

CONSERVATION BUFFERS AND BENEFICIAL INSECTS, MITES & SPIDERS

CONSERVATION INFORMATION SHEET

AGRONOMY SERIES March 1998



Natural Resources Conservation Service

Michigan



Wasp parasite of European corn borer



Predaceous ground beetles

What are Conservation Buffers?

Conservation buffers are areas or strips of permanent vegetation planted and maintained along streams, ditches, field borders or within fields. Buffers trap blowing soil particles and reduce runoff of soil, chemicals and other pollutants. Common types include riparian buffers, filter strips, grassed waterways, shelter belts, field windbreaks, living snow fences, contour grass strips, cross-wind trap strips or shallow water areas for wildlife. In addition to their soil and water conservation benefits, conservation buffers can help farmers by providing habitat for beneficial insects, mites and spiders.

What are Beneficial Insects, Mites And Spiders?

Beneficial insects, mites and spiders include species that are predators or parasites (i.e. natural enemies) of insect pests. Beneficials also include species that eat weed seeds and seedlings and may help reduce the soil seedbank and risk of weed infestations. Lady beetles, lacewings, and spiders are among some of

the best known beneficials but there are hundreds of other important species. Many wasps, flies, true bugs and beetles prey on insects or kill them as lethal parasites. Feeding on weed seeds is common for many beetles, crickets and true bugs.

Where to Get More Assistance

Additional local assistance may be obtained from the local office of a Michigan Conservation District or the USDA Natural Resources Conservation Service (NRCS) office at:

How Can Conservation Buffers Help Beneficials?

Many beneficial arthropods are unable to exist year-round in intensively managed crop fields. Disturbance by tillage, planting, pesticides and harvest disrupt the life cycle of these beneficials,

killing them or reducing their effectiveness. Because conservation buffers are not disturbed as frequently as the crop fields, they can provide refuges which are critical to the survival of beneficial arthropods. Conservation buffers can be vital as overwintering areas, refuges from pesticide applications, and as sources of alternate food and prey. In turn, beneficials frequently move into croplands from these refuges after a disturbance.

Conservation Buffers and Ground Beetles: An Example.

Ground beetles are common predators of insects and weed seeds in many agricultural crops. It has been estimated that ground beetles in numbers commonly found in midwestern U.S. crop fields can remove up to 4000 cutworms/acre/day and as many as 40 weed seeds per square foot/day. Conservation buffers may increase this impact by providing habitats that support larger ground beetle populations.

Research has shown that in agricultural landscapes, less-disturbed areas such as pastures, fencerows and filter strips harbor more ground beetles than the adjacent crops. A recent Michigan study showed that greater numbers and more species of ground beetles live in switchgrass filter strips, and legume-grass strips than in the center of an adjacent soybean field. Weed seed removal by ground beetles was also greater in filter strips than in the soybean field.

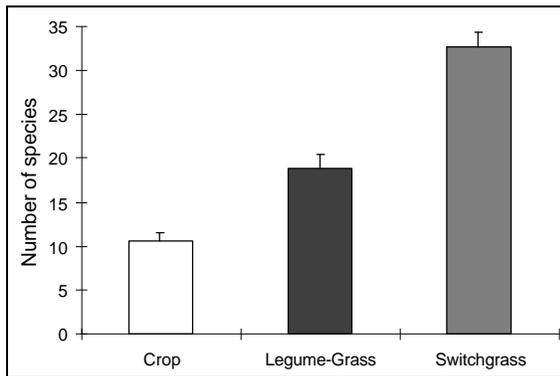


Figure 1. Average number of ground beetle species captured in crop and filter strip habitats, Midland Co., Michigan. Menalled & Landis 1997.

By providing areas where these natural enemies can flourish, conservation buffers may contribute to fewer pests within the field

Several studies have shown that the presence of nearby refuges is important for ground beetles to colonize crop fields after a disturbance. In one

European study, grass strips (similar to cross wind trap strips) harbored over 1000 predatory beetles per square meter, and small grain fields with grass strips in them suffered less aphid damage than those without grass strips. Additional research is on-going to help quantify the benefit of buffers to beneficial insects, mites and spiders and their effect on crop pests.

