TECHNICAL NOTE

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Plants for Pollinators in the Inland Northwest

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Brownbelted bumble bee (*Bombus griseocollis*) visiting a blanketflower (*Gaillardia aristata*). Pamela Pavek

The purpose of this Technical Note is to provide guidance for the design and implementation of conservation plantings to enhance habitat for pollinators including: bees, wasps, butterflies, moths and hummingbirds. Plant species included in this document are adapted to the Inland Northwest, which encompasses eastern Washington, northeastern Oregon and northern Idaho. For species adapted to southern Idaho, southeastern Oregon, northern Nevada and northern Utah, refer to the Idaho Plant Materials Technical Note 2A. For lists of species adapted to western Washington and western Oregon, refer to the Oregon Plant Materials Technical Note 13.

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Honey bee (*Apis mellifera*) visiting a Munro’s globemallow (*Sphaeralcea munroana*) flower. Pamela Pavek

INTRODUCTION

Pollinators include bees, moths, flies, beetles, wasps, desert bats, hummingbirds, and butterflies that transfer pollen from one plant to another while they are collecting pollen or nectar for food. Pollinators are critical to the function of terrestrial ecosystems because they enhance plant reproduction.

Honey bee (*Apis mellifera*) on a sunflower (*Helianthus annuus*). Pamela Pavek

Many of the world's crop species benefit from insect pollination, which is mostly provided by bees. In North America, bees pollinate many billions of dollars' worth of crops annually. Up to one quarter of our diet comes from crops whose production benefits from pollinating bees.

Pollinators are threatened world-wide by habitat loss, habitat fragmentation, pesticides, disease and parasites. The loss of pollinators has serious economic implications for humans and for maintaining ecosystem diversity and stability.

The Natural Resources Conservation Service can assist landowners with habitat enhancement for pollinators by encouraging the establishment of an array of attractive plants that flower throughout the growing season. Plants provide a source of nectar, pollen and cover for adult and immature pollinators and also provide habitat for a large array of other wildlife species.

Well-chosen forbs, legumes, shrubs and trees planted along farm and ranch borders and within fields attract pollinators and other beneficial insects. The correct mixes of plants that bloom throughout the growing season provide a continuous source of nectar and pollen needed by insects. An ideal plant mix is one that consists of at least nine species: three that bloom early in the season, three in mid-season and three in late season. In areas with less than 16 inches of mean annual precipitation, nine adapted and commercially produced species may not always be available.

Hedgerow planting with early, mid and late blooming plants. Pamela Pavek

Annual plants can be useful tools in pollinator plantings because they produce tremendous amounts of flowers. However, annual crops only last one growing season and can be very competitive with perennial species that are slower establishing. Annual plants may also be "weedy". Consequently, annuals should only be considered for small odd areas and should be mixed with perennials with caution. A few annual plants that readily attract pollinators include buckwheat, canola, safflower, berseem clover, camelina, lentils, dry peas and sunflowers. Annuals can also be used as interim crops prior to planting perennials, to suppress weed growth and reduce the weed seed bank.

HABITAT CONSIDERATIONS

Habitat requirements for pollinators are similar to other animal species: food, shelter, nesting sites and water. Shelter and nesting sites may be a limiting factor in your project area and should be considered during planning. Use the Xerces Pollinator Habitat Assessment Form and Guide to determine the components that need improvement in your habitat.

Nectar and pollen from flowering plants provide food for pollinators. Water needs can be met with birdbaths, fountains, ponds, puddles and moisture from plants. Moist salt licks help provide mineral requirements for butterflies and sweat bees. Shelter and nesting habitat needs differ by pollinator species and include bare or partially vegetated, well-drained soil; soil banks and cliffs, dead standing or fallen trees with beetle emergence holes, live trees, clumps of grass, live brush, tall grass, piles of leaves and sticks, wood piles, tree bark and rock crevices.

Most native bees are solitary, nesting underground, or less commonly, above ground using beetle holes in dead-wood or dead pithy stems (e.g. elderberry, sumac or rose). Bumble bees are social with colonies of dozens to hundreds of workers. They typically nest in tree hollows or below-ground in old rodent burrows. In pollinator plantings use of pesticides should be avoided, especially insecticides. (Some applications, like carbaryl bran baits for grasshoppers, are safe for bees.) If pesticides must be used, leave some areas untreated as refuge habitat for predatory and parasitic insects and pollinators that can re-colonize treated areas.

