide use and control weeds. Biocontrols are available for leafy spurge, spotted knapweed, purple loosestrife and Canada thistle.
- When herbicides will be used for management it is important that target species (such as Canada thistle or wild parsnip) are not in bloom when they are sprayed and that spot herbicide application is conducted rather than broadcast spraying. Herbicide spraying is typically not conducted the first or second year after planting, as it can damage native plant seedlings.

Information Sources

BWSR Pollinator and Biodiversity Toolbox
Minnesota NRCS Pollinator Conservation Planning Documents
Pollinators and Roadsides, Roadside Management for Bees and Butterflies
Conserving Bumblebees

A native bee collecting nectar from obedient plant