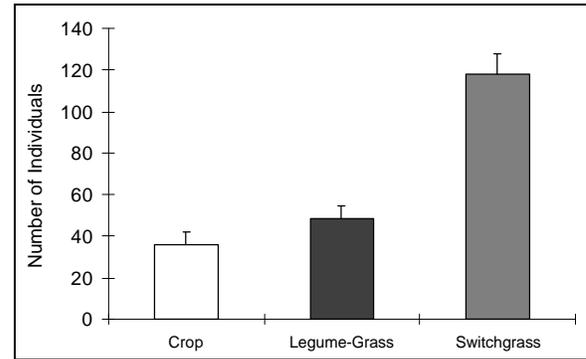


Figure 2. Average number of ground beetle individuals captured in crop and filter strip habitats, Midland Co., Michigan. Menalled & Landis 1997.

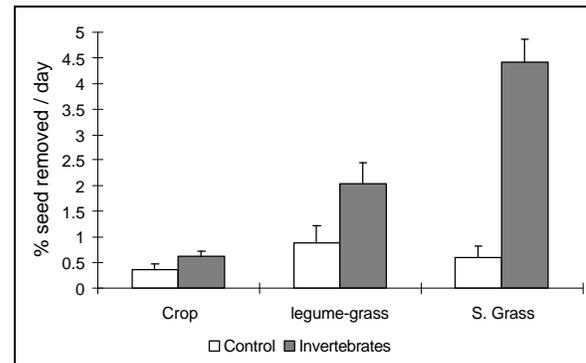


Figure 3. Predation of foxtail seeds by invertebrates in crop and filter strip habitats, Midland Co., Michigan. Fifty seeds per sample were left in the field for one week. Menalled & Landis 1997.

Design Criteria

Frequency of disturbance: To enhance beneficials, disturbance of buffers should be minimized. After establishment of the buffers, best results occur when mowing, fertilization or pesticide applications are limited to once in every two to three years. This will give the community of beneficials the best chance to establish and build up to effective levels. If there is a need to mow, control weeds or renovate the buffer, consideration should be given to leaving as much of the area as possible undisturbed.

Period of vegetative cover: Many beneficials need plant cover in the fall, winter and spring to overwinter, breed and get an early start in the spring. Buffers should maintain plant cover during these times to provide habitat for beneficials when it may be lacking in annual crop fields.