Cocoons of a cavity-nesting *Hoplitis* bee in a pithy dead sumac twig. Jim Cane

TABLE 1: HABITAT REQUIREMENTS FOR NATIVE POLLINATORS

Solitary bees	Nectar and pollen	Nest in bare and partially vegetated soils where water won't pond; or in beetle holes in deadwood, within pithy stems or twigs or construct nests of mud or leaf pulp
Bumble bees	Nectar and pollen	Nest cavitites underground, often in old rodent burrows, or in hollow trees or beneath clumps of grass
Butterflies and moths	Nectar; nutrients, minerals and salts from rotting fruit, tree sap, clay deposists and mud puddles	Leaves and stems of larval host plants; also small woodpiles used by species that winter as adults
Hummingbirds	Nectar, insects, caterpillars, tree sap and willow catkins	Trees, shrubs and vines

ECOLOGICAL BENEFITS OF POLLINATOR PLANTINGS

Pollinator-friendly plantings have the potential to provide multiple ecological benefits. They can:

Reduce pesticide use. Sequentially flowering plants provide forage and cover for predatory and parasitic insects that help control pest species; established plant communities resist weed invasion.

Stabilize soil and provide ground cover. Root systems and above ground vegetation hold soil in place, improve soil moisture infiltration, reduce the risk of erosion and serve as buffers which protect against surface water pollution. Legumes contribute nitrogen to the soil.

Serve as windbreaks and shelterbelts. Shrubs and trees protect farmsteads, feeding areas, crops and livestock from wind and dust damage. They also provide food, nesting and cover habitat for a great variety of wildlife, pollinators and other beneficial insects.

ESTABLISHING POLLINATOR PLANTINGS: GENERAL CONSIDERATIONS

- **Select an area that is at least 0.5 acres in size.** This will ensure adequate floral resources are available for pollinators.

- **Start right.** Most grasses and forbs, including legumes, can be started by direct seeding or in some cases by transplanting nursery seedlings. Flowering shrubs and trees are often best established by transplanting nursery seedlings.

- **Determine soil drainage and other soil limitation factors**. Most species will not do well in heavy, poorly drained or saline to sodic soils; select species that can perform well in the soils of the site.

- **Match plants with similar site preferences**. Choose plants that have similar soil and water requirements and that are adapted to the local climate.

- **Water wisely.** Shrub plantings in the drier portions of the Inland Northwest will require irrigation. For the best establishment biweekly watering the first 2 to 3 years is recommended. Once the plants are well established, watering less frequently, but for a longer duration to drive the moisture deeper into the soil will ensure the plants develop their roots more fully ensuring long-term survival.

- **Control weeds.** Most plants do not compete well with weeds during establishment. Start with a weed free area or create one using appropriate herbicides or tillage equipment. Keep the area relatively weed free for the first 2 to 3 years of establishment. Mowing weeds during plant establishment will help suppress weed competition and encourage desired plants.

- **Protect planting from wildlife, livestock and rodents.** Fencing to protect the planting may be required in areas with abundant deer, antelope or elk, or with livestock such as sheep, cattle or horses. This will ensure flowers are available to provide nectar, pollen and

succulent foliage for pollinators. Also, using tubes to protecting shrubs from rodent damage is recommended.

