CONSERVATION BIOCONTROL ON FARMS IN THE UPPER MIDWEST

Beetle Banks for Beneficial Insects



Beetle banks such as the one being planted in the central photo provide habitat that supports populations of ground beetles and other predators of crop pests. (Photos LEFT TO RIGHT*—Xerces Society / Sarah Foltz Jordan; Xerces Society / Sarah Nizzi; Jonathan Lundgren, USDA-ARS.)*

Beetle banks, linear strips of perennial native bunch grasses usually planted on a berm within or adjacent to fields, are a tool to support biological pest control on farms and promote movement of beneficial insects into the crops. The grasses provide overwintering shelter for a diversity of predatory invertebrates, especially ground beetles that contribute to the suppression of crop pests such as aphids, slugs, snails, caterpillars, and the larvae of herbivorous beetles like Colorado potato beetles. This guide will help with planning beetle bank installations.

Considerations for Beetle Bank Design

PLACEMENT: Beetle banks are intended to be long-term habitat within crop fields. As such, the placement and configuration of a beetle bank must be carefully considered with regard to any cropping system constraints. Avoid areas with pesticide exposure (aerial applications, within row applications, and treated crop seed), and consider pest management needs of future crop rotations. Ground beetles reproduce slowly and many types of insecticides will reduce their populations and ability to provide pest control. Well-drained soils are important for many ground beetles; avoid poorly drained areas.

SIZE: The size of the beetle bank will depend on the cropping system, space available and other factors. Length typically matches field length, while width may vary from about three feet or more.

SITE PREPARATION: Before planting, it is important to remove existing vegetation, particularly weeds, that could compete with newly installed plants. Proper site preparation will decrease the need for extensive maintenance of the banks. See **Additional Resources** below for sources of detailed guidance on site preparation methods.

Beetle banks may be installed without berming (creating an embankment) if soils are well drained, but creating a berm is recommended because it helps make the habitat warmer and drier earlier in the season to foster ground beetle activity. Berming should be done prior to site preparation by plowing two reverse furrows side-by-side or using a bed shaper. Once berming is

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complete, prevent weed growth through smother cropping (e.g., buckwheat), solarization, flame weeding, or herbicides. Tillage will not be an applicable site preparation method for bermed beetle banks, but may be successfully used on sites without a berm.

Plant Selection: Beetle banks are predominantly planted with short-statured (12–48 inches tall) native bunch grasses; avoid sod-forming grasses. Depending on the width of the beetle bank, a mixture of short- and tall-statured (over 48 inches tall) plants can be used, but consider that taller plants have the potential to shade out or flop over into adjacent crops or alleys for equipment, particularly with narrow plantings.

Beetle banks may also include a wildflower component if desired. Flowers support additional beneficial insects for pest control, like hover flies and parasitic wasps, and also pollinators. The ratio of grasses to flowers will depend on the objectives for the planting. For example, if nectar and pollen sources are limited on the farm, a stronger wildflower component (e.g., 30–40% of the final cover) may be prioritized. See **Table 1** for plants appropriate for beetle banks in the Upper Midwest.

When to Plant: The timing of planting is determined by the plant propagation material used (i.e., direct seeding or transplanting plugs). Direct seeding is best done during the dormant season (November–March); spring seedings can also be successful, however. Plugs are best transplanted in late spring (May–June) or late summer/early autumn (September).

Management: Management will be ongoing throughout the lifespan of the planting. Monitor plantings on a regular basis and pull or spot spray woody or herbaceous weeds at first detection. Beetle banks planted with seed will need to be kept short (mow or string trim) during the first year to control weeds and help native seedlings establish. Once habitat is established, mow, string trim, or burn every 4–6 years. Timing may depend on the presence and type of weed pressure. Leave refugia areas by only disturbing one-third of the habitat each year and rotating where the disturbance happens from year to year.

Advantages and Disadvantages of Transplanting Plugs Compared to Direct Seeding

Advantages

- Less weed control is needed prior to and following planting, since transplants are more mature and have a competitive advantage.
- Transplants are quicker to bloom, often flowering in the first year of the project.

Disadvantages

- Only suitable for small areas (one-tenth of an acre = 4,000 plants).
- More labor intensive.
- May require irrigation.
- Plant materials are more expensive.

