

Plant Enhancement Activity – PLT08 – Habitat development for beneficial insects for pest management



Enhancement Description

Establishment of habitat to attract and support populations of beneficial insects that provide natural suppress of undesirable insects or other pests. Beneficial insects used for pest management include insect arthropod, predators and parasitoids. Habitat requirements include shelter and food that attract and support beneficial insects. These can include trap crops and insectary strips (both permanent and annual.)

Land Use Applicability

Cropland, including orchards and vineyards

Benefits

Environmental benefits will be operation specific. Benefits may include but are not limited to improved water quality through a reduction in the amount and type of pesticides used, reduced risk of chemical residue on farm products and less exposure of farm worker to pesticides. Increase in habitat for beneficial organisms will also provide food and shelter for pollinators and other wildlife species creating a more biologically diverse farm.

Criteria

Planning Criteria (based on information available through the state land grant university or other known reputable sources such as “Appropriate Technology Transfer for Rural Areas (ATTRA)

1. Identify pest species and associated beneficial insects targeted for control
2. Inventory existing conditions on the farm to determine habitat needs of selected beneficial, include:
 - a. Permanent insectary sites
 - b. Augmentation of existing hedgerows, field borders or other odd areas adjacent to fields
 - c. Trap crop areas
3. Plant selection matched to attract identified beneficial insect
4. Amount of habitat required based on the beneficial insect dispersal ability and can be either annual or perennial cover
5. Lists of plants suitable for beneficial insect habitat will be developed by NRCS at the state level. The lists must emphasize as many native species as practical.

Planting Criteria

1. Site selection should consider existing weed pressures and available methods of control, delay planting if weed pressure requires excessive treatment



2. Site preparation and plant establishment shall be accomplished according to the appropriate NRCS conservation practice and specifications
3. Successful establishment is determined by comparing field conditions with published plant density recommendations for the species for the region

Operation and Maintenance

1. Management and/or maintenance activities such as mowing, haying, burning, or grazing must be conducted outside of the growing season or bloom period. Maintenance should be done on less than 1/3 of the acreage during any given year.
2. Insecticides and herbicides should not be used in the habitat planting area. Even non-synthetic herbicides and botanical insecticides can harm beneficial insects. If adjacent crop areas are treated use one or more of the following actions to limit insecticides in the pollinator habitat area:
 3. Create insecticide free buffers in the first 25 feet of crop area,
 4. Use application methods that minimize drift to the adjacent habitat,
 5. The planted habitat areas must be regularly inspected for invasive and/or noxious plants or other plants that may compromise the purpose of this enhancement. Undesirable species should be controlled using the method least damaging method.
6. If habitat is part of an organic farming operation, only materials allowed according to the USDA National Organic Program's National List of Allowed and Prohibited Substances may be used.

Documentation Requirements

Written plan documenting:

1. Targeted pest with associated beneficial insects
2. A map showing the location and dimension of the beneficial habitat areas.
3. A list of beneficial insect habitat species planted.
4. List of maintenance activities carried out

PLANT ENHANCEMENT ACTIVITY

PLT08 – OR *Establish Beneficial Insect Habitat*

Oregon Supplemental Criteria for *Establishing Beneficial Organism Habitat*

Pollinator habitat areas will be at least ½ acre in size for each 40 acres of orchard or vineyard.

Planning Criteria

Identify pest species and associated beneficial insects targeted for control – refer to Appendix A and to Oregon Plant Materials Technical Note #13 for greater details on developing beneficial insect habitat ftp://ftp-fc.sc.egov.usda.gov/OR/Technical_Notes/Plant%20Materials/PMC13.pdf

Your planting plan should emphasize as many native species as practical. Please Refer to Oregon Plant Materials Technical Note #13 for greater details on developing beneficial insect habitat ftp://ftp-fc.sc.egov.usda.gov/OR/Technical_Notes/Plant%20Materials/PMC13.pdf and references included there. For eastern Oregon, also refer to Idaho Plant Material Technical Note #2, “Plants for Pollinators in the Intermountain West” <ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/pollinators07.pdf> .

Conservation Practices

Many existing conservation practices may be used to implement and/or manage habitat for beneficial insects. Table 1 lists some of the most appropriate practices.