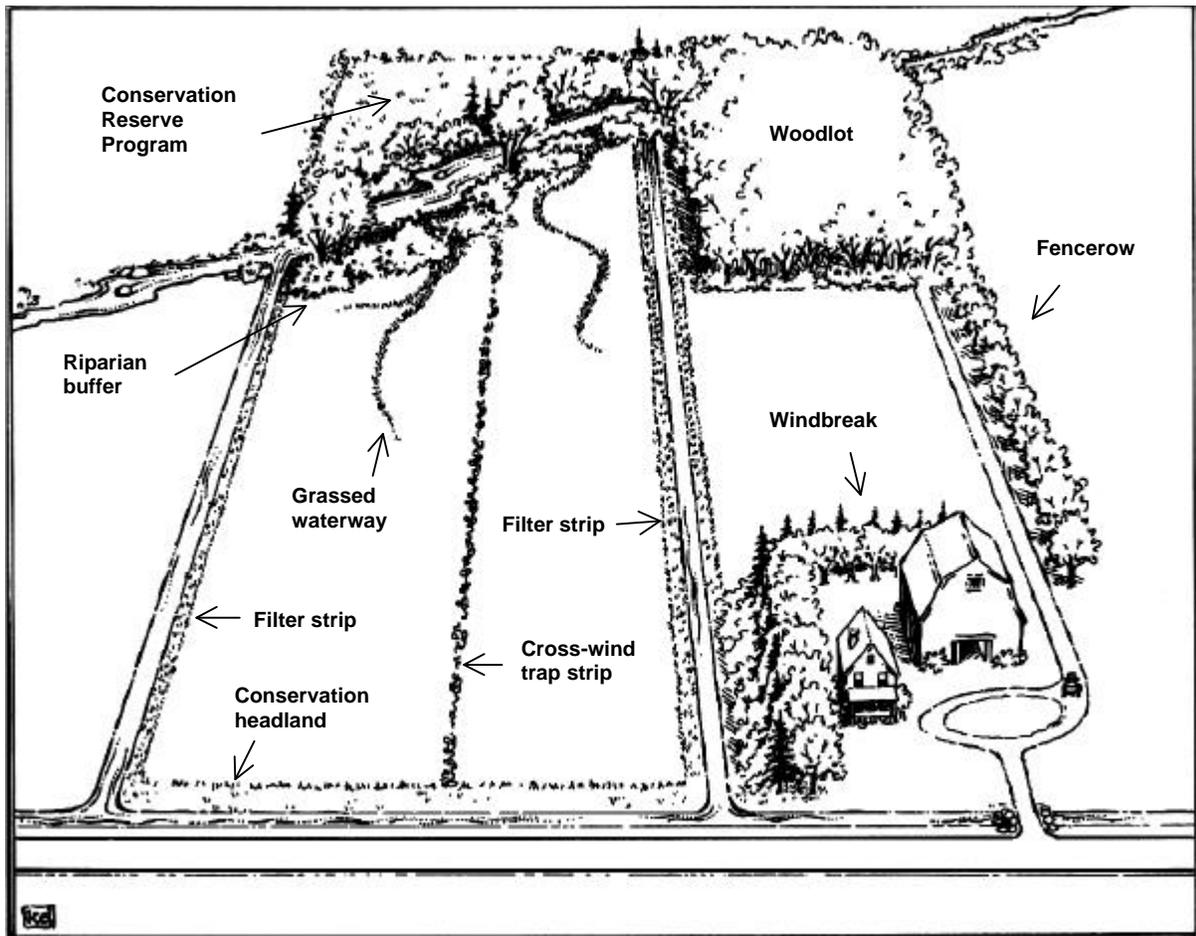
Plant species to establish: Because beneficial species may require very different resources, a diversity of plant species is generally better than a single species. Bunch grasses such as switchgrass and orchardgrass appear to provide better habitat for many beneficials than sod forming grasses. Inclusion of legumes and perennial flowering plants is considered important for providing pollen and nectar for many beneficials. Seed mixtures or adjacent strips of differing species can be used to create plant diversity.

Size and Arrangement: Little research has been done to identify the best physical arrangement of buffers for beneficials, but some general patterns can be suggested. Start with existing habitats such as

woodlots, fencerows, and roadside ditches, and consider how they can be enlarged and/or linked. Larger buffers should be linked together by smaller ones to provide a network of habitats. Breaking up large fields with buffers that do not restrict machinery (grass waterways, cross-wind trap strips, contour buffer strips) can help beneficials colonize field centers more rapidly and provide better pest control. Any buffer width based on soil conservation considerations will improve habitat for beneficials. Even small buffers are better than none at all for beneficial insects, mites and spiders.

For More Information:

Additional information about beneficial insects, mites and spiders, and biological control may be obtained from the World Wide Web at <http://www.ent.msu.edu/biocontrol/>, and at <http://www.mi.nrcs.usda.gov>



Farm showing integration of many types of conservation buffers to maximize benefits to beneficials and enhance soil and water conservation.

This Conservation Information Sheet

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Reference/File Indexes

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References:

- North Central Regional Extension Bulletin No. 481
Biological Control of Insects and Mites
- Michigan State University Extension Bulletin E-2453
Biological Control of Insects
- Michigan State University Extension Bulletin E-2646
Michigan Field Crop Ecology
- USDA NRCS (MI) Conservation Practice Associations:
 - # 380 Windbreak/Shelterbelt
 - # 386 Field Border
 - # 391 Riparian Forest Buffer
 - # 393 Filter Strip
 - # 589C Cross Wind Trap Strips
- USDA NRCS (MI) Associated Conservation Sheets:
 - Cross Wind Trap Filter Strip for Wildlife
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