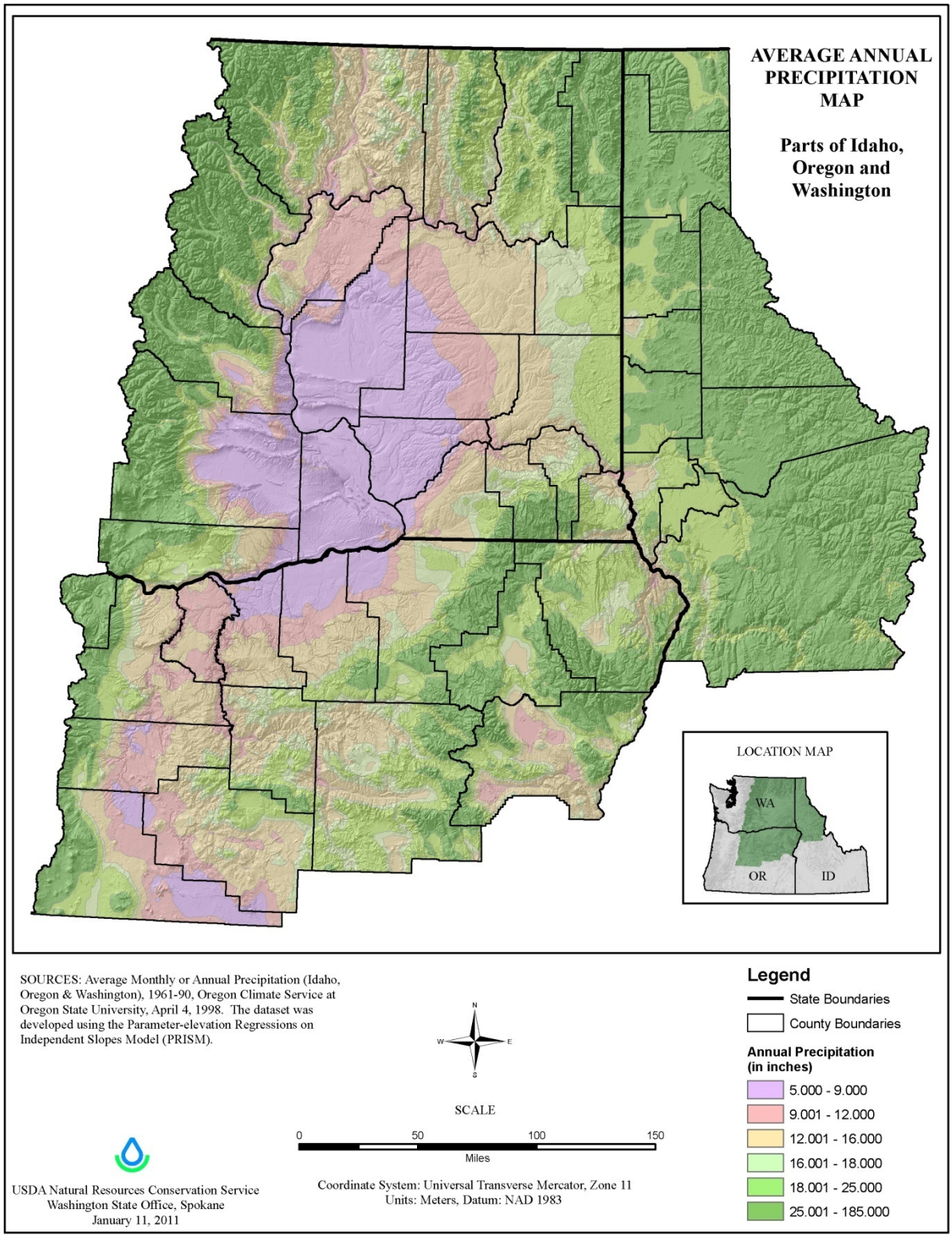
- **Choose the right plant species.** Plantings should include a mixture of species that provide continual blooms throughout the growing season. Depending on precipitation zone, at least one to three species are recommended for each bloom time: spring, summer and fall. One or two grass species may also be included in the mix if ground cover is needed for erosion control or suppression of weeds. To select plant species for your precipitation zone, use the Approved Pollinator Plant Lists (Tables 2 - 6).

- **Maintain plantings.** Treatments such as haying or mowing may be required outside of the flowering period to remove plant litter or weeds. Spot-spray herbicide treatments may also be needed to control invasive weeds.

- **Be aware of risks associated with certain species planted around orchards.** Chokecherry and serviceberry can harbor pests and disease that may be transferred to orchard crops. Shrubs with soft berries such as Oregon grape and currant may attract the dreaded new pest, spotted wing drosophila. Also, snowberry may be a host for the snowberry maggot which is nearly impossible to distinguish from the apple maggot. If the apple maggot is found in an orchard or warehouse, production throughout the entire area can be shut down. When planting pollinator habitat around orchards, work with your producer and local extension agent to select species that pose minimal risk to orchard crops.

