

Flower-Rich Habitats for Beneficial Insects (Pollinators and Pest Predators) On Farms and In Orchards

Oregon Conservation Activity/Fact Sheet



The Xerces Society for Invertebrate Conservation
Portland, OR / Sacramento, CA / St. Louis, MO



THE XERCES SOCIETY
FOR INVERTEBRATE CONSERVATION

The Xerces Society for Invertebrate Conservation is nonprofit organization that protects wildlife through the conservation of invertebrates and their habitat. Established in 1971, the Society is at the forefront of invertebrate protection worldwide, harnessing the knowledge of scientists and the enthusiasm of citizens to implement conservation programs. The Society uses advocacy, education, and applied research to promote invertebrate conservation.

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FLOWER-RICH HABITATS FOR BENEFICIAL INSECTS (POLLINATORS AND PEST PREDATORS) ON FARMS AND IN ORCHARDS.

Oregon Conservation Activity/Fact Sheet



Definition

Establishing and maintaining areas of diverse shrubs and wildflowers, with a focus on native species, to create flower-rich forage habitat (primarily offering nectar and pollen) for pollinators and the predators and parasitoids of crop pests.

Purpose

This activity/fact sheet is provided as a component of a resource conservation plan. This activity may be applied to land taken out of agricultural production or to land adjacent to agricultural fields, and dedicated to habitat for beneficial invertebrates and wildlife. This activity sheet is to be used in conjunction with job sheets for specific prescriptions. It contains detailed guidance that will allow existing prescriptions, such as Conservation Cover, Field Border, Hedgerow Planting, and Riparian Herbaceous Cover, to provide habitat for beneficial insects and enhance biodiversity.

Where Used

This activity applies on lands requiring permanent protective cover that are adjacent to an agricultural field or are being converted from agricultural production. Examples of appropriate locations include field or orchard margins, road edges, pivot corners, and areas within orchards that are unsuitable for fruit production, such as steep slopes or cold patches. Although larger areas of habitat (1/2 acre or more) will provide resources to support more beneficial insects, flower-rich habitat can be created in small patches or strips and still provide significant benefits for a grower.

General Criteria and Specifications

Conservation Practices

Many existing conservation practices may be used to implement and/or manage habitat for beneficial insects. The following are some of the most appropriate conservation practices that may be used to provide beneficial insect habitat:

- 327: Conservation Cover
- 342: Critical Area Planting
- 380: Windbreak/Shelterbelt Establishment
- 386: Field Border
- 390: Riparian Herbaceous Cover
- 393: Filter Strip
- 422: Hedgerow Planting
- 550: Range Planting
- 595: Pest Management
- 612: Tree/Shrub Establishment
- 643: Restoration and Management of Rare or Declining Habitats
- 645: Upland Wildlife Habitat Management
- 647: Early Successional Habitat Development/Management

Planting

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 pollinators and the predators and parasitoids of crop pests. Special care may be taken to establish plantings that complement the bloom period of adjacent crops. For example, if the aim is to provide habitat to support pollinators of blueberries, plants should be chosen that flower before and after the crop blooms. A minimum of nine flowering forbs or shrubs shall be planted that together offer bloom through the entire growing season. For some sites (see below), a minimum of two grasses should be added to the species mix. The final combined seeding rate for all species will be between 30 and 60 pure live seeds (PLS) per square foot (with grasses at less than 25% of the total).

The goal of this activity is to establish flower-rich habitats. For some projects, such as an insectary strip along a field margin or even within a field, only a mix of flowers may be necessary. For other projects such as riparian planting or creation of a meadow, the seed mix should include both grasses and flowers. While we better understand how to establish native grasses, they may be very competitive with the wildflowers and thus prevent wildflower production. Therefore, until we have an established protocol that has been tested, grasses should be planted in a low enough density to allow for strong competition by wildflowers. Alternatively, strips planted only in wildflower seed mixes (or single wildflower species) may be planted adjacent to, and alternating with, strips of native bunch grasses (see Figure 1 on page 8 below).

The native plant species selected shall be chosen from Oregon Plant Materials Tech Note No. 13, *Plants for Pollinators in Oregon*. Tables 3, 4, and 5 of this document list species from Major Land Resource Area (MLRA) 2 Willamette and Puget Sound Valleys; these are extracted from Tech Note No. 13. Select at least three species from each part of the growing season: early spring to early summer (April – June), summer (June – August), and late summer to fall (August – September). This will provide pollen and nectar resources for the entire growing season.

While the focus of this activity/fact sheet is the use of native flowers to create habitat, there are situations where nonnative flowers may be appropriate. Examples of this include in-field insectary strips or patches and cover crops under orchards. Nonnative flowers such as alyssum (*Aurinia saxitalis*) and bird's-foot trefoil (*Lotus corniculatus*) will create flower-rich habitat and seed may be more readily available. Table 7 lists some suitable nonnative species.

Considerations While Developing a Plan

There are a number of things to consider that will aid with developing a successful planting plan. Looking to see which pests and natural enemies are present, and identifying the habitat requirements of these species, will allow plant selection to best meet their needs. Create an inventory of existing habitat and plant resources on the farm (including bloom season, if possible) will help identify gaps in bloom that can be filled by the new habitat.

The beneficial insect habitat should provide a diversity of blooms (species, shape, color) over a long season. For pollinators, it should ideally not provide direct competition with the crop. When deciding where habitat can go, remember that habitat patches that are bigger, closer together, or interconnected will support more abundant populations of pollinators and predators and parasites than small, isolated patches.

Competition Control Before Planting

Site preparation is **one of the most important** and often inadequately addressed components of project success. It is also a process that may require a year or more of effort to reduce competition from invasive, noxious or undesirable plants prior to planting. *In particular, site preparation should focus on the abatement of competition from perennial weeds.* More effort and time spent eradicating undesirable plants prior to planting will result in higher success rates in establishing the targeted plant community.

Suggestions for eradicating weeds are provided in Table 2 below (page 10). Most techniques depend upon the use of herbicides, but several suggestions for organic operations are included.

