

TECHNICAL NOTES

U. S. DEPT. OF AGRICULTURE
Portland, Oregon

NATURAL RESOURCES CONSERVATION SERVICE
March 2008

PLANT MATERIALS No. 13

PLANTS FOR POLLINATORS IN OREGON

Kathy Pendergrass, Plant Materials Specialist, NRCS, Portland, Oregon
Mace Vaughan, Conservation Director, Xerces Society, Portland, Oregon
Joe Williams, Manager, NRCS, Plant Materials Center, Corvallis, Oregon



Left – honey bee on camas flower (Pendergrass)



Right – bumble bee on rabbit brush (Vaughan)

The purpose of this technical note is to provide information about establishing, maintaining and enhancing habitat and food resources for native pollinators, particularly for native bees, in Riparian buffers, Windbreaks, Hedgerows, Alley cropping, Field borders, Filter strips, Waterways, Range plantings and other NRCS practices. We welcome your comments for improving any of the content of this publication for future editions. Please contact us!

PLANTS FOR POLLINATORS IN OREGON

Native pollinators are a vital part of our environment. Pollinators are essential for the reproduction of native plants, as well as many crops. Pollinators include some bird and bat species and a wide array of insect species, but bees are the most important for our agricultural landscapes. Native bees are becoming more important pollinators for crop plants in light of recent challenges to honey bee keepers across the U.S., namely Colony Collapse Disorder and the variety of other ailments honey bees face. As a group, pollinators are threatened world-wide by habitat loss and fragmentation, pesticides, introduced diseases and parasites.

Habitat enhancement for pollinators can also support other beneficial insects. For example, maintaining native sources of nectar and pollen, as well as protecting or establishing nest sites, provides important resources for other insects which might parasitize or predate upon harmful crop pests. Farmers that implement these practices can rely less heavily on honey bees and pesticides to produce crops. Additionally, enhancements for beneficial insects and pollinators can provide food and cover for other wildlife species, help stabilize the soil and improve water quality; and, when using native plants, these enhancements can provide landscape connectivity for native plant populations (particularly in the face of global climate change).

The NRCS can assist landowners with habitat enhancement for pollinators and other beneficial insects by encouraging them to establish an array of plants that flower throughout the entire growing season. A diversity of carefully chosen plants assures a continual source of nectar and pollen for adult bees: both native and honey bees.

This note is organized into three main sections. First, it outlines general steps for enhancing habitat for pollinators. Next is a section describing how NRCS practices might be used to enhance pollinator habitat. And the last section includes tables of suggested plants that might be used for various pollinator enhancements.

I. Steps in Establishing or Enhancing Habitat for Native Pollinators:

A. Know the habitat on your land and preserve good pollinator elements, where possible.

Preserve those habitat elements already present at your site, such as existing native flowering plants for food, and standing dead wood, untilled ground, and overgrown grassy areas for nests (see Figure 1 below). For more details on habitat elements needed by pollinators, in addition to sources of pollen and nectar, see also section D below and the Xerces Society-NRCS *Farming for Pollinators* brochure.

Also, be aware that insect-pollinated crops may supply abundant forage for short periods of time, which should be factored into an overall plan if a grower is interested in supporting wild pollinators for specific crops.

B. Get to know your site - Many factors determine which plants will be best for your site and what kinds of site preparation will be needed.

1. Sun exposure. How much sun is there and how long is the site exposed to sunlight? Some plants require full sun or shaded conditions to thrive. You will want to create a design where sun-loving plants will continue to get light as your planting matures. In some cases, you may need to phase plantings. For example, you may need to plant trees and shrubs and let these develop an over-story prior to planting shade-loving plants.

Generally, plants will flower more, and thus provide greater amounts of nectar and pollen, when they receive more sunlight than when they are fully shaded.

2. Soil type – nutrients, drainage and soil moisture. Is your soil sand, clay, loam, or peat? Consult local soil surveys or the Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov/app/>). Does the soil hold moisture or does it drain or dry quickly? You will want to choose plants that will be adapted for the moisture and nutrient conditions of your particular soil type.

3. Existing plant composition. Do you have existing established plants on which you have observed abundant pollinators that you may want to augment for a pollinator enhancement area? Do you have undesirable aggressive plants on your site? It is imperative to do good weed control and site preparation prior to planting your new plants.

4. Immediate land uses, activities, and crops. Do you have wildland habitat (with existing pollinator habitat) or an intensively managed crop immediately adjacent to your planned enhancement site? You will want to consider immediate land uses, activities, and crops into your planning process. For example, it would be best to choose an enhancement site that will be protected from drifting pesticide sprays from adjacent farm practices.

C. Make a plan for enhancing pollinator plants

1. Choose plants and compose a planting plan

a. Choose plants suitable to your project conditions and locale. Choose plants with moisture, light, soil, and nutrient requirements that are compatible with the site where they will be planted. Tables 1- 5 provide information about moisture, soil, light, and nutrient needs for various plants to help guide you in making plant selections. We have highlighted those species that are known, through observation, to be good pollinator plants. Other closely-related species – like a species within the same genus of a species known to be a good pollinator plant – might also be a good source of pollen and nectar. The tables included here are a starting point for plant selections and generally include the more widely distributed species known to occur within Oregon. You may have other species not listed on these tables within your specific area that might be good pollinator plants and a logical choice for your pollinator enhancement project (particularly other species of buckwheats (*Eriogonum*) or phacelia (*Phacelia*)). Basically, almost any plant that requires pollination (e.g. outcrossing—the movement of pollen from one flower or plant to another) for reproduction, and also provides nectar and pollen rewards to a pollinator, might be a candidate for a pollinator enhancement planting. “Best bee plants” for all of the locales across the State of Oregon are not well-documented, therefore, local knowledge about favorite bee plants should be considered when selecting plants for your enhancement project (i.e. this is why the suggested plant tables are so inclusive).

b. Use native plants as a first alternative. Native pollinators are generally adapted to the native plants found in their habitats. Native plants are adapted to the local climate and soil conditions where they naturally occur. Unlike natives, some common horticultural plants do not provide energetic rewards (e.g. pollen, nectar) for their visitors and often require insect pest control to survive. Non-native plants often become problematic invasive species if they are very successful at establishing and reproducing in a new region. Another objective of using native plants in cost-share programs with NRCS is to provide connectivity for native plant populations, particularly in regions with fragmented habitats. By providing

connectivity of plant species across the landscape, we increase the potential for these species to shift and move on the landscape in relation to probable future climatic shifts.

Native plants are advantageous because they generally: 1) do not require fertilizers and require fewer pesticides for maintenance, 2) require less water than other non-native plantings, 3) provide permanent shelter and food for wildlife, 4) are less likely to become invasive than non-native plants, and 5) promote local native biological diversity.

c. Choose native seed and plants from appropriate seed transfer zones or within your local region. Many species of trees and shrubs have recommended seed transfer zones – local acceptable transfer areas of source material within an area. You should use plants that originate from appropriate transfer zones where these have been developed for a species.

This website has maps of seed zones for some of Oregon's trees -

<http://www.oregon.gov/ODF/FIELD/Nursery/ZoneMaps.shtml>. Many species have not had the necessary research conducted to determine seed transfer zones. Where this is the case, as with most shrubs and herbaceous species, look for sources selling seeds and plants produced from plants of local origin. Plants selected from local sources will generally establish and grow well because they are adapted to the local climatic conditions. If local plants are not available, strive to get plants originating and produced from the same ecological region (or Major Land Resource Area) as your project location or at least from a similar elevation (or within 1500 feet elevation) and longitude (no more than 300 miles north or south) as your project site (see information below in Section III. and Tables 1- 5.). It is not advisable to move plant materials from one side (e.g. east or west) of the Cascade Mountains to the other.

d. Use plant association and/or ecological site information as much as possible when designing plantings of native plants. Diverse plantings that resemble a native plant community in your area are likely to have the most success and confer the most pollinator benefits. Visit natural areas and learn which plants are found in association with each other to help in this planning process. Species found in association with each other are likely to have the same light, moisture, and nutrient needs such that when these species are put into plantings they are more likely to thrive together. You might even consider choosing an intact native, nearby reference site to replicate for your planting design. There are many guides for plant associations found in Oregon (see the Reference section below and this link to Ecological Site Information <http://esis.sc.egov.usda.gov/Welcome/pgESDWelcome.aspx>)

e. Use a diversity of plants that will provide a diversity of flowers through the entire growing season. It is desirable to include a diversity of plants with different flower color, sizes and shapes as well as varying plant heights and growth habits to encourage a diversity of pollinators. Most bee species are generalists, feeding on a range of plants through their life cycle. Many others, including some important crop pollinators, only forage on a single family or even genus of plant. By having several plant species flowering at once, and a sequence of plants flowering through spring, summer, and fall, you can support a wide range of bee species that fly at different times of the season.