Table 1: Conservation practices that may be used to provide beneficial insect habitat

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|-----------------------------|--|
| • Filter Strip | • Tree/Shrub Establishment |
| • Conservation Cover | • Hedgerow Planting |
| • Critical Area Planting | • Windbreak/Shelterbelt Establishment |
| • Field Border | • Restoration and Management of Rare or Declining Habitats |
| • Riparian Herbaceous Cover | • Upland Wildlife Habitat Management |

Planting Criteria

Site preparation and plant establishment shall be accomplished according to the appropriate NRCS conservation practice and specifications (see list of potential practices in Table 1.).

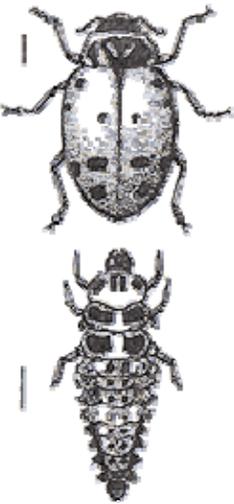
Shrubs, forbs, legumes, and grasses shall be planted in mixes (not all of these may be appropriate in all situations depending on the crops being grown) to promote a diversity of flowering plants over the growing season and provide habitat for beneficial insects, especially the predators and parasitoids of crop pests. Special care may be taken to establish plantings that complement the bloom period and expected pest-control benefits for adjacent crops.

Appendix A.

Attached here is a resource from: Farmscaping to enhance biological control. 2000. Appropriate Technology for Rural Areas (ATTRA): <http://attra.ncat.org/attra-pub/PDF/farmscaping.pdf>

This is provided to help determine beneficial insects to attract and the species of plants that will help attract them.

Plants that Attract Beneficials (A1)		
Beneficial	Pests	How to attract/conserves
<p>Aphid midge (<i>Aphidoletes aphidimyza</i>)</p> <p>(Larvae are aphid predators)</p>	Aphid	Dill, mustard, thyme, sweet clover; Shelter garden from strong winds; Provide water in a pan filled with gravel (A2).
<p>Aphid parasites (<i>Aphidius matricariae</i> and others)</p>	Aphid	Nectar-rich plants with small flowers (anise, caraway, dill, parsley, mustard family, white clover, Queen Anne's lace, yarrow). Don't use yellow sticky traps (A2).
<p>Assassin bug (Reduviidae family)</p>	Many insects, including flies, tomato hornworm, large caterpillars	Permanent plantings for shelter (e.g., hedgerows)
<p>Bigeyed Bugs (<i>Geocoris</i> spp. of Lygaeid Family)</p>  <p>(lines represent actual size) After Ore. Agric. Exp. Stn. Bull. 749</p>	Many insects, including other bugs, flea beetles, spider mites, insect eggs and small caterpillars. Will also eat seeds (A12).	Can build up in cool-season cover crops such as berseem clover (<i>Trifolium alexandrinum</i>) and subterranean clovers (<i>Trifolium subterraneum</i>). Can be found on common knotweed (<i>Polygonum aviculare</i>) as well (A11).
<p>Braconid wasp (Braconidae family)</p>  <p>After USDA Bull. 233</p>	Armyworm, cabbageworm, codling moth, gypsy moth, European corn borer, beetle larvae, flies, aphid, caterpillars, other insects	Nectar plants with small flowers (caraway, dill, parsley, Queen Anne's lace, fennel, mustard, white clover, tansy, yarrow), sunflower, hairy vetch, buckwheat, cowpea, common knotweed, crocuses, spearmint (A2, A3, A4, A6).
<p>Damsel bug (Nabidae family)</p>	Aphid, thrips, leafhopper, treehopper, small caterpillars	Anything in the sunflower family as well as goldenrod, yarrow, alfalfa.