Seeding

The appropriate seeding method will depend on the size of the habitat area and the available equipment. In small areas, seed may be broadcast by an ATV-mounted or hand-held belly grinder. In larger areas, a drop-seeder, or a seed drill may be used, as long as they are compatible with the seed sizes. Standard row crop planters (for example, corn seed drills) should not be

used. Some grass seed drills will work for some native plant seed, so long as the native seeds are similar in size and shape, and if the seed is very clean. Alternatively, special native plant seed drills, such as those manufactured by Tye or Truax, are often required. Local wildlife agencies may have such seed drills available.

Whatever method is chosen, equipment should be calibrated prior to use to be sure that the seed is being sown at the recommended rate. Because the drop-rate can become inconsistent when the amount of seed in the equipment dispenser gets low, it is important to make sure an ample amount of seed is loaded into the equipment, both for calibration and actual seeding. Fine play sand can be mixed into seed mixes at a 50 / 50 ratio in order to facilitate equal seed distribution. This can be particularly useful when seeding small areas, or when broadcasting very small seed. In addition, irrespective of method employed, thoroughly clean all equipment before and after use to avoid planting seeds from previous jobs.

Prior to sowing, the soil should be prepared such that the top several inches is loose and porous, and the bed is as level as possible. Once the seed has been spread, it should be gently tamped down into the soil. A roller can be used for this purpose.

Until seed is germinated and seedlings are several inches tall, predation from birds or small rodents can be a factor. Floating row covers or frost blankets can reduce predation. Because these products allow for the passage of light, and slightly increase temperatures, they can be spread over seed beds in the fall as soon as planting is completed. They should be removed as soon as seedlings begin to grow.

Other Considerations

Pesticide poisonings: Many insecticides are used on fields and in orchards. It is critical that the beneficial insect planting area is outside of the crop area and/or protected from application and drift.

Weeding: To facilitate weeding, shrubs and wildflowers may be clumped into islands or planted in strips within the planting area, which will allow for mowing of habitat around taller woody plants or dense perennials to maintain open nature of site. Within these habitat islands or strips, plugs and/or seeds can be planted in rows to aid with locating and differentiating pollinator plants from weeds during maintenance operations.

Site disturbance: Minimizing disturbance within these plantings creates opportunities for the development of alternative prey for pest predators and parasitoids, stable conditions for predaceous ground beetles, and nesting opportunities for bumble bees and ground nesting bees

Wildlife damage: Browsing by deer, voles and other animals may cause significant damage to young plantings, especially to woody species. Where damage is likely, consider deer fencing, trunk guards, and wire cages as necessary.

Others: Please contact Mace Vaughan, Joint Xerces Society-NRCS Pollinator Specialist (503-753-6000) if other considerations come to mind.

Operation and Maintenance

Monitoring and controlling weeds and watering vegetation is critical in the first and second years. If the site is well prepared, then less effort will be required for weeding after project installation. Maintenance practices must be adequate to control noxious and invasive species.

Habitats dominated by wildflowers and grasses will also need to be managed over time to maintain open, early successional characteristics. The actual management will depend on the size and location of the habitat. Management tools such as mowing or spot spraying will be appropriate for all sizes of habitat patches. Tools such as prescribed grazing or prescribed burning will be suited to larger areas. Consider rotating management and maintenance activities throughout the beneficial insect habitat areas to maximize spatial and temporal diversity. For example, if possible, apply management practices to only one-third of the site per year. Also, if mowing is used to manage the habitat, be sure all equipment is clean and free of weed and/or grass seed prior to being used in the beneficial insect habitat.

Hedgerows that are primarily composed of shrubs will need to have weeds controlled around the shrubs during establishment. This can be accomplished by mowing or herbicides, but in most situations the most effective method is to mulch around the plants. It is not advisable to use shallow tillage, as this may disturb any ground-nesting bees in residence in the area around the shrubs.

Project Specifications

Site-specific requirements are listed on the specifications sheet. Additional provisions may be contained in the conservation plan or other acceptable form of documentation. Specifications are prepared in accordance with the NRCS Field Office Technical Guide.

| | | | | |
|------------------------------|-----------------|---------------------|-----------|-----------|
| Client: | Farm #: | Total Acres: | | |
| Field(s): | Tract #: | S. | T. | R. |
| Planned By: | Date: | | | |
| Landowner Objectives: | | | | |

Conservation practice this project covers _____

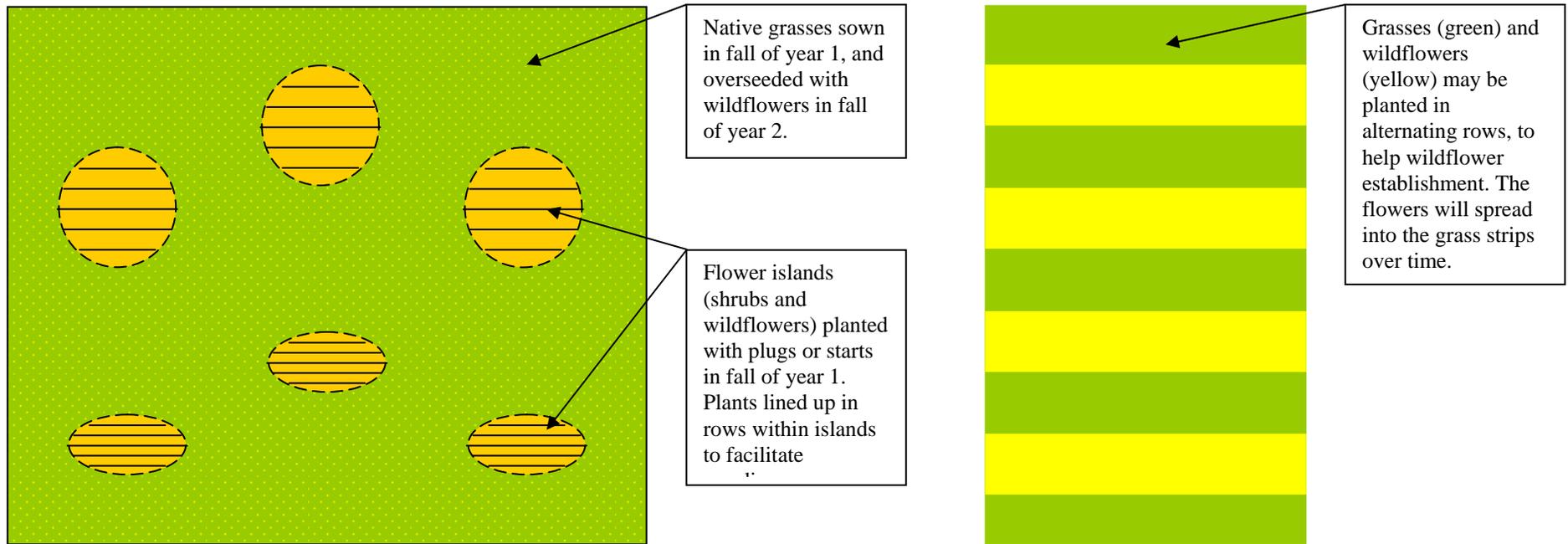
Additional criteria required by this practice _____