It is especially important to include plants that flower early in the season. Many native bees, such as bumble bees and some sweat bees, produce multiple generations each year. More forage available early in the season will lead to greater reproduction and more bees in the middle and end of the year. Early forage (e.g. willows or Oregon grape) may also encourage bumble bee queens that are emerging from hibernation to start their nests nearby, or simply increase the success rate of nearby nests.

Conversely, it is also **important to include plants that flower late in the season** to ensure that queen bumble bees are strong and numerous going into winter hibernation.

Researchers in California have found that when eight or more species of appropriate plants are grouped together at a single site, they tend to attract a significantly greater abundance and diversity of bee species. Therefore, ***we recommend planting at least three different pollinator plants within each of three blooming periods (i.e. early, mid or late season; or early spring, spring, and summer - refer to Tables below) for a total of at least nine different pollinator plants to include in your planting design.***

f. Consider your crop when choosing plants.

You will want to consider the bloom timing of adjacent crops in relation to that of plants considered for your pollinator enhancement. You might want to minimize selection of plants that bloom at the same time as your crop to reduce competition for pollination. You would want to choose plants for your hedgerow or border that generally bloom earlier and later than your crop to lengthen the period of available bloom, particularly for the bee species visiting a crop. You also might want to consider the diversity of crops or crop varieties planted at a farm. Increasing crop diversity also can help extend the period of bloom available for pollinators and other beneficial insects.

You will also want to avoid plants that might act as intermediate hosts for pests on your or your neighbor's crops. For example, orchardists in the Hood River area do not want black hawthorn (*Craetagus douglasii*) planted in their region as this species acts as an intermediate host for the apple maggot, a serious pest for apple production. Additionally, the species in the cherry or plum (*Prunus* spp.species) and pear (*Pyrus* spp.) or apple (*Malus* spp.) genera can be problematic in harboring pests around some orchard crops.

g. Consider other pollen and nectar sources: weeds and crops.

Dandelions and other non-native plants are often good pollinator plants. As long as a plant is not a noxious species that should be removed or controlled, a producer might consider letting some of their native or non-native forbs bloom prior to their crop bloom, mow the non-native forbs during crop bloom time and then let the forbs bloom afterward to enhance habitat for pollinator and other beneficial insect species. You also may allow some of your salad and cabbage crops to bolt and bloom. Beneficial insects are attracted to the flowers of arugula, chervil, chicory, mustards and other greens.

h. Herbaceous plantings should include at least one native bunch grass adapted to the site in addition to the three or more forbs from each of the three bloom-groupings (i.e. early spring, spring and summer - refer to Tables below). This scenario results in a minimum of 10 plant species per planting. Strive for an herbaceous planting that mimics a local prairie or bunchgrass assemblage of plant density and diversity (generally with a great diversity of herbs/forbs) to maximize pollinator habitat. Prairie communities generally contain at least one dominant grass in their compositions. These grasses often provide forage resources for beneficial insects and for larval growth stages of native butterflies (see Appendix A), potential nesting sites for colonies of bumble bees, and possible overwintering sites for beneficial insects, such as predaceous ground beetles.

Bunchgrasses usually have a deep fibrous root system which will help prevent weed invasion and help stabilize the soil. Rhizomatous grasses may not be desirable in this type of planting as they tend to dominate a site and might exclude the desired forbs/wildflowers in your

planting. Native prairies and bunchgrass communities in Oregon generally have some small open soil areas between plants, and thus available nest site areas for solitary ground-nesting bees.

i. *Plant density/spacing* – A basic rule of thumb for plant spacing is to place plants as far apart as the mature width of the plants that you are using or just a little less to ensure that the plants fill in and occupy the space from encroaching weeds. If you are planning to have multiple height layers, you should plant on a more open spacing to ensure that lower level plants have adequate light to flower in abundance. This approach works well if you are planning a pollinator hedgerow, although you may want to plan for some bee nesting habitat (undisturbed bare soil areas) elsewhere on the property or design for the “hedge bottom” (i.e., the herbaceous plant strip adjacent to a tree and shrub planting) with some open soil areas.

j. *Consider providing plants that supply food for larval growth stages of butterflies* (see attachment Appendix A) – consider this in the choices of plants selected for your pollinator enhancement or in addition to the pollen- and nectar-rich plants that you may choose.

k. *Consider your budget, phasing of plantings, and ordering plants ahead, if possible.* Funds will be needed for site preparation, plant materials, and maintenance. You may be able to gather seed or cuttings locally, or may need to buy seed or plants. It may be practical to build your project in phases over a period of time. You may consider the following approaches based on available funding and plant materials: a) plant the entire site with many different species, b) plant the entire site with a few species, and add more diversity as funding allows, or, c) plant many species on a part of the site, then use your own resulting seeds, seedlings or cuttings to expand the planted area. You may need to special-order some plant materials that you want to include in your plantings if they aren’t regular species that nurseries grow. You may need to place those orders to nurseries a year or more in advance of when you would like to have those plants to install on your site (e.g. some species require several years in the nursery to produce a plant of sufficient size for out-planting).

l. *Using non-natives.* If you must use non-native plants due to practical considerations, such as their low cost, better availability, or your interest in a temporary cover crop between plantings or short-term insectary plantings (plants that attract beneficial insects which predate or parasitize crop pests), use the tables below as a guide in choosing species that benefit pollinators.

2. Size and shape of your planting area

The larger the planting area, the greater the potential benefit to pollinator species. We recommend that **at least a 0.5 acre area be considered for enhancing plant habitat.** Particularly with herbaceous plantings, large, square planting blocks will minimize the edge around your planting and thus it’s susceptibility to invasion of weeds around its perimeter. However, linear corridor plantings (e.g. along a stream or a hedgerow, or a crop border) will often be the practical shape for planting locations.

3. Site Preparation

Site preparation is one of the most important, and often inadequately addressed, components for project success! The site should be properly prepared for seeding or planting your new plants. If an undesirable plant composition occupies the site, it must be removed for the new planting to have adequate habitat and reduced competition to establish. A site may also have a

large “soil bank” of accumulated weed seeds. Weed removal and control is a critical component of site preparation. ***It is often advisable to do site preparation for several years prior to planting if you know that the site has been occupied by weedy plants.*** Some site preparation techniques include careful use of herbicides, hand pulling, using weed wrenches, cultivating or mowing. You may need to seek competent advice on control techniques to eliminate unwanted or undesirable plants prior to planting natives.

4. Plant pollinator plants in clumps

It is more desirable for plants to be clumped with high densities of a given species within a small area rather than with a more interspersed distribution. Research suggests that clump-plantings of at least three foot by three foot blocks of an individual plant species are more attractive to pollinators than when a species is widely and randomly dispersed in smaller clumps. If you can plant single-species clumps (e.g. of a perennial or shrub species) that are five to ten feet on a side (i.e. more than 25 square feet), this may be more ideal for attracting pollinators and providing efficient foraging.

5. Seeding

It is desirable to use a seed drill or mechanized broadcast spreader for large sites and hand operated seeders for small sites. Broadcasting prairie seeds by hand is often a viable option and may result in more natural planting patterns; however, you will generally need to distribute more seed by this method than if seed can be drilled into the soil. Seeds need to have good surface contact to the soil in order to germinate and establish well, however, be careful not to plant seeds too deep. Many seeds also need light to germinate. At this point in time, seed of many native species is not readily available, nor is the technology well determined for its establishment success (e.g. seeding rates, compositions, or cultural needs). Depending on the size of your planting area or other objectives of your planting, you may want to consider using plugs or containerized plants.

6. Protection of plantings

For tree and shrub plantings, weed control and protection from livestock and wildlife is often necessary for small seedlings. Various weed mats and/or fencing or tubing of seedlings may be needed to establish plantings.