<p>Ground beetle (Carabidae family)</p>  <p>After Packard, 1889</p>	<p>Slug, snail, cutworm, cabbage-root maggot; some prey on Colorado potato beetle, gypsy moth and tent caterpillar</p>	<p>Permanent plantings, amaranth; white clover in orchards, mulching.</p>
<p>Lacewing, Neuroptera Family (<i>Chrysoperla</i> and <i>Chrysopa</i> spp.)</p>  <p>Top: adult; Middle: larva; Bottom: eggs</p> <p>(lines represent actual size)</p> <p>After Extension Service 4-H Handbook</p>	<p>Soft-bodied insects including aphid, thrips, mealybug, scale, caterpillars, mite</p>	<p>Carrot family (caraway, Queen Anne's lace, tansy, dill, angelica), sunflower family (coreopsis, cosmos, sunflowers, dandelion, goldenrod), buckwheat, corn, holly leaf cherry (<i>Prunus ilicifolia</i>), flowering bottle tree (<i>Brachychiton populneum</i>), soapbark tree (<i>Quillaja saponaria</i>). Provide water during dry spells (A2, A3, A4, A6, A7).</p>
<p>Ladybird beetle or ladybug (<i>Hippodamia</i> spp. and others)</p>  <p>(lines represent actual size) After USDA Bull. 2148</p>	<p>Aphid, mealybug, spider mite, soft scales</p>	<p>Once aphids leave a crop, lady beetles will also. To retain active lady beetles, maintain cover crops or other hosts of aphids or alternate prey (A11). Carrot family (fennel, angelica, dill, tansy, bishop's weed (<i>Ammi</i>), Queen Anne's lace), sunflower family (goldenrod, coreopsis, cosmos, golden marguerite (<i>Anthemis</i>), dandelion, sunflower, yarrow), crimson clover, hairy vetch, grains and native grasses, butterfly weed (<i>Asclepias</i>), black locust, buckwheat, euonymus, rye, hemp sesbania (<i>Sesbania exaltata</i>), soapbark tree, buckthorn (<i>Rhamnus</i>), saltbush (<i>Atriplex</i> spp.), black locust (<i>Robinia pseudoacacia</i>) (A2, A3, A4, A6, A7, A8).</p>

<p>Mealybug destroyer (<i>Cryptolaemus montrouzieri</i>)</p>	<p>Mealybug</p>	<p>Carrot family (fennel, dill, angelica, tansy), sunflower family (goldenrod, coreopsis, sunflower, yarrow) (A2).</p>
<p>Minute Pirate Bug (Anthocorid Family, <i>Orius</i> spp.)</p>  <p>(line represents actual size) After Oregon Exp. Station Bull. 749</p>	<p>Thrips, spider mite, leafhopper, corn earworm, small caterpillars, many other insects</p>	<p>Effective predators of corn earworm eggs. Carrot family (Queen Anne's lace, tansy, coriander, bishop's weed, chervil), sunflower family (cosmos, tidy tips (<i>Layia</i>), goldenrod, daisies, yarrow), baby-blue-eyes (<i>Nemophila</i>), hairy vetch, alfalfa, corn, crimson clover, buckwheat, blue elderberry (<i>Sambucus caerulea</i>) willows, shrubs. Maintain permanent plantings or hedgerows (A2, A4, A6, A7, A9).</p>
<p>Parasitic nematodes</p>	<p>Nematodes</p>	<p>Marigolds, chrysanthemum, gaillardia, helenium, <i>Eriophyllum lanatum</i>, horseweed (<i>Conyza canadensis</i>), hairy indigo, castor bean, <i>Crotalaria</i> spp., <i>Desmodium</i> spp., sesbania, mexican tea (<i>Chenopodium ambrosioides</i>), shattercane (<i>Sorghum bicolor</i>), lupines, <i>Phaseolus atropurpurens</i> (A10).</p>
<p>Praying mantis (<i>Mantis</i> spp.)</p>	<p>Any insect (including beneficials)</p>	<p>Cosmos, brambles. Protect native species by avoiding pesticides (A3).</p>
<p>Predatory mite (<i>Typhlodromus</i> spp.)</p>  <p>After Oregon Extension Service</p>	<p>Spider mite</p>	<p>There are many species of predatory mites with ecological requirements-especially with respect to humidity and temperature-particular to the species. Avoid use of insecticides. Provide beneficial refugia for non-crop habitat of non-crop mite prey.</p>
<p>Predatory thrips (Thripidae family)</p>	<p>Spider mite, aphid, other thrips, Oriental fruit moth, codling moth, bud moth, peach twig borer, alfalfa weevil, whitefly, leafminer, scale</p>	<p>There are several species of predatory thrips. Predatory thrips populations may be conserved/maintained by having non-crop populations of plant-feeding mites (e.g., European red mite, two-spotted spider mite), scales, aphids, moth eggs, leafhoppers, and other thrips.</p>