Site preparation requirements (weed pressure, cropping history, etc.) _____

Site preparation plan (Choose an option from Table 2 (below) and note adjustments to plan here) _____

Installation shall be in accordance with the specified drawings, specifications, and special requirements. **No changes are to be made in the drawings or specifications without prior approval from the technical specialist developing the plan.**

Figure 1. Example sketches for a project plan for a larger habitat patch illustrating two options for the island layouts and for how wildflowers and grasses may be planted in alternating strips.



The left hand example, shows two options for islands of plants. The 20 foot circles (top row) would allow for placement of a sprinkler in the middle, and the approximately 8 feet by 20 feet islands (bottom row) would be easier for equipment, such as mowers, to move around. Within each island, plants are organized in rows to facilitate weeding. All plants in the islands go into the ground as plugs or starts, and will form dense stands at maturity. These will form both high-quality habitat and a source of seeds that will spread into the surrounding area of native bunch grasses. Wildflowers (which may be different species from the islands) are also seeded into the bunch grass area. Restoration ecologists express concern about interseeding wildflowers into established grass stands and believe that, to be successful, native grasses will need to be planted at a relatively low density or that the chosen wildflower species will need to be aggressive species.

In the right hand example, wildflowers and native bunch grasses are planted in separate rows. The option of planting grass-only or wildflower-only strips is meant to address the concern over interseeding wildflowers into established grass. Planting flowers and grasses separately will help wildflowers become firmly established and then move out into adjacent rows of grasses.

Table 1. Some criteria that may influence the choice of plants for beneficial insect plantings.

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| A long lived perennial capable of self propagation and spreading. |
| Has a long period of sustained bloom; at least three weeks. |
| Is vigorous and can compete with most annual and perennial weeds. |
| Will not spread into areas it is not welcome, such as within the tree rows. |
| Is available in large quantities at a reasonable price. |
| Requires minimal maintenance. |
| Does not require irrigation more often than every 10 days. |
| Distinctive leaves; easy to identify during weeding operations. |
| Shrubs do not block air flow during winter (not evergreen). |
| Plants short enough to allow equipment to pass over. |
| Plants can be mown to allow equipment to pass over. |
| Will not lay flat and cause equipment to slip on steep slopes. |
| Able to withstand occasional foot or equipment traffic. |
| Disease and pest resistant. |
| Is not a host to pest and diseases of crop (e.g., berry-eating birds). |
| Not a legume due to problems with voles. |

Table 2. This table contains several options for controlling competing, non-desirable vegetation prior to plant establishment. For all planned herbicide applications, records should indicate when the herbicide was applied to the field.

| Option | Current Condition | Timing | Method |
|---|--|---|---|
| <p>1: Island Planting</p> <p>Herbicide and Cultivation (1.5 years)</p> | <p>Grassland</p> <p>Large habitat planting with medium to high weed pressure</p> | <p>Start site prep in spring of year 1 and plant in the fall. Weed control continues through the spring and summer of year 2.</p> | <ol style="list-style-type: none"> Year 1, spring (April): cultivate and irrigate to maximize germination of weed seed. Cultivate and irrigate again after vegetation has grown 4 to 6 inches. After second cultivation, apply non-selective herbicide after vegetation has grown 4 to 6 inches. Year 1, summer (May or June): if the site is sloping and has erosion potential, plant summer cover crop (for example, oats), irrigate, and mow before it sets seed. Year 1, fall: cultivate field again and spray weeds with non-selective herbicide * after weeds reach 4 to 6 inches. Year 1, fall: drill-seed native bunch grasses and oats (Note: oats serve as a nurse crop and protects soil while native grasses establish, <i>however be certain to mow the oats before they go to seed</i>). Be careful to plant native bunch grasses at a density low enough that they will not inhibit establishment of wildflowers (see seeding rate recommendations below - to be developed). Year 1, fall: plant “islands” of nectar plants (container plants or plugs, not seed). These may be a combination of wildflowers and/or shrubs. Establish irrigation and provide water to ensure establishment. Year 2, winter: oats will be killed by hard freeze. Year 2, spring: conduct broadleaf weed control in native grasses. Year 2, summer: conduct another round of broadleaf weed control in native grasses. Year 2, fall: inter-seed bunch grasses with wildflowers (broadleaf plants) and irrigate as necessary. Note, it is important in this scenario to choose aggressive wildflowers for the inter-seeding. Getting native grasses established first runs the risk of out-competing the wildflowers that are the goal of this activity. |
| <p>2: Strip Planting</p> <p>Herbicide and Cultivation (1.5 years)</p> | <p>Grassland</p> <p>Medium to high weed pressure</p> | <p>Start site prep in spring of year 1 and plant in the fall. Weed control continues through the spring and summer of year 2</p> | <ol style="list-style-type: none"> Year 1, spring (April): cultivate and irrigate to maximize germination of weed seed. Cultivate and irrigate again after vegetation has grown 4 to 6 inches. After second cultivation, apply non-selective herbicide after vegetation has grown 4 to 6 inches. Year 1, summer (May or June): if the site is sloping and has erosion potential, plant summer cover crop (for example, oats), irrigate, and mow before it sets seed. Year 1, fall: cultivate field again and spray weeds with non-selective herbicide * after weeds reach 4 to 6 inches. Year 1, fall: drill-seed strips of native bunch grasses and oats (Note: oats serve as a nurse crop and protects soil while native grasses establish, <i>however be certain to mow the oats before they go to seed</i>). Year 1, fall: drill-seed strips of nectar plants alternating with the bunch grass strips. These may be a combination of wildflowers and/or shrubs; the shrubs will be container plants. Establish irrigation and provide water to ensure establishment. Year 2, winter: oats will be killed by hard freeze. Year 2, spring: conduct broadleaf weed control in native grasses. Year 2, summer: conduct another round of broadleaf weed control in native grasses. |
| <p>3: Meadow Planting</p> <p>Herbicide (1</p> | <p>Grassland or cropland with low erosion potential</p> | <p>Start site prep in late summer, plant in</p> | <ol style="list-style-type: none"> Remove excess vegetation in late summer/early fall (Aug./Sept.) and irrigate. In the weeks after removing excess vegetation, apply tank mixture of non-selective herbicide after vegetation has actively grown to 4 to 6 inches. In the spring, apply non-selective herbicide after remaining vegetation re-grows 4 to 6 inches, and then again just prior to |