7. Maintenance of plantings

a. Water wisely. For the most successful establishment of plantings, water deeply at least every other week for the first two to three years, depending on site conditions (i.e. soil type, exposure to winds, etc.) until plants are well established.

b. Habitat plantings for pollinators should remain undisturbed (e.g. no grazing or mowing) throughout the growing season so that pollinators (and other beneficial insects) can utilize flower pollen and nectar resources (for adult stages) and vegetative parts of plants for food and cover resources (for immature/larval stages). If site maintenance must occur during the growing season in order to maintain the open, species rich habitat preferred by pollinators, establish a system for managing a small percentage (30% or less) of the site each year on a three to five year rotation. This will allow for recolonization of disturbed habitat from the surrounding area.

c. Plan for weed control; particularly during the first couple of years of establishment. Some alternatives include careful use of herbicides, hand pulling, using weed wrenches, cultivating, mowing or prescribed burning. Find the best approaches that suit your situation. Remember that soil disturbance can destroy native bee ground nests. In early plantings, mulch can help choke weeds and support seedlings, but will also smother potential ground nesting sites (bare soil) for bees. If weed growth is early in relation to the desirable plant growth period, mowing treatments might be used to reduce weed growth, lessen weed seed-set and thus reduce weed competition at a site.

d. Maintenance treatments, such as weeding, grazing, burning, or haying may be required outside of the flowering or growing season. When possible, conduct safe controlled burns for those plant communities naturally maintained by fire such as prairies, oak savannas, and many pine forests. If these areas are managed with prescribed burning, no more than half of the total acreage (ideally, one third or less) should be burned in any one year to provide a refuge area from which pollinators and beneficial insects can re-colonize the habitat.

Controlled, rotational grazing may be a viable option for managing the plant community. Grazing should generally occur during the pollinator dormant season and at light intensity, or at least with a long rest-rotation schedule of grazing. You may want to consult grazing specialists in determining a good site maintenance schedule for maximizing bloom and flower diversity. If burning or grazing is not possible or practical, plan to mow and remove clippings. For more details, see the Xerces Society's primer on habitat management for pollinators (http://www.xerces.org/pubs_merch/Managing_Habitat_for_Pollinators.htm).

D. Other habitat considerations.

1. Minimize pesticide use - especially use of any insecticides in the vicinity of your enhancement planting. If pest control is necessary, use bee-safe insecticides if possible. If you are uncertain about the toxicity of a product to bees, refer to the tables in the Pacific Northwest extension publication 591 "How to Reduce Bee Poisoning from Pesticides" (available on-line at <http://extension.oregonstate.edu/catalog/pdf/pnw/pnw591.pdf>). Where herbicides are needed for spot weed control, use carefully to preserve pollinator plants.

2. Include other habitat requirements. To complete the habitat requirements (e.g. shelter, water) of pollinator species, including butterflies as well as bees, intersperse the kind of diverse plantings described above with various sources of cover (Figure 1, Table 1). This cover may include rock and log piles or trees with exfoliating bark and cavities, patches of bare soil, standing dead wood, or plants with pithy stems. Also, include a source of clean water (bird bath, damp, sandy area, small pond, etc.) for honey bees or a muddy area for puddling butterflies or mason bee nesting material.

Approximately, 70% of native bees are solitary ground-nesters and need access to well-drained bare soil to make nests. Most of the remaining native bees nest in old beetle tunnels in wood or in the hollow center of pithy twigs. Nest sites for tunnel-nesting bees may be increased by drilling holes into standing dead wood or erecting nest blocks of wood filled with narrow tunnels. Also, consider including elderberry and other pithy stemmed plants. Many native bees will nest in the center of dead or cut-off twigs of these plants.

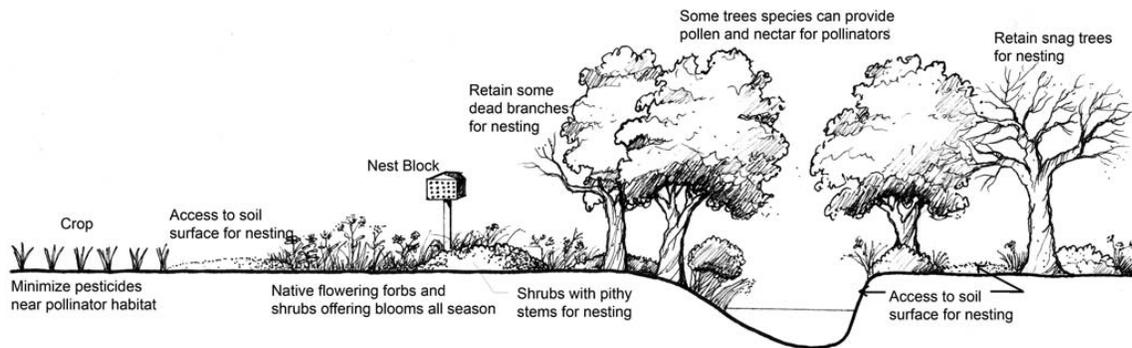


Figure 1. From: Agroforestry Note – 34: “Enhancing Nest Sites for Native Bee Crop Pollinators”

Table 1. General native pollinator habitat requirements

Pollinator	Food	Shelter
Solitary bees	Nectar and pollen	Most nest in bare or partially vegetated, well-drained soil; can also construct domed nests of mud, plant resins, saps, or gums on the surface of rocks or trees; nest in narrow tunnels in dead standing trees, or excavate nests within the pith of stems and twigs
Bumble bees	Nectar and pollen	Most nest in small cavities (approx. softball size), often underground in abandoned rodent nests, but can be in hollow trees or walls, or under a clump of grass.
Butterflies and Moths – egg	Non-feeding stage	Usually on or near larval host plant
Butterflies and Moths – Caterpillar	Leaves of larval host plants	Larval host plants
Butterflies and Moths - Pupa	Non-feeding stage	Protected site such as a bush, tall grass, a pile of leaves or sticks or, in the case of some moths, underground
Butterflies and Moths – Adult	Nectar; some males obtain nutrients, minerals, and salt from rotting fruit, tree sap, animal dung and urine, carrion, clay deposits, and mud puddles	Flowers and a variety of other resources: rotting fruit, tree sap, animal dung and urine, carrion, clay deposits, and mud puddles
Hummingbirds	Nectar, insects, tree sap, spiders, caterpillars, aphids, insect eggs, and willow catkins	Trees, shrubs, and vines. Typically need red, deep-throated flowers, such as twin berry or penstemons.

[From: Native Pollinators. Feb. 2006. Fish and Wildlife Habitat Management Leaflet. No. 34.]

II. Pollinator-Friendly Plantings and NRCS Practices

The Natural Resources Conservation Service supports the use of native species in many conservation practices that involve seeding or transplanting. Selecting pollinator-friendly native species for these practices can provide added conservation benefits. Many of these practices have a purpose or consideration for enhancing wildlife (that can include pollinators), however, the enhancement for wildlife should not compromise the intended function of the practice. For example, plants attractive to pollinators could be used in a grassed waterway practice but the planting should not interfere with the hydraulic function of the practice and objective of stabilizing the waterway from water erosion.

Some practices that could include pollinator friendly supplements as recommended by the Xerces Society include:

Conservation Practice Name (Units)	Code	Pollinator Notes
Alley Cropping (Ac.)	311	Can include native trees or shrubs or row covers (e.g. various legumes) that provide nectar or pollen (see <i>Agroforestry Note 33</i>).
Channel Bank Vegetation (Ac.)	322	Can include diverse flowering trees, shrubs, and forbs. Channel banks provide a unique opportunity to supply early-flowering willow and, in dry areas, late flowering native forbs (e.g. goldenrod (<i>Solidago</i> spp.)).
Conservation Cover (Ac.)	327	Can include diverse forbs (e.g. various legumes) to increase plant diversity and ensure flowers are in bloom for as long as possible, providing nectar and pollen throughout the season.
Conservation Crop Rotation (Ac.)	328	Can include rotation plantings that provide abundant forage for pollinators forbs (e.g. various legumes, buckwheat (<i>Eriogonum</i> spp.), phacelia (<i>Phacelia</i> spp.), etc.). Moving insect-pollinated crops no more than 250 meters (750 feet) during the rotation may help maintain local populations of native bees that have grown because of a specific crop or conservation cover. You may want to consider crop rotations that include a juxtaposition of diverse crops with bloom timing that overlaps through the season to support pollinator populations. You might also consider eliminating, minimizing insecticides and/or using bee-friendly insecticides in cover crop rotations.
Constructed Wetland (Ac.)	656	Constructed wetlands can include plants that provide pollen and nectar for native bees and other pollinators. Possible plant genera with obligate or facultative wetland species include: <i>Rosa</i> spp., <i>Ribes</i> spp., <i>Salix</i> spp., <i>Rubus</i> spp., <i>Crataegus</i> spp., <i>Spirea</i> spp., <i>Solidago</i> spp., <i>Cornus</i> spp. Look for appropriate wetland plants from these genera for your region.
Contour Buffer Strips (Ac.)	332	Can include diverse legumes or other forbs that provide pollen and nectar for native bees. In addition, the recommendation to mow only every two or three years to benefit wildlife also will benefit nesting bumble bees. To protect bumble bee nests, mowing should occur in the late Fall when colonies have died for the year and queens are overwintering.
Cover Crop (Ac.)	340	Can include diverse legumes or other forbs that provide pollen and nectar for native bees. Look for a diverse mix of plant species that overlap in bloom timing to support pollinators throughout the year. Some examples of cover crops that are utilized by bees include clover (<i>Trifolium</i> spp.), phacelia (<i>Phacelia</i> spp.), and buckwheat (<i>Eriogonum</i> spp.). Many