White-lined sphinx moth (*Hyles lineata*) extracting nectar from a purple sage (*Salvia dorrii*) flower. Pamela Pavek

FIGURE 1: MAP OF AREA COVERED BY THIS TECHNICAL NOTE AND PRECIPITATION ZONES WITHIN THE AREA



SELECTING PLANT SPECIES FOR POLLINATOR HABITAT

Tables 2 to 6 (pages 10 to 28) below are lists of plants that have known value for pollinators and are adapted to the Inland Northwest. The lists are separated into 6 – 9", 9 – 12", 12 – 16", 16 – 18" and 18 – 25" mean annual precipitation zones. **The BASE MIX list at the beginning of each table is the starting point for developing a mix.** The Base Mix meets the minimum program requirements for number of species per bloom period, and includes species that are relatively easy to establish and are usually commercially available. However, we recommend adding more species to the mix because there is a chance not all of the species will establish (due to environmental factors, seeding errors, etc). Select additional species from the Alternative Forbs and the Shrubs lists. Species on the Alternative Forbs Lists should comprise a smaller proportion of the mix than species in the Base Mix. They are typically more difficult to establish, not available in large quantities, or are more expensive than species in the Base Mix.

Use only certified or certified quality seed. Certified or certified quality means it has been tested for percent purity and percent germination, which are necessary to determine the proper seeding rate. If a seed company tells you they do not test the seed because it is too small of a lot or because it was wild collected **do not buy it.** If lack of tested seed means you have fewer species in the mix than required, document this and plant fewer species. Washington and Oregon NRCS Practice Standards require certified or certified quality seed be used, and if not used, a NRCS contract holder can be denied payment. **Do not waste taxpayer money on untested seed.**

We strongly recommended several species in a pollinator habitat area be planted by transplanting seedlings, due to a higher rate of success. Transplanted seedlings can be planted along a border of a seeded area, and the planting may be considered a separate practice (386 Field Border or 422 Hedgerow Planting for example). Any of the forbs and shrubs listed on the approved plant lists can be transplanted as seedlings.

Grasses are included on the Approved Plant Lists because they provide ground cover and reduce weed competition. They can also compete with forbs, and for this reason should not exceed 25% of the mix based on seeds per square foot. Grasses can be omitted from a planting in areas with heavy cheatgrass, medusahead or ventenata infestations to allow for the option of using selective grass herbicides.

Read the Plant Selections and Establishment Protocols for Pollinator Habitat Plantings on pages 29 to 33 for more instructions on how to make plant selections from the approved plant lists. Landowners should consult with their NRCS Field Office to develop a plan based on specific circumstances.

Get approval from the State Plant Materials Specialist prior to making substitutions of plant species not on these lists. Many species are available on the commercial market that have the potential to escape the planted area and become a weed problem, or are not adapted to our growing conditions.

APPROVED PLANT LISTS

Full seeding rates are provided for each species. The seeding rates are derived from target seeding densities of 30 seeds/ft^2 for species with less than 500,000 seeds per pound, and 50 seeds/ft^2 for species with more than 500,000 seeds per pound. The full seeding rates will need to be adjusted according to the proportion of the mix. For example, the full seeding rate of yarrow is 1 PLS lb/ac, and if it is 10% of the mix, the seeding rate will be 0.1 PLS lb/ac.

Photos and more detailed descriptions of the plants on the lists can be found on pages 34 to 57. Additional information for many of these species can be found in NRCS Plant Guides and Fact Sheets, available by download from the NRCS PLANTS Database.

All of the forbs and shrubs on these lists attract generalist pollinators that utilize pollen and nectar from a variety of plant species. For more specifics about plant-pollinator relationships, see pages 58 and 59.