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| year) | Low weed pressure | spring | planting. Be careful that chosen herbicide will not affect germination of seeds. 4. Drill seed or plant plugs into cleared area. A no-till drill should be used to minimize soil disturbance and reduce weed germination. |
| 4: Meadow Planting Herbicide (1/2 year) | Cropland Very low weed pressure | Start site prep in winter and plant in spring | 1. Remove excess vegetation in fall or winter with a close mow (e.g. flail mower, which will chop up cuttings very fine). 2. Apply non-selective herbicide after vegetation has actively grown 4 to 6 inches in spring. 3. Apply non-selective herbicide just prior to planting or after remaining vegetation grows at least 4 to 6 inches. 4. If planting seeds, close mow to remove excess vegetation to ensure good contact between seeds and soil. Do not till the soil. 5. Drill seed or plant plugs into cleared area. A no-till drill should be used to minimize soil disturbance and reduce weed germination. |
| 5: Linear Planting Organic: Smother (at least 1 year) | Grassland or Cropland Small habitat planting (linear strips or areas 1/4 acres or less) Low weed pressure | Start site prep in spring, planting in spring or fall year 2 | 1. Cultivate/till existing cover in spring. 2. Pack soil and smother remaining existing vegetation with black plastic. Leave plastic in place for at least a year. Clear plastic can also be used, however black plastic may result in greater soil heating, and more successful destruction of weeds and weed seed. Note: a small amount of soil moisture is required in order to have maximum control. 3. Do not cultivate soil prior to planting. 4. Drill seed or plant plugs into prepared bed. In small areas, broadcasting may be the best seeding method. |
| 6: Meadow Planting Organic: Frequent cultivation (at least 1 year) | Cropland Small habitat planting (1/2 acre or less) Low weed pressure | Start site prep in spring, planting in spring year 2 | 1. Cultivate/till existing cover starting in spring with first flush of vegetation. 2. Cultivate/till the soil regularly (every one to two weeks) throughout the growing season, before annuals set seed. 3. Continue cultivation in spring year 2. 4. After existing vegetation is gone, cultivated soils will need to be smoothed, lightly packed, and free of stubble prior to planting. Large straight toothed harrows can be used to break up large soil clods, and excess plant litter can be smoothed with a shallow disking. 5. Drill seed or plant plugs into prepared bed. NOTES: This site preparation method works best on previously cropped land, or land without a history of aggressive perennial weed problems. This approach can be labor intensive, take more than one year, and only reduce, but not eliminate all weed seeds in the seed bank. Frequent follow up is essential as some weeds may be uprooted and carried through the blades of a tiller only to be replanted. Also, since some weeds spread by rhizomes, repeated chopping of these root sections into multiple pieces may result in creating more weeds that are then spread throughout the planting area. Finally for every weed plowed under, several dormant weed seeds may be brought to the surface where they will germinate. With aggressive repeated tillage however, the perennial weed “seed bank” will be depleted, leaving mostly annual weed seed to contend with during the planting process. |
| 7: Meadow Planting Organic: Cultivation | Cropland Small habitat planting (1/2 acre or less) | Spring planting | 1. Cultivate two or three times in the spring or early summer. 2. Cover crop in mid summer with species that will winter kill (e.g. Sudan grass, summer wheat, or buckwheat). 3. Till again <u>before</u> seed set. 4. Fall, cover crop (e.g. annual rye, phacelia, fava bean, vetch) which germinates in the fall and provides cover all winter. Note: if using vetch it is important to till it in before it sets seed. |

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| and cover crop (at least 1 year) | Medium to low weed pressure | <ol style="list-style-type: none"> 5. Till in cover crop early next spring. 6. Spring weeds will germinate. Remove weed seedlings with a basket or tine weeder at regular intervals, or flame weed in the early spring. Conduct this weed removal at least two times separated by about two weeks. 7. Drill seed native grass and wildflowers in spring and irrigate. 8. Mow native grass in the fall and then plant wildflower plugs and shrubs in the fall. Mulch around woody shrubs. 9. Come back in spring and hoe or cut out weeds. <p>Start small and build a half or quarter acre at a time.</p> |
|----------------------------------|-----------------------------|---|

* NRCS does not require specific herbicides by trade name and recommendations on herbicides and specifications on rate and timing should come from an extension agent or a state licensed consultant.