Conservation Practice Name (Units)	Code	Pollinator Notes
		“beneficial insect” cover crop blends include plant species that will also provide forage for pollinators.
Critical Area Planting (Ac.)	342	Can include plant species that provide abundant pollen and nectar for native bees and other pollinators.
Early Successional Habitat Development/Management (Ac.)	647	This management practice is important for maintaining prime open and sunny habitat for pollinators. NOTE: To minimize damage to pollinator populations, disturbance practices should be implemented only every two to three years and, ideally, on only 30 percent or less of the overall site. This allows for recolonization from non-treated habitat. For example, mowing or burning one-third of the site every two or three years, on a three-year cycle. In addition, when possible, disturbance practices should be implemented when most pollinators are inactive, such as in late fall or winter.
Field Border (Ft.)	386	Can include diverse legumes or other forbs that provide pollen and nectar for native bees. Strive for a mix of forbs and shrubs that come into bloom at different times throughout the year. Site management (for example, mowing) should occur in the fall to minimize impacts on pollen and nectar sources used by pollinators. If a goal is to create potential nesting habitat for bees, mowing, combined with no tillage, can maintain access to the soil surface that may provide nesting habitat for ground-nesting solitary bees. Alternatively, allowing field borders to become overgrown (e.g. with native bunch grasses) may provide nesting habitat for bumble bees.
Filter Strip (Ac.)	393	Can include legumes or other forbs that provide pollen and nectar for native bees. Look for a diverse mix of plant species that come into bloom at different times throughout the year. Site management (for example, mowing or burning) should occur in the fall to minimize impacts on pollinators.
Forest Stand Improvement (Ac.)	666	Can help maintain open understory and forest gaps that support diverse forbs and shrubs that provide pollen and nectar for pollinators. Standing dead trees may be kept or drilled with smooth 3- to 6-inch deep holes to provide nesting sites for bees.
Grassed Waterway (Ac.)	412	Can include diverse legumes or other forbs that provide pollen and nectar for native bees. In dry regions, these sites may be able to support flowering forbs with higher water requirements and thus provide bloom later in the summer.
Hedgerow Planting (Ft.)	422	Can include forbs and shrubs that provide pollen and nectar for native bees. Look for a diverse mix of plant species that come into bloom at different times throughout the year. Bee nesting sites also may be incorporated, including semi-bare ground or wooden block nests. Including strips of unmowed grasses and forbs along the edge of the hedgerow may provide nesting opportunities for bumble bees. This practice also can help reduce drift of pesticides onto areas of pollinator habitat.
Herbaceous Wind Barriers (Ft.)	603	Can include diverse forbs and shrubs that provide pollen and nectar for native bees. Look for a diverse mix of plant species that come into bloom at different times throughout the year.
Multi-Story Cropping (Ac.)	379	Woody plants may be chosen that supply pollen and nectar for pollinators. Look for mixes of plants that flower at different times throughout the growing season and can support populations of pollinators over time.

Conservation Practice Name (Units)	Code	Pollinator Notes
Pasture and Hay Planting (Ac.)	512	Can include diverse legumes (e.g. alfalfa, clovers) or other forbs that, when in bloom, provide pollen and nectar for native bees.
Pest Management (Ac.)	595	Biological pest management can include plantings that attract beneficial insects that predate or parasitized crop pests. These plantings can also benefit pollinator species. Plants commonly used for pest management that also benefit bees include: yarrow (<i>Achillea</i> spp.), phacelia (<i>Phacelia</i> spp.), and sunflowers (<i>Helianthus</i> spp.). Can include legumes or other forbs that provide pollen and nectar for native bees. Look for a diverse mix of plant species that come into bloom at different times throughout the year.
Prescribed Burning (Ac.)	338	Can greatly benefit pollinators by maintaining open, early successional habitat. NOTE: It is best if (a) only 30% or less of a site is burned at any one time to allow for recolonization by pollinators from adjacent habitat and (b) if burning occurs when pollinators are least active, such as when most plants have senesced or in the fall.
Prescribed Grazing (Ac.)	528	Can help maintain late successional habitat and its associated flowering plants. Can help provide for a stable base of pollinator plant species. Note: Properly managed grazing can sustain and improve all pollinator forage (pollen and nectar sources) and potential nesting sites for ground-nesting and cavity-nesting bees. Provide rest-rotation in pastures/fields during spring and summer when pollinators are most active.
Range Planting (Ac.)	550	Can include diverse legumes, other forbs, or shrubs that provide pollen and nectar for native bees.
Residue and Tillage Management, No-Till/Strip Till/Direct Seed (Ac.)	329	Leaving standing crop residue can protect bees that are nesting in the ground at the base of the plants they pollinate. Tillage digs up these nests (located 0.5 to 3 feet underground) or blocks emergence of new adult bees the proceeding year.
Restoration and Management of Rare and Declining Habitats (Ac.)	643	Can be used to provide diverse locally grown native forage (forbs, shrubs, and trees) and nesting resources for pollinators. Many specialist pollinators that are closely tied to rare plants or habitats may significantly benefit from efforts to protect rare habitat. In addition, certain rare plants require pollinators to reproduce. Note: Pollinator plants should only be planted if they were part of the rare ecosystem you are trying to restore.
Riparian Forest Buffer (Ac.)	391	Can include trees, shrubs, and forbs especially chosen to provide pollen and nectar for pollinators. This practice also can help reduce drift of pesticides onto areas of pollinator habitat.
Riparian Herbaceous Cover (Ac.)	390	Can include diverse forbs that provide pollen and nectar for native bees. In drier parts of the U.S., many of these forbs flower in the late summer and fall, when forage is needed most.
Silvopasture Establishment (Ac.)	381	If grazing intensity is low enough to allow for plants to flower, this practice can include legumes and other forbs that provide pollen and nectar for native bees. Trees and shrubs that provide pollen and nectar also can be planted.
Stream Habitat Improvement and Management (Ac.)	395	Plants chosen for adjoining riparian areas can include trees, shrubs, and forbs that provide pollen and nectar for pollinators. Maximizing plant diversity along riparian corridors will result in more pollinators and other terrestrial insects to feed fish in the streams.