<p>Rove beetle (Staphylinidae family)</p> 	<p>Aphid, springtail, nematode, flies; some are parasitic on cabbage-root maggot</p>	<p>Permanent plantings; interplant strips of rye, grains, and cover crops; mulch beds; make stone or plant walkways in garden to provide refuges.</p>
<p>Spider</p>	<p>Many insects</p>	<p>Caraway, dill, fennel, cosmos, marigold, spearmint (A2, A6).</p>
<p>Spider mite destroyer (<i>Stethorus</i> spp.)</p>	<p>Spider mite</p>	<p>Carrot family (dill, fennel, etc.), mustard family (sweet alyssum, candytuft, etc.).</p>
<p>Spined soldier bug (<i>Podisus maculiventris</i>)</p>	<p>Fall armyworm, sawfly, Colorado potato beetle, Mexican bean beetle</p>	<p>Sunflower family (goldenrod, yarrow), bishop's weed; Maintain permanent plantings (A7).</p>
<p>Syrphid fly (Hover flies) (Syrphidae family)</p>  <p>(lines represent actual size) After USDA Bull. 1930</p>	<p>Aphid</p>	<p>Carrot family (Queen Anne's lace, dill, fennel, caraway, tansy, parsley, coriander, bishop's weed), the sunflower family (coreopsis, Gloriosa daisy, yarrow, cosmos, sunflower, marigolds), candytuft, sweet alyssum, ceanothus, holly-leaved cherry (<i>Prunus ilicifolia</i>), buckwheat, scabiosa, spearmint, coyote brush (<i>Baccharis pilularis</i>), knotweed (<i>Polygonum aviculare</i>), California lilacs (<i>Ceanothus</i> spp.), soapbark tree, meadow foam (<i>Linnanthus douglasii</i>), baby-blue-eyes (<i>Nemophila</i>); (A2, A3, A4, A5, A6, A7).</p>
<p>Tachinid fly (Tachinidae family)</p>  <p>After U.S.D.A</p>	<p>Cutworm, armyworm, tent caterpillar, cabbage looper, gypsy moth; some attack sawfly, Japanese beetle, May beetle, squash bug, green stink bug, sowbug</p>	<p>Carrot family (caraway, bishop's weed, coriander, dill, parsley, Queen Anne's lace, fennel), goldenrod, sweet clover, <i>Phacelia</i> spp., sweet alyssum, buckwheat, amaranth, buckthorn, <i>Heteromeles arbutifolia</i> (A2, A3, A4, A6, A7).</p>

<p>Tiger beetle (Cicindelidae family)</p>  <p>After MA State Board of Agriculture, 1862</p>	<p>Many insects</p>	<p>Maintain permanent plantings and some exposed dirt or sand areas.</p>
<p>Chalcid wasps (many families, including Trichogrammatidae)</p>  <p>(line represents actual size) After USDA Bull. 1642</p>	<p>Spruce budworm, cotton bollworm, tomato hornworm, corn earworm, corn borer, codling moth, other moths</p>	<p>Maintain a diversity of plants, including dill, anise, caraway, hairy vetch, spearmint, Queen Anne's lace, buckwheat, common knotweed, yarrow, white clover, tansy, cowpea, fennel, cosmos, chervil. For orchards, provide a mix of clover and flowering weeds (A2, A3, A6).</p>
<p>Whitefly parasitic wasp (<i>Encarsia formosa</i>)</p>	<p>Greenhouse whitefly, sweet potato whitefly</p>	<p>Carrot family (Queen Anne's lace, dill, fennel, tansy), sunflower family (yarrow, sunflower, cosmos, coreopsis) (A2).</p>

Farming for Pest Management Brochure

The Farming for Pest Management brochure, shown as a reference on the following two pages, can be found online at:

http://www.xerces.org/wp-content/uploads/2008/09/farming_for_pest_management_brochure_compressed.pdf