Table 3: Oregon perennial forbs (wildflowers) for pollinators

Arranged by bloom period and flower color

Subset of species including those that occur in the Willamette Valley (MLRA 2, Willamette and Puget Sound Valleys).

| Common Name | Scientific Name | MLRA's in which species occurs (watch the wrapping on this column) | Bloom Period | Flower Color | *Height Mature (feet) | Light Needs | *Drought Tolerance | *Precip. Minimum | *pH Min. | *pH Max. | *Calcium Carbonate Tolerance | *Salinity Tolerance |
|----------------------|--|--|--------------|--------------|-----------------------|-------------------|--------------------|------------------|----------|----------|------------------------------|---------------------|
| dwarf checkermallow | <i>Sidalcea malviflora</i> ssp. <i>virgata</i> | 1,2,3,5 | Early spring | Pink | 2 | Sun to part shade | High | 25 | | | | |
| bigseed biscuitroot | <i>Lomatium macrocarpum</i> | 2,5,6,7,8,9,10,21,23,24,25,43 | Early Spring | White | 0.5 | Sun | High | 8 | 6 | 8.5 | Medium | Low |
| camas | <i>Camassia quamash</i> (use local stocks) | 1,2,3,5,9,10,21,23,24,25,43 | Mid Spring | Blue | 2.3 | Sun to part shade | None | 16 | 5.7 | 7 | Low | None |
| broadleaf lupine | <i>Lupinus latifolius</i> var. <i>latifolius</i> | 1,2,3,5,6,21 | Mid Spring | Blue | 2.5 | Sun to part shade | None | 25 | 6.5 | 7 | Low | None |
| meadow checkermallow | <i>Sidalcea campestris</i> | 2 | Mid Spring | Light pink | 4 | Sun to part shade | Medium | 35 | | | | |
| Oregon geranium | <i>Geranium oreganum</i> | 2,3,5 | Mid Spring | Purple | 3 | Sun to part shade | None | 55 | 7 | 8 | Low | None |
| barestem biscuitroot | <i>Lomatium nudicaule</i> | 2,3,5,6,8,10,21 | Mid Spring | Yellow | 3 | Sun | Medium | 15 | | | | |
| yellow bush lupine | <i>Lupinus arboreus</i> | 4 | Mid Spring | Yellow | 6 | Sun | High | 16 | 6 | 7.5 | Low | Medium |
| Mule's ear | <i>Wyethia angustifolia</i> | 2,3,5, | Mid Spring | Yellow | 2.5 | Sun | Low | 22 | | | | |
| bigleaf lupine | <i>Lupinus polyphyllus</i> var. <i>polyphyllus</i> | 1,2,3,4,5,6,21 | Spring | Purple | 5 | Sun to part shade | Low | 15 | | | | |
| riverbank lupine | <i>Lupinus rivularis</i> | 1,2,3,4, | Spring | Purple | 3 | Sun to part shade | Medium | 20 | | | | |
| wild mint | <i>Mentha arvensis</i> (<i>canadensis</i>) | 2,3,4,5,6,8,10,11,21,23,24,25,43 | Spring | White | 2.6 | Sun to part shade | Low | 10 | 5 | 7 | Medium | None |
| deltoid balsamroot | <i>Balsamorhiza deltoidea</i> | 2,3,5 | Spring | Yellow | 2.5 | Sun | Medium | 28 | | | | |
| Pacific waterleaf | <i>Hydrophyllum tenuipes</i> | 1,2,3,4 | Late Spring | cream | 1 | Shade | Low | 40 | | | | |
| narrow-leaf onion | <i>Allium amplexans</i> | 2,3,5,21 | Late Spring | Pink | 1 | Sun | Medium | 28 | | | | |
| tapertip onion | <i>Allium acuminatum</i> | 2,5,6,8,9,10,11,21,23,25,43 | Late Spring | Pink | 1 | Sun | Medium | 10 | 6 | 8 | High | None |
| American vetch | <i>Vicia americana</i> var. <i>americana</i> | 1,2,3,4,5,6,9,10,21,23,24,25,43 | Late spring | Purple | 1.3 | Sun to part shade | High | 9 | 5.9 | 7.2 | Low | None |
| Western waterleaf | <i>Hydrophyllum occidentale</i> | 2,3,4,5 | Late Spring | White | 1.5 | Shade | Low | 10 | 6.2 | 7.5 | Low | None |

| | | | | | | | | | | | | |
|--------------------------|---|-----------------------------------|--------------|-----------------|-----|-------------------|--------|----|-----|-----|--------|------|
| varileaf phacelia | <i>Phacelia heterophylla</i> | 1,2,3,4,5,6,8,9,10,21,24 | Late Spring | White | 2 | Sun to part shade | Medium | 10 | | | | |
| fernleaf biscuitroot | <i>Lomatium dissectum</i> var. <i>dissectum</i> | 2,3,5,6 | Early Summer | Purple | 4 | Sun to part shade | High | 14 | 6.5 | 7.5 | High | None |
| selfheal | <i>Prunella vulgaris</i> | 1,2,3,4,5,6,43 | Early Summer | Purple | 1.5 | Sun to part shade | Medium | 16 | 5.4 | 8 | Medium | None |
| western yarrow | <i>Achillea millefolium</i> var. <i>occidentalis</i> | All | Early Summer | White | 3 | Sun to part shade | Medium | 8 | 6 | 8 | Medium | Low |
| celeryleaf licorice-root | <i>Ligusticum apiifolium</i> | 2,3,5 | Early Summer | White | 3.3 | Sun to part shade | Medium | 15 | | | | |
| showy milkweed | <i>Asclepias speciosa</i> | 2,5,7,8,9,10,11,23,25 | Early Summer | White to pink | 6 | Sun | Low | 16 | 5 | 7 | Medium | None |
| fireweed | <i>Chamerion angustifolium</i> | 1,2,3,4,5,6,9,10,21,24,43 | Summer | Fuchia | 5 | Sun to part shade | Medium | 16 | | | | |
| showy fleabane | <i>Erigeron speciosus</i> var. <i>speciosus</i> | 2,9,10,43 | Summer | Purple | 2.5 | Sun to part shade | Low | 22 | | | | |
| common woolly sunflower | <i>Eriophyllum lanatum</i> | 2,3,5,6,8,9,10,21,23,25,43 | Summer | Yellow | 1 | Sun | Medium | 10 | | | | |
| Puget Sound gumweed | <i>Grindelia integrifolia</i> | 2 | Summer | Yellow | 2 | Sun | Low | 35 | | | | |
| rough-leaf aster | <i>Eurybia radulina</i> | 2,3,5,6 | Late Summer | Purple | 3 | Sun | High | 10 | 6 | 7.5 | High | None |
| Douglas aster | <i>Symphyotrichum (Aster) subspicatum</i> var. <i>subspicatum</i> | 2,4,5,7,8 | Late Summer | Purple | 3 | Sun to part shade | None | 19 | 6 | 7.5 | None | High |
| Hall's aster | <i>Symphyotrichum (Aster) hallii</i> | 2,5 | Late Summer | White to purple | 3 | Sun to part shade | Medium | | | | | |
| salebrosa goldenrod | <i>Solidago canadensis</i> var. <i>salebrosa</i> | 1,2,3,4,5,6,7,9,10,21,23,24,25,43 | Late Summer | Yellow | 3.5 | Sun | Medium | 16 | 4.8 | 7.5 | Medium | None |