Conservation Practice Name (Units)	Code	Pollinator Notes
Streambank and Shoreline Protection (Ft.)	580	If vegetation is used for streambank protection, plants can include trees, shrubs, and forbs (for example, willow (<i>Salix</i> spp.), dogwood, (<i>Cornus</i> spp.) and goldenrod (<i>Solidago</i> spp.)) especially chosen to provide pollen and nectar for pollinators.
Stripcropping (Ac.)	585	Can include diverse legumes or other forbs that provide pollen and nectar for native bees. Also, if insect pollinated crops are grown, plants used in adjacent strips of vegetative cover may be carefully chosen to provide a complementary bloom period to the crop, such that the flowers available at the field are extended over a longer period of time.
Tree/Shrub Establishment (Ac.)	612	Can include trees and shrubs especially chosen to provide pollen and nectar for pollinators, or host plants for butterflies.
Upland Wildlife Habitat Management (Ac.)	645	Can include managing for pollinator forage or pollinator nest sites, such as nest blocks or snags for cavity nesting bees, or overgrown grass cover for bumble bees.
Vegetative Barriers (Ft.)	601	Can include plants that provide pollen and nectar for pollinators as long as they are of a stiff, upright stature for impeding surface water flow..
Vegetated Treatment Area (Ac.)	635	Can include plants that provide pollen and nectar for pollinators.
Wetland Enhancement (Ac.)	659	Wetland and adjacent upland can include trees, shrubs, and forbs especially chosen to provide pollen and nectar for pollinators. Snags can be protected or nest blocks for bees erected. . Some forbs used for enhancement will require pollinators to reproduce.
Wetland Restoration (Ac.)	657	Wetland and adjacent upland can include trees, shrubs, and forbs especially chosen to provide pollen and nectar for pollinators. Snags can be protected or nest blocks for bees erected. Some forbs used for restoration will require pollinators to reproduce.
Wetland Wildlife Habitat Management (Ac.)	644	Wetland and adjacent upland can include trees, shrubs, and forbs especially chosen to provide pollen and nectar for pollinators. Snags can be protected or nest blocks for bees erected.
Windbreak/Shelterbelt Establishment (Ft.)	380	Can include trees, shrubs, and forbs especially chosen to provide pollen and nectar for pollinators. Can also be a site to place nesting structures for native bees. Windbreaks and shelter belts also will help reduce drift of insecticides on to a site.
Windbreak/Shelterbelt Renovation (Ft.)	650	Can include trees, shrubs, and forbs especially chosen to provide pollen and nectar for pollinators. If appropriate, dead trees and snags may be kept or drilled with holes to provide nesting sites for bees.

Complete Oregon NRCS Practice Standards and Specifications can be found at the electronic Field Office Technical Guide at <http://efotg.nrcs.usda.gov/treemenuFS.aspx> .

NRCS conservation cost-share programs such as the Environmental Quality Incentives Program (EQIP) (<http://www.or.nrcs.usda.gov/programs/eqip/>) and the Wildlife Habitat Incentives Program (WHIP) (<http://www.or.nrcs.usda.gov/programs/whip/index.html>) can help agricultural producers with the establishment of native species plantings, including the pollinator-friendly species listed in this technical note. The Farm Service Agency cost-share and retirement programs, such as the Conservation Reserve Program and the Conservation Reserve Enhancement Program, also provide many opportunities to support pollinator habitat. Information about these programs can be found at:

Conservation Reserve Program - <http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp> Conservation Reserve Enhancement Program - <http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=cep>

III. Plant Tables

Below are tables with information about non-native cover crop, insectary and garden plants, and native grasses, trees, shrubs, and wildflowers to consider for plantings to enhance pollinator habitat in Oregon. These tables include brief information on bloom timing and the basic cultural needs of the plants. The information provided is a starting point for determining plants to use for a particular project. To find species that are available and/or hardy for your location, consult field guides, plant nurseries, and/or garden guides. You will want to consult further information from species fact sheets like those found at the PLANTS database (<http://plants.usda.gov/java/factSheet>) as well as other sources of information on species cultural needs in your geographic location and for your site conditions. Technical Note #2, “Plants for Pollinators in the Intermountain West” has recently been published out of the Idaho State Office of NRCS and would be a good reference when working with producers in eastern Oregon (http://www.id.nrcs.usda.gov/programs/tech_ref.html).

These tables are not exhaustive; many other native plants are good for bees. These lists were limited to those plants thought to require insect pollination and to be relatively widespread and commonly found in Oregon and available in the public marketplace as seeds, bare root, or containerized plants. We were especially inclusive in our table for native forbs/wildflowers since nurseries are quickly determining how to produce these plants for the public marketplace.

A. Non-native Plantings

Currently, seed of few native species are available in affordable quantities for use as cover crops, green manures or short-term plantings. A number of non-native plants have been developed and work very well for these purposes. Some of these species show weedy characteristics (e.g. able to reproduce and spread) so you will want to choose appropriate species for your needs and watch their development on your site.

1. Cover crop and insectary plants - good for bees and beneficial insects

Cover crops are generally established for seasonal vegetative cover and soil conservation. They reduce soil erosion and weed competition, and improve soil organic material and soil tilth. They may be part of a crop rotation that is a harvested crop or they may be inter-planted between crop rows (e.g. vineyards) to enhance soil organic matter and nutrients. Nitrogen-fixing legumes are often used in cover crop mixtures to increase soil nitrogen. Broadleaf cover crops (i.e. forbs) can also provide good pollen or nectar sources for bees and other beneficial insects.

Insectary plantings are plantings that may be placed as a block inside of a crop, along the borders or placed just outside of a crop to attract beneficial insects to the crop for biological control (i.e. predators or parasitoids) of crop pests. Beneficial insects can be as much as ten times more

abundant in insectary plantings as nearby. Some of these plants can also provide good pollen or nectar sources for bees. These may be annual plantings or more permanent plantings along the outer rows within the field or outside but adjacent to the crop field. The principles of enhancement for pollinators also generally apply to insectary plantings - such as including a diversity of flowers that bloom through the entire growing season to provide a steady supply of nectar and pollen.

Insectary plants often have very small flowers. Predatory and parasitoid beneficial insects are often small insects with small mouth-parts such that plants with simple, cup-shaped and open flowers (that the insects can easily access) are preferred flowers for feeding on.

The species suggested below are known to be used commonly in farm practices and presumed to be widely available in the marketplace. These plants will generally do best in a full sun location and will require supplemental summer watering as most require medium to high water availability. Fertility requirements are generally medium to high so these plants will require good rich soils and supplemental fertilization to grow and flower well.

Table 2. Seasonal cover crop or insectary plants (also provided as an Excel spreadsheet with this note. You will need to save it with a different file name so that you can sort the data and tailor for your project ftp://ftp-fc.sc.egov.usda.gov/OR/Technical_Notes/Plant%20Materials/PMC_13_Table_2_Insectary_and_Cover_Crop_Plants.xls).

Common Name	Scientific Name	Bloom timing	Flower color	Cover (C) or Insectary (I) plants	Beneficial Insect Visitors
*+Alfalfa	<i>Medicago sativa</i>	Early-mid	Purple	C	Bees, assassin bugs, lady bug beetles, pirate bugs, parasitic wasps,
*Alyssum, annual or sweet	<i>Lobularia maritima</i>	Mid-late	White to purples	I	Bees, hoverflies, lacewings, parasitic wasps, pirate bugs
*+Baby blue eyes (native)	<i>Nemophila meziesii</i>	Early	White	I	Bees, parasitic wasps, pirate bugs
Basil	<i>Ocimum basilicum</i>	Mid	White	I	Bees
*+Bell beans	<i>Vicia faba</i>	Early-mid	White	C	Bees
+Borage	<i>Borago officinalis</i>	Mid	Blue	I	Bees
*+Buckwheat, California	<i>Eriogonum fasciculatum</i>	Mid	Pink	I/C	Bees, hover flies, pirate bugs

Common Name	Scientific Name	Bloom timing	Flower color	Cover (C) or Insectary (I) plants	Beneficial Insect Visitors
(native)					
*+Buckwheat, sulphur-flowered (native)	<i>Eriogonum umbellatum</i>	Mid-late	Yellow	I/C	Bees, hover flies, pirate bugs
*+Buckwheat (non-native crop)	<i>Fagopyrum esculentum</i>	Mid-late	White	I/C	Bees
Calendulas, pot marigold	<i>Calendula officinalis</i>	Early-mid	Orange, yellow	I	Bees, various predators and parasitoids
*Coriander (cilantro)	<i>Coriandrum sativum</i>	Mid	White	I	Bees, hover flies, parasitics wasps, pirate bugs
*Corn cockle	<i>Agrostemma githago</i>	Late to early	Pink	I	Bees, lady bug beetles, parasitics wasps
*+Cosmos	<i>Cosmos bininnatus</i>	Mid-late	White(best), pinks, purple	I	Bees, hoverflies, parasitic wasps, lacewings, lady bug beetles
*+Clover, Crimson	<i>Trifolium incarnatum</i>	Early-mid	Red	C	Bees
*+Clover, Red	<i>Trifolium pratense</i>	Mid	Pink	C	bees
*+Dill	<i>Anethum graveolens</i>	Mid-late	Yellow	I	Bees, lady bug beetles, lacewings, wasps
*Marigolds (single petal varieties)	<i>Tagetes patula</i>	Mid-late	Yellow to oranges	I	Various predators and parasitoids
*+Mexican sunflower	<i>Tithonia rotundiflora</i>	Mid	Orange	I	Bees
*+Mint, Korean licorice	<i>Agastache rugosa</i>	Mid-late	Purples	I	Bees
*+Mustards	<i>Brassica</i> species	Early	Yellow	I	Bees
+Pincushion flower	<i>Scabiosa</i> species	Mid-late	Pink to blue	I	Bees
*+Phacelia	<i>Phacelia tanaecitifolia</i>	Mid-late	Purples	I/C	Bees, syrphid flies
Pigweed	<i>Amaranthus</i>	Mid-late	Red	I	Ground beetles