Sweat bee (*Agapostemon* sp.) on Douglas' dustymaiden (*Chaenactis douglasii*). Derek Tilley

TABLE 2: POLLINATOR PLANT LIST 6 – 9 INCH PRECIPITATION

BASE MIX		Bloom Color and Time								Soils		
Scientific Name	Common Name	spring	summer	fall	Origin N = native, I = introduced	Seeding Depth (in)	Seeds/lb	Seeding Rate (PLS lbs/ac)	Plant Spacing (ft)	fine	med	coarse
* Achillea millefolium	yarrow				N	0 - 1/8	2,500,000	1	N/A		X	X
* Ericameria nauseosa	rubber rabbitbrush				N	1/8 - 1/4	693,000	3	4		X	X
* Helianthus annuus	common sunflower				N	1/2 - 1	45,000	30	N/A	X	X	X
* Machaeranthera canescens	hoary tansyaster				N	0 - 1/8	1,300,000	1	N/A		X	X
* Melilotus officinalis	sweetclover				I	1/4 - 1/2	260,000	5	N/A	X	X	X
GRASSES												
Elymus wawawaiensis	Snake River wheatgrass				N	1/4 - 1/2	139,000	8	N/A		X	X
Poa secunda	Sandberg bluegrass				N	1/8 - 1/4	1,000,000	2	N/A	X	X	X

TABLE 2 CONTINUED: POLLINATOR PLANT LIST 6 – 9 INCH PRECIPITATION

ALTERNATIVE FORBS		Bloom Color and Time								Soils		
Scientific Name	Common Name	spring	summer	fall	Origin N = native, I = introduced	Seeding Depth (in)	Seeds/lb	Seeding Rate (PLS lbs/ac)	Plant Spacing (ft)	fine	med	coarse
& Astragalus filipes	basalt milkvetch				N	1/4 - 1/2	120,000	10	N/A		X	X
Balsamorhiza careyana	Carey's balsamroot				N	1/2 - 1	55,000	24	N/A		X	X
Chaenactis douglasii	Douglas' dustymaidens				N	1/4 - 1/2	350,000	4	N/A		X	X
@ Dalea ornata	western prairie clover				N	1/4 - 1/2	140,000	10	N/A	X	X	X
Erigeron filifolius	threadleaf fleabane				N	1/4 - 1/2	300,000	4	N/A		X	X
Erigeron linearis	linearleaf daisy				N	1/4 - 1/2	250,000	5	N/A		X	X
* Erigeron pumilus	shaggy daisy				N	0 - 1/8	1,800,000	1	N/A		X	X
Mentzelia laevicaulis	smoothstem blazing star				N	1/4 - 1/2	300,000	4	N/A			X
Oenothera pallida	evening primrose				N	1/8 - 1/4	700,000	3	N/A		X	X
# Sphaeralcea munroana	Munro's globemallow				N	1/4 - 1/2	500,000	3	N/A		X	X

TABLE 2 CONTINUED: POLLINATOR PLANT LIST 6 – 9 INCH PRECIPITATION

SHRUBS ^		Bloom Color and Time								Soils		
Scientific Name	Common Name	spring	summer	fall	Origin N = native, I = introduced	Seeding Depth (in)	Seeds/lb	Seeding Rate (PLS lbs/ac)	Plant Spacing (ft)	fine	med	coarse
* Ericameria nauseosa	rubber rabbitbrush				N	1/8 - 1/4 or seedlings	693,000	3	4		X	X
Eriogonum niveum	snow buckwheat				N	1/4 - 1/2 or seedlings	500,000	3	4		X	X
Eriogonum umbellatum	sulphur buckwheat				N	1/4 - 1/2 or seedlings	209,000	6	4		X	X
Purshia tridentata	antelope bitterbrush				N	seedlings	N/A	N/A	6		X	X
Salvia dorrii	purple sage				N	seedlings	N/A	N/A	2		X	X

* Species that germinate and establish well.

\# Requires scarification.

& Requires scarification and inoculation.

^ Plant 90 shrub seedlings per acre of each species. Plant in clumps of 10 or in rows.

TABLE 3: POLLINATOR PLANT LIST 9 - 12 INCH PRECIPITATION

BASE MIX		Bloom Color and Time								Soils		
Scientific Name	Common Name	spring	summer	fall	Origin N = native, I = introduced	Seeding Depth (in)	Seeds/lb	Seeding Rate (PLS lbs/ac)	Plant Spacing (ft)	fine	med	coarse
* Achillea millefolium	yarrow				N	0 - 1/8	2,500,000	1	N/A		X	X
* Ericameria nauseosa	rubber rabbitbrush				N	1/8 - 1/4	693,000	3	4		X	X
* Gaillardia aristata	blanket flower				N	1 /4 - 1/2	200,000	7	N/A		X	X
* Helianthus annuus	common sunflower				N	1/2 - 1	45,000	30	N/A	X	X	X
* Linum perenne	blue flax				I	1/4 - 1/2	278,000	5	N/A		X	X
* Medicago sativa	alfalfa				I	1/4 - 1/2	200,000	6	N/A	X	X	
GRASSES												
Elymus wawawaiensis	Snake River wheatgrass				N	1/4 - 1/2	139,000	8	N/A		X	X
Poa secunda	Sandberg bluegrass				N	1/8 - 1/4	1,000,000	2	N/A	X	X	X