Table 4: Oregon annual forbs (wildflowers) for pollinators

Arranged by bloom period and flower color

Subset of species including those that occur in the Willamette Valley (MLRA 2, Willamette and Puget Sound Valleys).

| Common Name | Scientific Name | MLRA's in which species occurs (watch the wrapping on this column) | Bloom Period | Flower Color | *Height, Mature (feet) | Light Needs | *Drought Tolerance | *Precip. Minimum | *pH (Minimum) | *pH (Maximum) | *Calcium Carbonate Tolerance | *Salinity Tolerance |
|--------------------|----------------------------|--|--------------|----------------|------------------------|-------------------|--------------------|------------------|---------------|---------------|------------------------------|---------------------|
| shortspur seablush | <i>Plectritis congesta</i> | 1,2,3,4,5 | Early Spring | pink | 2 | Sun to part shade | Low | 25 | | | | |
| slender clarkia | <i>Clarkia gracilis</i> | 2,5,6,21 | Early Spring | Purple | 2.5 | Sun to part shade | High | 12 | 6.4 | 8.5 | Medium | None |
| baby blue eyes | <i>Nemophila menziesii</i> | 2,5 | Early Spring | White to blue | 0.8 | Sun to part shade | Medium | 30 | | | | |
| farewell to spring | <i>Clarkia amoena</i> | 1,2,3,5 | Late Spring | Pink to purple | 2 | Sun | High | 25 | | | | |
| golden tickseed | <i>Coreopsis tinctoria</i> | 2,7,8 (Columbia River area) | Late Spring | Yellow | 3 | Sun to part shade | Low | 20 | 5.2 | 7.8 | Medium | None |
| common madia | <i>Madia elegans</i> | 2,3,5 | Summer | yellow and red | 2.5 | Sun | Medium | 20 | | | | |

Table 5: Oregon native trees and shrubs for pollinators

Arranged by bloom period, flower color and height

Subset of species including those that occur in the Willamette Valley (MLRA 2, Willamette and Puget Sound Valleys).

| Common Name | Scientific Name | MLRA's in which species occurs (watch the wrapping on this column) | Bloom Period | Flower Color | *Height, Mature (feet) | Light Needs | *Drought Tolerance | Evergreen or Deciduous | *Precip. Minimum | pH Maximum | *Calcium Carbonate Tolerance | *Salinity Tolerance |
|--------------------------------|--|--|-------------------|--------------|------------------------|-------------------|--------------------|------------------------|------------------|------------|------------------------------|---------------------|
| willow | <i>Salix</i> spp. | 1,2,3, 5,6 | Very Early Spring | Yellow | 20-60 | Sun to part shade | Low | Deciduous | 45 | 7.5 | Low | None |
| Scouler's willow | <i>Salix scouleriana</i> | 1,2,3,4,5,6,9,10,21,23,25,43 | Very Early Spring | Yellow | 35-60 | Sun to part shade | Low-Medium | Deciduous | 11 | 8.0 | High | High |
| kinnikinnick | <i>Arctostaphylos uva-ursi</i> | 2,3,4,5,6,9,21,43 | Early Spring | Purple | 1 | Sun to part shade | High | Evergreen | 14 | 8.0 | Medium | Medium |
| salmonberry | <i>Rubus spectabilis</i> | 1,2,3,4,5 | Very Early Spring | Purple | 12 | Sun to shade | High | Deciduous | 14 | 7.2 | Medium | None |
| Oregon grape | <i>Mahonia aquifolium</i> | 1,2,3,4,5,6,7,8,9,10,43 | Early Spring | Yellow | 8 | Sun to shade | High | Evergreen | 20 | 8.0 | Low | None |
| redstem ceanothus | <i>Ceanothus sanguineus</i> | 1,2,3,5,6,43 | Mid Spring | White | 10 | Sun to part shade | Medium | Deciduous | 13 | 8.0 | Low | None |
| Oregon crapapple | <i>Malus fusca</i> | 1,2,3,4,5 | Mid Spring | White | 15 | Sun to part shade | Low | Deciduous | 33 | 8 | Low | Low |
| Suksdorf's hawthorn | <i>Crataegus suksdorfii</i> | 1,2,3,4,5,6 | Mid Spring | White | 25 | Sun to part shade | Medium | Deciduous | 30 | | | |
| casara | <i>Frangula purshiana</i> | 1,2,3,4,5,9,43 | Mid Spring | White | 35 | Sun to part shade | Medium | Deciduous | 14 | 7.9 | Low | None |
| bitter cherry | <i>Prunus emarginata</i> | All | Mid Spring | White | 80 | Sun | Medium | Deciduous | 16 | 7.8 | Medium | None |
| rose spirea | <i>Spiraea douglasii</i> | 1,2,3,4,5,6,21 | Mid Summer | Pink | 6 | Sun | Medium | Deciduous | 16 | 7.5 | Low | None |
| Pacific rhododendron | <i>Rhododendron macrophyllum</i> | 1,2,3,4,5 | Spring | Purple | 15 | Sun to shade | None | Evergreen | 55 | 7.0 | None | None |
| red huckleberry | <i>Vaccinium parvifolium</i> | 1,2,3,4,5 | Spring | White | 12 | Sun to shade | High | Deciduous | 16 | 7.5 | Low | None |
| western chokecherry | <i>Prunus virginiana</i> var. <i>demissa</i> | 2,3,5,6,7,8,9,10,21,24,25,43 | Spring | White | 10-25 | Sun to part shade | Medium | Deciduous | 16 | 8.0 | Medium | Low |
| swamp rose | <i>Rosa pisocarpa</i> | 1,2,3,4,5 | Late spring | Red | 3 | Sun to shade | Medium | Deciduous | 35 | | | None |
| Nootka rose (use local stocks) | <i>Rosa nutkana</i> | 1,2,3,4,5,6,7,8,9,10,43 | Late Spring | Red | 10 | Sun to part shade | Low | Deciduous | 35 | 7.0 | Low | Low |
| redflower currant | <i>Ribes sanguineum</i> | 1,2,3,4,5,6 | Late Spring | Red | 12 | Sun to part shade | Medium | Deciduous | 14 | 7.5 | Medium | None |