Common Name	Scientific Name	Bloom timing	Flower color	Cover (C) or Insectary (I) plants	Beneficial Insect Visitors
*+Tidytips	<i>Layia platyglossa</i>	early-late	Yellow and white	I	Bees, parasitic wasps, pirate bugs
*+Sunflower	<i>Helianthus annulus</i>	Mid-late	Yellow	I	Bees, Pirate bugs beneficial mites, various predators and parasitoids
+Vetch	<i>Vicia</i> species	Early to late	Whites to purples	C	Bees
Zinnias (no double petals)	<i>Zinnia</i> species	Mid-late	Multi-colors	I	Various predators

* - particularly good insectary plants.

+ - particularly good bee plant

2. Plant a perennial herb or flower garden near your crop

This type of planting will generally be a more permanent planting along the outer rows within the field or outside but adjacent to the crop field. The principles of enhancement for pollinators will also apply to these plantings - such as including a diversity of flowers that bloom through the entire growing season to provide a steady supply of nectar and pollen. Also, when selecting plant varieties, keep in mind that the simple-flowered varieties generally provide greater nectar and pollen rewards for pollinators than the multi-petaled (e.g. double petal) varieties.

The plants suggested below are all commonly available perennial plants. These plants will generally do best in a full sun location and will require supplemental summer watering as most require medium to high water availability. Fertility requirements are generally medium to high so these plants will require good rich soils and supplemental fertilization to grow and flower well. Establishment of these plants may take a few years, but they will last for an extended period of years.

Table 3. Perennial herbs and flowers to plant near a crop for bees and other beneficial insects (also provided as an Excel spreadsheet with this note. You will need to save it with a different file name so that you can sort the data and tailor for your project ftp://ftp-fc.sc.egov.usda.gov/OR/Technical_Notes/Plant%20Materials/PMC_13_Table_3_Non-native_Perennials.xls).

Common Name	Scientific Name	Bloom Timing	Flower color	Visitors
+Agastache, mint	<i>Agastache</i> species	Mid-late	Pink to purple	Bees
*Alyssum, perennial	<i>Aurinia saxitalis</i>	Mid-late	White to purples	Bees, hover flies

Common Name	Scientific Name	Bloom Timing	Flower color	Visitors
+Black-eyed Susan	<i>Rudbeckia</i> species	Mid	Orange and black	Bees
+Blanket flower	<i>Gaillardia grandiflora</i>	Mid-late	Orange and red	Bees
+Blue-beard	<i>Caryopteris incana</i>	Late	Blue	Bees
+Bluebells, scorpionweed	<i>Phacelia</i> species	Mid	Blue	Bees,
+Buckwheats	<i>Eriogonum</i> species	Mid	Cream, yellows	Bees
*Candytuft, globe or common	<i>Iberis umbellata</i>	Early-late	White, pink, purple	Bees, hoverflies
Cardoon, artichoke	<i>Cynara cardunculus</i>	Mid	Purple	Bees
+Cat mint, catnip	<i>Nepeta x faassenii</i>	Mid-late	Blue-purple	Bees
*Chicory	<i>Cichorium intybus</i>	Mid-late	Blue	Various predators and parasitoids
+Chrysanthemum (simple flowered)	<i>Chrysanthemum</i> species	late	Multi-colors	Various predators and parasitoids
*Cilantro, coriander	<i>Coriandrum sativum</i>	mid	White	Various predators
+Coneflower, purple	<i>Echinacea purpurea</i>	Mid-late	Pink to purple	Bees
*Crown pink (Rose Champion)	<i>Lychnis coronaria</i>	Mid-late	Pink - white	Bees, hover flies, parasitic wasps
+Daisy, Seaside	<i>Erigeron glaucus</i>	Early-mid	Blue	Bees, butterflies
Dusty Miller	<i>Centaurea cineraria</i>	Mid-late	Yellow	Bees
*Feverfew	<i>Chrysanthemum parthenium</i>	Mid-late	White	Bees, hover flies, various predators and parasitoids
Geraniums, scented	<i>Pelargonium graveolens</i>	Mid	Whites to pinks and reds	Bees
Globe thistle	<i>Echinops</i> species	Late	Blue	Bees
+Goldenrod	<i>Solidago</i> species	Late	Yellow	Bees
Horehound	<i>Marrubium vulgare</i>	Mid	White	Bees
Hyssop	<i>Hyssopus</i> species	Mid-late	White, pinks to purples	bees
+Lavender	<i>Lavandula</i> species	Mid	Blues-purples	Bees

Common Name	Scientific Name	Bloom Timing	Flower color	Visitors
*Lovage	<i>Levisticum officinale</i>	Mid-late	Yellow	
*Lupine	<i>Lupinus</i> species	Early-mid	Purples	Aphidium, aphidoletes, hoverflies
Monch	<i>Aster frikartii</i>	Mid-late	Purples	Bees
+Mint (be careful that species selected are not weedy)	<i>Mentha</i> species	Mid-late	White, pinks, purple	Bees
+Onions, many species (be careful that species selected are not weedy)	<i>Allium</i> species	Early-mid	White, pink, purples	Bees
+Oregano	<i>Origanum vulgare</i>	Mid	Purple	Bees
*Parsley	<i>Petroselinum crispum</i>	Mid-late	Yellow	Parasitic wasps, hoverflies, tachinid flies
+Penstemons	<i>Penstemon</i> species	Mid-late	White, pink, red, purple	Bees, hummingbirds
*+Phacelia, tansy	<i>Phacelia tanaecitifolia</i>	Early-mid	Yellow	Bees
+Pincushion flower	<i>Scabiosa columbaria</i>	Mid-late	Pink to blue	Bees
+Purple coneflower	<i>Echinacea purpurea</i>	Mid-late	Pink-purple	Bees
+Purple toadflax	<i>Linaria purpurea</i>	Mid	Purple	Bees
+Rosemary	<i>Rosmarinus</i> species	Mid	White, pink, purples	Bees
*Rue	<i>Ruta graveolens</i>	Mid	Yellow	Bees, mud wasps, parasitics wasps, potter wasps
+Sage (be careful that species selected are not weedy)	<i>Salvia</i> species	Mid-late	White to purples	Bees
+Sea holly	<i>Eryngium</i> species	Mid	Blue	Bees
+Sedum, stonecrop	<i>Sedum</i> species	Early	White to yellows	Bees
+Squash gourd, pumpkin	<i>Cucurbita</i>	Mid	orange	Bees
+Spearmint	<i>Mentha spicata</i>	id	White	Bees
*Statice	<i>Limonium perezii. L. latifolium</i>	Mid-late	Purple	Bees, Hoverflies,

Common Name	Scientific Name	Bloom Timing	Flower color	Visitors
				parasitic wasps
+Strawberries	<i>Fragaria</i> species	Early	White	Bees
*+Sunflower	<i>Helianthus</i> species	Mid-late	Yellows to reds	Bees, Pirate bugs, aphidius
+Thyme	<i>Thymus</i> species	Mid	White, pink, purples	Bees
*+Tickseed	<i>Coreopsis grandiflora</i> cultivars	Mid-late	Yellow, orange to maroon	Bees, hover flies, lacewings, lady bug beetles, parasitic wasps
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 bug beetles, parasitic wasps

* - particularly good insectary plant

+ - particularly good bee plant

Many other garden plants are also known to be used widely by bees. For additional plants known to be attractive to native bees go to: Logan Bee Lab's list of "Plants Attractive to Native Bees" <http://www.ars.usda.gov/Main/docs.htm?docid=12052>

3. Alternative plantings containing a mixture of native and non-native plants

Technical notes have been developed in Idaho and Montana

(<http://www.mt.nrcs.usda.gov/technical/ecs/plants/pollinator/index.html> and

http://www.id.nrcs.usda.gov/programs/tech_ref.html - Technical Note #2) for pollinator enhancements that contain a variety of native and non-native plant options. This information may be useful in designing a pollinator enhancement planting in eastern Oregon.