Prairie dropseed (*Sporobolus heterolepis* [L]) and little bluestem (*Schizachyrium scoparium* [R]) are recommended grass species for beetle banks. (Photos: L—Joshua Mayer, Flickr [CC BY-SA 2.0]; R—Tom Potterfield, Flickr [CC BY-NC-SA 2.0].)

Table 1. Native Plants of the Upper Midwest Suitable for Beetle Banks

Match native species to the site's soil and drainage conditions. If flowers are included, select a variety of native species to ensure blooming begins early in the spring and lasts through the fall. Include species from a diversity of plant families and genera to support a wider range of insects. Consider adding host plants to benefit specialist moths and butterflies, like milkweed for monarch caterpillars.

NATIVE GRASSES AND SEDGES	SOIL MOISTURE[1]	HEIGHT[2]
***Carex* spp. (sedge)**	MW, M, MD, D	Short
***Koeleria macrantha* (prairie June grass)**	MD, D	Short
***Sporobolus* spp. (prairie dropseed and others)**	M, MD, D	Short
***Schizachyrium scoparium* (little bluestem)**	M, MD, D	Short
***Andropogon gerardii* (big bluestem) ***	MW, M, MD, D	Tall
***Elymus* spp. (wild rye)**	W, MW, M, MD, D	Tall
***Sorghastrum nutans* (Indiangrass) ***	MW, M, DM, D	Tall

NATIVE WILDFLOWERS	SOIL MOISTURE[1]	HEIGHT[2]
***Dalea* spp. (prairie clover)**	M, MD, D	Short
***Tradescantia* spp. (spiderwort)**	M, MD, D	Short
***Achillea millefolium* (yarrow)**	MW, M, MD, D	Short
***Coreopsis palmata* (prairie coreopsis)**	M, MD, D	Short
***Zizia aurea* (golden Alexanders)**	MW, M, MD	Short
***Pycnanthemum* spp. (mountain mint)**	W, MW, M, MD	Short
***Baptisia* spp. (cream indigo and others)**	M, MD, D	Short/tall
***Asclepias* spp. (milkweed)**	MW, M, MD, D	Short/tall
***Verbena* spp. (vervain)**	MW, M, MD, D	Short/tall
***Echinacea* spp. (coneflower)**	MW, M, MD, D	Short/tall
***Solidago speciosa* (showy goldenrod)**	M, MD, D	Tall
***Veronicastrum virginicum* (Culver's root)**	MW, M, MD	Tall
***Eryngium yuccifolium* (rattlesnake master)**	MW, M, MD	Tall
***Monarda* spp. (bee balm, spotted bee balm)**	MW, M, MD, D	Tall

1. SOIL MOISTURE: W = wet; MW = medium wet; M = medium; MD = medium dry; D = dry
2. HEIGHT: Short = 12–48 inches; Tall = 48 inches or more

* Grass species that if planted at high density can be aggressive and outcompete other native grasses and forbs

Additional Resources

- *Farming with Native Beneficial Insects: Ecological Pest Control Solutions* (Xerces Society)
  xerces.org/publications/books/farming-with-native-beneficial-insects
- *Habitat Planning for Beneficial Insects: Guidelines for Conservation Biological Control* (Xerces Society)
  xerces.org/publications/guidelines/habitat-planning-for-beneficial-insects
- *Organic Site Preparation for Wildflower Establishment* (Xerces Society)
  xerces.org/publications/guidelines/organic-site-preparation-for-wildflower-establishment
- *Upper Midwest Pollinator Meadow: Habitat Installation Guide* (Xerces Society)
  xerces.org/publications/higs/upper-midwest-pollinator-meadow
- Conservation Biological Control links and resources (Xerces Society)
  xerces.org/pesticides/ecological-pest-management/conservation-biological-control
- *Wildflowers for Beneficial Insects: A Guide for Fruit and Vegetable Growers* (Marion County SWCD)
  marionswcd.org/wp-content/uploads/MarionCountySWCD-Wildflowers-for-Beneficial-Insects.pdf

A beetle bank has been planted along the edge of this field on an urban farm in Iowa. (Photo: Xerces Society / Sarah Nizzi.)

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