| | | | | | | | | | | | | |
|------------------------|------------------------------|--|--------------|--------|----|-------------------|--------|-----------|----|-----|--------|--------|
| common snowberry | <i>Symphoricarpos albus</i> | 1,2,3,4,5,6,7,8,9,10,2 1,43 | Late Spring | White | 3 | Sun to shade | High | Deciduous | 12 | 7.8 | High | None |
| salal | <i>Gaultheria shallon</i> | 1,2,3,4,5,6 | Late Spring | White | 6 | Sun to shade | Low | Evergreen | 55 | 7.0 | None | None |
| Pacific ninebark | <i>Physocarpus capitatus</i> | 1,2,3,4,5,6 | Late Spring | White | 8 | Sun | Low | Deciduous | 20 | 7.0 | None | None |
| Lewis' mockorange | <i>Philadelphus lewisii</i> | 1,2,3,4,5,6,7,8,9,10,1 1,25,43 | Late Spring | White | 10 | Sun | Medium | Deciduous | 15 | 7.5 | Low | Low |
| buckbrush | <i>Ceanothus cuneatus</i> | 2,3,5 | Early Summer | White | 8 | Sun | High | Evergreen | 16 | 8.5 | High | Medium |
| Saskatoon serviceberry | <i>Amelanchier alnifolia</i> | 1,2,3,5,6,7,8,9,10,11, 21,23,24,25,43 | Early Summer | White | 20 | Sun to part shade | Medium | Deciduous | 12 | 8.0 | Medium | None |
| twinberry | <i>Lonicera involucrata</i> | 1,2,3,4,5,6,9,10,21, | Summer | Yellow | 10 | Sun to part shade | Low | Deciduous | 14 | 8.0 | High | None |
| coyote bush | <i>Baccharis pilularis</i> | 1,2,4,5 | Late Summer | White | 10 | Sun | High | Evergreen | 12 | 8.5 | High | High |
| oceanspray | <i>Holodiscus discolor</i> | 1,2,3,4,5,6,7,8,9,43 | Late Summer | White | 12 | Sun to part shade | Low | Deciduous | 9 | 7.5 | Low | None |

Table 6: Oregon bunchgrasses for herbaceous plantings

Arranged alphabetically by common name

Subset of species including those that occur in the Willamette Valley (MLRA 2, Willamette and Puget Sound Valleys).

| Common name | Scientific name | MLRA's in which species occurs (watch the wrapping on this column) | *Height, Mature (feet) | *Drought Tolerance | *Precip. Minimum | *Precip. Maximum | *+Salinity Tolerance | *Calcium Carbonate Tolerance |
|---------------------|---|--|------------------------|--------------------|------------------|------------------|----------------------|------------------------------|
| California oatgrass | <i>Danthonia californica</i> | 1,2,3,4,5,9,10,21,23,43 | 2 | High | 6 | 50 | MS | Medium |
| prairie Junegrass | <i>Koeleria macrantha</i> | All | 2 | High | 14 | 50 | S | High |
| Roemer's fescue | <i>Festuca roemeri</i> (E. idahoensis ssp. <i>roemeri</i>) | 2,4,5 | 2 | Medium | 20 | 80 | MS | High |
| Sandberg bluegrass | <i>Poa secunda</i> | 2,3,5,6,7,8,9,10,11,21,23,24,25,43 | 2 | Medium | 10 | 22 | MS | High |
| slender hairgrass | <i>Deschampsia elongata</i> | 1,2,3,4,5,9,10,21,24,25,43 | 2 | Medium | 10 | 65 | MS | Medium |
| tufted hairgrass | <i>Deschampsia caespitosa</i> | 1,2,3,4,5,6,9,10,21,23,24,25,43 | 3 | Medium | 14 | 80 | MT | Medium |

* Heights and tolerances may differ between populations, races, or ecotypes of the same species.

+ = Salinity Tolerance: S=sensitive; MS=moderately sensitive, MT=moderately tolerant, and T=tolerant.

Disclaimer: Most of the information in this table was downloaded from the NRCS PLANTS "Characteristics" database. The database information originated from various plant material experts' estimations of the tolerances of the specific plants. We are interested in further refining this information specifically for Oregon environs and would welcome your inputs and feedback on the accuracy of this information. Please contact kathy.pendergrass@or.usda

Table 7. Nonnative perennial herbs and flowers for bees and other beneficial insects

Arranged by bloom period and flower color

| Common Name | Scientific Name | Bloom Timing | Flower color | Insect visitors |
|--|--------------------------------|--------------|--------------------------|---|
| *Candytuft, globe or common | <i>Iberis umbellata</i> | Early-late | White, pink, purple | Bees, hoverflies |
| *+Phacelia, tansy | <i>Phacelia tanaecitifolia</i> | Early-mid | Yellow | Bees |
| *Lupine | <i>Lupinus</i> sp. | Early-mid | Purples | Aphidium, aphidoletes, hoverflies |
| +Bluebells, scorpionweed | <i>Phacelia</i> sp. | Mid | Blue | Bees, |
| +Lavender | <i>Lavandula</i> sp. | Mid | Blues-purple | Bees |
| +Buckwheats | <i>Eriogonum</i> sp. | Mid | Cream, yellows | Bees |
| +Oregano | <i>Origanum vulgare</i> | Mid | Purple | Bees |
| +Purple toadflax | <i>Linaria purpurea</i> | Mid | Purple | Bees |
| *Cilantro, coriander | <i>Coriandrum sativum</i> | Mid | White | Various predators |
| +Spearmint | <i>Mentha spicata</i> | Mid | White | Bees |
| +Rosemary | <i>Rosmarinus</i> sp. | Mid | White, pink, purples | Bees |
| +Thyme | <i>Thymus</i> sp. | Mid | White, pink, purples | Bees |
| +Cat mint, catnip | <i>Nepeta x faassenii</i> | Mid-late | Blue-purple | Bees |
| +Blanket flower | <i>Gaillardia grandiflora</i> | Mid-late | Orange and red | Bees |
| +Agastache, mint | <i>Agastache</i> sp. | Mid-late | Pink to purple | Bees |
| +Coneflower, purple | <i>Echinacea purpurea</i> | Mid-late | Pink to purple | Bees |
| +Pincushion flower | <i>Scabiosa columbaria</i> | Mid-late | Pink to blue | Bees |
| *Alyssum, perennial | <i>Aurinia saxitalis</i> | Mid-late | White to purples | Bees, hover flies |
| +Penstemons | <i>Penstemon</i> sp. | Mid-late | White, pink, red, purple | Bees, hummingbirds |
| Hyssop | <i>Hyssopus</i> sp. | Mid-late | White, pinks to purples | bees |
| +Mint (be careful that species selected are not weedy) | <i>Mentha</i> sp. | Mid-late | White, pinks, purple | Bees |
| +Sage (be careful that species selected are not weedy) | <i>Salvia</i> sp. | Mid-late | White to purples | Bees |
| *Parsley | <i>Petroselinum crispum</i> | Mid-late | Yellow | Parasitic wasps, hoverflies, tachinid flies |