B. Native Plantings

The cost of native plants may appear to be more expensive than non-native alternatives when comparing costs at the nursery, but when the costs of maintenance (e.g. weeding, watering, fertilizing) are calculated over the long-term, native plantings can ultimately be more cost-efficient for pollinator enhancement. Native plantings also give the added benefit of enhancing native biological diversity (e.g. plant and wildlife diversity) and are the logical choice to enhance native pollinators.

The tables for native plantings contain information about which Major Land Resource Areas (MLRA's) the recommended species occur in Oregon and thus where their use would be most appropriate (<http://soils.usda.gov/survey/geography/mlra/index.html>). MLRA's are roughly equivalent to the Environmental Protection Agency's "Ecoregion" boundaries (Oregon http://www.epa.gov/wed/pages/ecoregions/or_eco.htm and http://oregonstate.edu/dept/range/projects/EcologicalProvincesOfOregon/province_map.htm) and somewhat synonymous in having similar climate and soils within a designated MLRA or Ecoregion. This MLRA map is provided to aid in making your plant choices.

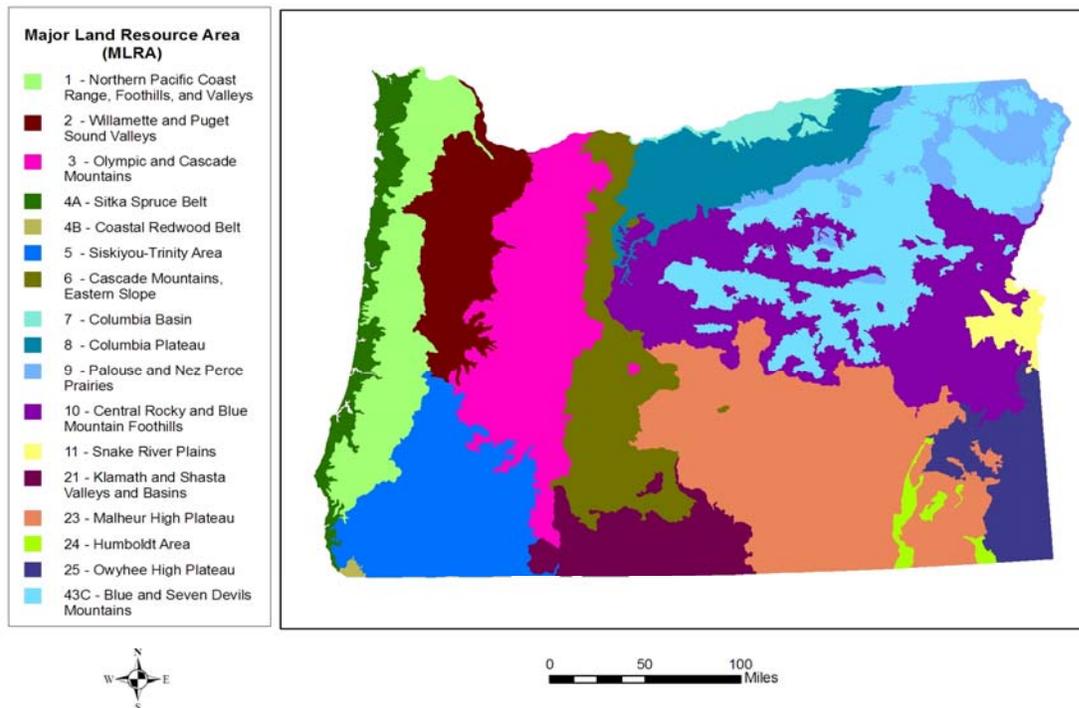


Figure 2. Map of the Major Land Resource Areas (MLRA's) in Oregon

1. Native Trees and Shrubs for pollinator enhancement

Tree and shrub plantings may be designed for a number of concurrent purposes, such as riparian wildlife enhancement, stream stabilization, windbreak, and/or pollinator enhancement. These are just some of the tree and shrub species that you might want to consider, paying close attention to overlapping bloom periods and the appropriate plant for the site conditions.

Table 4. Native trees and shrubs for pollinators (see attachment [ftp://ftp-fc.sc.egov.usda.gov/OR/Technical_Notes/Plant_Materials/PMC_13_Table_4_Native_Treesshrubs_for_Pollinators\(2\).xls](ftp://ftp-fc.sc.egov.usda.gov/OR/Technical_Notes/Plant_Materials/PMC_13_Table_4_Native_Treesshrubs_for_Pollinators(2).xls)). This is an Excel spreadsheet attachment included with this note. You will need to save it with a different file name so that you can sort the data and tailor for your region/project.

2. Native Forbs (wildflowers)

There is a vast array of forbs to choose from in designing a pollinator enhancement. We generally narrowed our original list to species that are relatively widespread and common in Oregon. We were especially inclusive in our table here since nurseries are quickly determining how to produce native forbs for the public marketplace. These are species that you might consider using in a Hedgerow “bottom” (at the base of one or both sides of a hedgerow), Riparian buffer, Windbreaks, Alley cropping, Field border, Filter strip, Waterway or Range planting to enhance conditions for pollinators. These are just some of the plant options that you might want to consider, paying close attention to overlapping bloom periods and the appropriate plant for the site conditions.

Table 5. Native forbs/wildflowers for pollinators (see attachment ftp://ftp-fc.sc.egov.usda.gov/OR/Technical_Notes/Plant%20Materials/PMC_13_Table_5_Native_Forbs_for_Pollinators.xls). This is a two-part Excel spreadsheet attachment included with this note; one sheet contains native perennials and the other contains note-worthy native annuals to trial in plantings. You will need to save it with a different file name so that you can sort the data and tailor a plant list for your region/project.

3. Native bunch grasses to include in an herbaceous mixture of native forbs

Herbaceous plantings should include at least one native bunch grass adapted to the site in addition to the forbs that you will be planting for pollinator enhancement. Including a grass in your planting mixture will help keep weeds out of your planting area, help stabilize the soil and potentially provide overwintering habitat for beneficial insects, forage resources for larval growth stages of some butterflies, and potential nest sites for bumble bees. See comments at Section I.C.1.h. above.

Table 6. Native bunchgrasses for herbaceous plantings (see attachment [ftp://ftp-fc.sc.egov.usda.gov/OR/Technical_Notes/Plant%20Materials/PMC_13_Table_6_Grasses_for_Plantings%20\(2\).xls](ftp://ftp-fc.sc.egov.usda.gov/OR/Technical_Notes/Plant%20Materials/PMC_13_Table_6_Grasses_for_Plantings%20(2).xls)). This is an Excel spreadsheet attachment included with this note. You will need to save it with a different file name so that you can sort the data and tailor a plant list for your region/project.

References Used in Preparing this Summary and Further Information:

- Black, S.H., N. Hodges, M. Vaughan and M. Shepherd. 2008. Pollinators in Natural Areas: A Primer on Habitat Management
http://www.xerces.org/pubs_merch/Managing_Habitat_for_Pollinators.htm
- Rees, J., Vaughan, M., Williams J. 2007. [Introduction to Insect Pollinators](#). (238 KB). NRCS, Portland, Oregon. June 2007. 2p. (ID# 7561) <http://www.plant-materials.nrcs.usda.gov/pubs/orpmcbr7561.pdf>
- Shepherd M., S. Buchmann, M. Vaughan and S. Black. 2003. *Pollinator Conservation Handbook*. The Xerces Society. Portland, OR. 145 pp.
- USDA, NRCS and FS, Agroforestry Note – 32: “Agroforestry: Sustaining Native Bee Habitat for Crop Pollination,” Vaughan, Mace and Black, Scott Hoffman, 2006. USDA National Agroforestry Center. <http://www.unl.edu/nac/agroforestrynotes/an32g06.pdf>
- USDA, NRCS and FS, Agroforestry Note – 33: “Agroforestry: Improving Forage for Native Bee Crop Pollinators,” Vaughan, Mace and Black, Scott Hoffman, 2006. USDA National Agroforestry Center. <http://www.unl.edu/nac/agroforestrynotes/an33g07.pdf>
- USDA, NRCS and FS, Agroforestry Note – 34: “Enhancing Nest Sites for Native Bee Crop Pollinators,” Vaughan, Mace and Black, Scott Hoffman, 2006. USDA National Agroforestry Center. <http://www.unl.edu/nac/agroforestrynotes/an34g08.pdf>
- USDA, NRCS and FS, Agroforestry Note – 35: “Pesticide Considerations for Native Bees in Agroforestry,” Vaughan, Mace and Black, Scott Hoffman, 2006. USDA National Agroforestry Center. <http://www.unl.edu/nac/agroforestrynotes/an35g09.pdf>
- USDA, NRCS, Conservation Security Program Job Sheet: “Nectar Corridors,” Plant Management EPL 41.
www.wv.nrcs.usda.gov/programs/csp/06csp/JobSheets/nectarCorridorsEL41.pdf
- USDA, NRCS, 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>
- USDI, BLM, Technical Reference 1730-3. “Landscaping with Native Plants of the Intermountain Region.” 2003. 47pp.
<http://www.id.blm.gov/publications/TR1730-3/index.htm>
- USDA, NRCS, “Creating Native Landscapes in the Northern Great Plains and Rocky Mountains.” 2001. 16p. <http://www.mt.nrcs.usda.gov/technical/ecs/plants/xeriscp/>
- USDA, NRCS, “Montana Native Plants for Pollinator Friendly Plantings.” 2005. 8p.
<http://www.mt.nrcs.usda.gov/technical/ecs/plants/pollinator/index.html>

USDA, NRCS, Montana Biology Technical Note No. 20. "Habitat Development for Pollinator Insects." 2004. 2p.

<http://www.mt.nrcs.usda.gov/technical/ecs/biology/technotes/biotechnoteMT20.html>

Vaughan, M., M. Shepherd, C. Kremen, and S. Black. 2007. "Farming for Bees: Guidelines for Providing Native Bee Habitat on Farms. 2nd Ed.," Xerces Society. 44 pp.

http://www.xerces.org/Pollinator_Insect_Conservation/Farming_for_Bees_2nd_edition.pdf

See "Native Pollinators", "Butterflies", "Bats", and "Ruby-throated Hummingbird" Fish and Wildlife Habitat Management Leaflet Numbers 34, 15, 5, and 14 respectively.

<http://www.whmi.nrcs.usda.gov/technical/leaflet.htm>

Web-Sites:

Pollinator Information

- *The Xerces Society Pollinator Program
http://www.xerces.org/Pollinator_Insect_Conservation
- USDA ARS Logan Bee Lab, www.loganbeelab.usu.edu
- The Pollinator partnership <http://www.pollinator.org/>
- Forest Service Pollinator Info <http://www.fs.fed.us/wildflowers/pollinators/index.shtml>
- U.S. Fish & Wildlife Service Info www.fws.gov/pollinators/
- Pollinator friendly practices <http://www.nappc.org/PollinatorFriendlyPractices.pdf>
- Your Urban Garden Is Better With Bees
<http://www.pollinator.org/Resources/Better%20with%20Bees.pdf>
- Logan Bee Lab – list of plants attractive to native bees
<http://www.ars.usda.gov/Main/docs.htm?docid=12052>
- Urban bee gardens <http://nature.berkeley.edu/urbanbeegardens/index.html>

Conservation Biological Pest Control Information

- Oregon State University, Integrated Plant Protection Center <http://www.ipmnet.org/>
- A Pocket Guide to the Common Natural Enemies of Crop and Garden Pests in the Pacific Northwest (pdf) <http://extension.oregonstate.edu/catalog/pdf/ec/ec1613-e.pdf>
- Practical Guidelines for Establishing, Maintaining and Assessing the Usefulness of Insectary Plantings on Your Farm (pdf)
http://www.ipmnet.org/Posters_and_Presentations/Farm_Insectary_Plant_Manual_Draft2_Pressqual1.pdf
- Beneficial Insects <http://www.pollinator.com/beneficials/beneficial.htm>
- Natural pest control <http://www.grinningplanet.com/2005/04-26/beneficial-insect-natural-pest-control-article.htm>
- Enhancing Biological Control with Beneficial Insectary Plants
<http://ifs.orst.edu/insect.html>
- *Farmscaping to Enhance Biological Control <http://www.attra.org/attra-pub/farmscape.html#appendixa>
- Michigan State University's Enhancing Beneficials with Native Plants
<http://nativeplants.msu.edu/>

- What are insectary plants - http://en.wikipedia.org/wiki/Insectary_plants
- Benefits of Insectary Plants
http://www.csrees.usda.gov/nea/pest/in_focus/bbpest_if_benefits.html
- Garden insectary http://eartheasy.com/grow_garden_insectary.htm See: tables
- Case study with broccoli <http://www.agroecology.org/cases/insectaryplants.htm>
- Beneficial Insects for Gardens
<http://www.mastergardenproducts.com/sustainablelandscape/beneficialinsects.htm>
- Banking on beetles in Oregon
<http://ippcweb.science.oregonstate.edu/beetlebank/index.htm>
- Insectary planting http://oregonstate.edu/dept/nurspest/Insectary_plants.htm

Landscaping/Restoration with Natives

- Considerations in choosing native plant materials
<http://www.fs.fed.us/wildflowers/nativeplantmaterials/index.shtml>
- Selecting Native Plant Materials for Restoration
<http://extension.oregonstate.edu/catalog/pdf/em/em8885-e.pdf>
- Sources of Native Forest Nursery Seedlings
http://www.oregon.gov/ODF/PRIVATE_FORESTS/docs/2007-08Seedlings.pdf
- Native Seed Network <http://www.nativeseednetwork.org/> has good species lists by ecological region and plant communities
- Native Plant Network <http://nativeplants.for.uidaho.edu/network/> a good resource on how to collect, store and germinate seed
- Gardening with Oregon Native Plants West of the Cascades
<http://extension.oregonstate.edu/catalog/html/ec/ec1577/>
- Natives for Western Oregon <http://plantnative.org/rpl-orwa.htm>
- Wallace Hansen web-site (although this is a commercial site, it is packed with information, especially on west-side species) <http://www.nwplants.com/>
- Landscaping with Native Plants of the Intermountain Region
<http://www.id.blm.gov/publications/TR1730-3/index.htm>
- Natives for Eastern Oregon <http://plantnative.org/rpl-imw.htm>
- Oregon State University Horticulture site on natives
<http://oregonstate.edu/dept/ldplants/native-or.htm>
- Deschutes Basin Native Plant Seedbank www.deschutes.org/nativesseedbank
- Great Basin Native Plant Selection and Increase Project:
<http://www.fs.fed.us/rm/boise/research/shrub/projects/species.shtml>
- Planting a hedgerow http://www.kingcd.org/pub_fis_hed.htm
- A guide to multifunctional hedgerows in western Oregon
<http://extension.oregonstate.edu/catalog/pdf/em/em8721.pdf>
- Restoring Rare Native Habitats in the Willamette Valley: A landowner's guide for restoring oak woodlands, wetlands, prairies, and bottomland hardwood and riparian forests. By Bruce Campbell.
<http://www.biodiversitypartners.org/pubs/Campbell/index.shtml>
- Landowner's Guide for Restoring and Managing Oregon White Oak Habitats –
<http://www.oregonoaks.org>

Information for Ecoregions/Major Land Resource Areas

- Lots of Plant Association and/or Plant community guides for various regions of Oregon and Washington (Caution - Download files can be very large!)
<http://www.reo.gov/ecoshare/Publications/searchresults.asp>
<http://oregonstate.edu/ornhic/publications.html>
- Ecological Site Information <http://esis.sc.egov.usda.gov/Welcome/pgESDWelcome.aspx>
- Ecoregions of Oregon http://www.epa.gov/wed/pages/ecoregions/or_eco.htm and
http://oregonstate.edu/dept/range/projects/EcologicalProvincesOfOregon/province_map.htm
- Wildlife Habitat Descriptions from the Northwest Habitat Institution
<http://www.nwhi.org/index/habdescriptions>
- Oregon Major Land Resource Areas (MLRAs) –
<http://soils.usda.gov/survey/geography/mlra/index.html>
- Native Seed Network <http://www.nativeseednetwork.org/> has good plant species lists by ecological region and plant communities