| | | | | |
|---|--|----------|-----------------|--|
| *+Sunflower | <i>Helianthus</i> sp. | Mid-late | Yellows to reds | Bees, Pirate bugs, |
| Trefoil, birdsfoot | <i>Lotus corniculatus</i> | Mid-late | Yellow | Bees |
| *Western Yarrow (be careful – many weedy cultivars of yarrow) | <i>Achillea millifolia</i> var. <i>occidentalis</i> | Mid-late | White | Bees, Lacewings, aphidius, lady beetles, parasitic wasps |
| +Blue-beard | <i>Caryopteris incana</i> | Late | Blue | Bees |
| +Goldenrod | <i>Solidago</i> sp. | Late | Yellow | Bees |

* - particularly good insectary plant

+ - particularly good bee plant

Table 8: Sample list of native species for planting to support pollinators of blueberries

Perennial/annual Tree/shrub

| Common Name | Scientific Name | MLRA's in which species occurs (watch the wrapping on this column) | Bloom Period | Flower Color | *Height, Mature (feet) | Light Needs | *Drought Tolerance | Evergreen or Deciduous | *Precip. Minimum | pH Maximum | *Calcium Carbonate Tolerance | *Salinity Tolerance |
|----------------------|--|--|-------------------|----------------|------------------------|-------------------|--------------------|------------------------|------------------|------------|------------------------------|---------------------|
| Sitka willow | <i>Salix sitchensis</i> | 1,2,3,6 | Very Early Spring | Yellow | 23 | Sun | Low-Medium | Deciduous | 35 | 7.5 | Low | Low |
| Scouler's willow | <i>Salix scouleriana</i> | 1,2,3,4,5,6,9,10,21,23,25,43 | Very Early Spring | Yellow | 35-60 | Sun to part shade | Low-Medium | Deciduous | 11 | 8.0 | High | High |
| Oregon grape | <i>Mahonia (=Berberis) aquifolium</i> | 1,2,3,4,5,6,7,8,9,10,43 | Early Spring | Yellow | 8 | Sun to shade | High | Evergreen | 20 | 8.0 | Low | None |
| camas | <i>Camassia quamash</i> | 2,3,5 | Mid Spring | Blue | 2.5 | Sun to part shade | Low | 28 | | | | |
| common snowberry | <i>Symphoricarpos albus</i> | 1,2,3,4,5,6,7,8,9,10,21,43 | Late Spring | White | 3 | Sun to shade | High | Deciduous | 12 | 7.8 | High | None |
| redflower currant | <i>Ribes sanguineum</i> | 1,2,3,4,5,6 | Late Spring | Red | 12 | Sun to part shade | Medium | Deciduous | 14 | 7.5 | Medium | None |
| farewell to spring | <i>Clarkia amoena</i> | 1,2,3,5 | Late Spring | Pink to purple | 2 | Sun | High | 25 | | | | |
| Pacific rhododendron | <i>Rhododendron macrophyllum</i> | 1,2,3,4,5 | Spring | Purple | 15 | Sun to shade | None | Evergreen | 55 | 7.0 | None | None |
| deltoid balsamroot | <i>Balsamorhiza deltoidea</i> | 2,3,5 | Spring | Yellow | 2.5 | Sun | Medium | 28 | | | | |
| fireweed | <i>Chamerion angustifolium</i> | 1,2,3,4,5,6,9,10,21,24,43 | Summer | Fuchia | 5 | Sun to part shade | Medium | 16 | | | | |
| Puget Sound gumweed | <i>Grindelia integrifolia</i> | 2 | Summer | Yellow | 2 | Sun | Low | 35 | | | | |
| common madia | <i>Madia elegans</i> | 2,3,5 | Summer | yellow and red | 2.5 | Sun | Medium | 20 | | | | |
| selfheal | <i>Prunella vulgaris</i> | 1,2,3,4,5,6,43 | Early Summer | Purple | 1.5 | Sun to part shade | Medium | 16 | 5.4 | 8 | Medium | None |
| buckbrush | <i>Ceanothus cuneatus</i> | 2,3,5 | Early Summer | White | 8 | Sun | High | Evergreen | 16 | 8.5 | High | Medium |
| oceanspray | <i>Holodiscus discolor</i> | 1,2,3,4,5,6,7,8,9,43 | Late Summer | White | 12 | Sun to part shade | Low | Deciduous | 9 | 7.5 | Low | None |
| Douglas aster | <i>Symphotrichum (Aster) subspicatum</i> var. <i>subspicatum</i> | 2,4,5,7,8 | Late Summer | Purple | 3 | Sun to part shade | None | 19 | 6 | 7.5 | None | High |
| goldenrod | <i>Solidago canadensis</i> | 1,2,3,4,5,6,7,9,10,21,23,24,25,43 | Late Summer | Yellow | 3.5 | Sun | Medium | 16 | 4.8 | 7.5 | Medium | None |