TABLE 3 CONTINUED: POLLINATOR PLANT LIST 9 - 12 INCH PRECIPITATION

ALTERNATIVE FORBS		Bloom Color and Time								Soils		
Scientific Name	Common Name	spring	summer	fall	Origin N = native, I = introduced	Seeding Depth (in)	Seeds/lb	Seeding Rate (PLS lbs/ac)	Plant Spacing (ft)	fine	med	coarse
& Astragalus filipes	basalt milkvetch				N	1/4 - 1/2	120,000	10	N/A		X	X
Balsamorhiza careyana	Carey's balsamroot				N	1/2 - 1	55,000	24	N/A		X	X
Balsamorhiza sagittata	arrowleaf balsamroot				N	1/2 - 1	55,000	24	N/A		X	X
Chaenactis douglasii	Douglas' dustymaidens				N	1/4 - 1/2	350,000	4	N/A		X	X
Cleome lutea	yellow bee plant				N	1/4 - 1/2	101,000	14	N/A	X	X	
Crepis atribarba	slender hawksbeard				N	1/8 - 1/4	800,000	3	N/A		X	X
& Dalea ornata	western prairie clover				N	1/4 - 1/2	140,000	10	N/A	X	X	X
Erigeron filifolius	threadleaf fleabane				N	1/8 - 1/4	300,000	4	N/A		X	X
Erigeron linearis	linearleaf daisy				N	1/4 - 1/2	250,000	5	N/A		X	X
Erigeron pumilus	shaggy daisy				N	0 - 1/8	1,800,000	1	N/A		X	X
* Eriophyllum lanatum	Oregon sunshine				N	1/8 - 1/4	810,000	3	N/A	X	X	X
& Hedysarum boreale	Utah sweetvetch				I	1/2 - 1	46,000	28	N/A	X	X	X
* Linum lewisii	Lewis flax				N	1/4 - 1/2	260,000	5	N/A		X	X
Lomatium triternatum	nineleaf biscuitroot				N	1/2 - 1	45,000	30	N/A		X	X
* Machaeranthera canescens	hoary tansyaster				N	0 - 1/8	1,300,000	1	N/A		X	X
* Medicago sativa ssp. falcata	yellow blossom alfalfa				I	1/4 - 1/2	211,000	6	N/A	X	X	
* Mentzelia laevicaulis	smoothstem blazing star				N	1/4 - 1/2	300,000	4	N/A			X
Oenothera pallida	evening primrose				N	1/8 - 1/4	700,000	3	N/A		X	X

TABLE 3 CONTINUED: POLLINATOR PLANT LIST 9 - 12 INCH PRECIPITATION

	Penstemon speciosus	showy penstemon				N	1/4 - 1/2	400,000	3	N/A	X	X
	Phacelia hastata	whiteleaf phacelia				N	1/4 - 1/2	153,000	8	N/A	X	X
	Phacelia heterophylla	varileaf phacelia				N	0 - 1/8	1,100,000	2	N/A	X	X
#	Sphaeralcea munroana	Munro's globemallow				N	1/4 - 1/2	500,000	3	N/A	X	X

	SHRUBS ^		Bloom Color and Time								Soils		
	Scientific Name	Common Name	spring	summer	fall	Origin N = native, I = introduced	Seeding Depth (in)	Seeds/lb	Seeding Rate (PLS lbs/ac)	Plant Spacing (ft)	fine	med	coarse
*	Ericameria nauseosa	rubber rabbitbrush				N	1/8 - 1/4 or seedlings	693,000	3	4		X	X
*	Eriogonum heracleoides	Wyeth's buckwheat				N	1/4 - 1/2 or seedlings	136,000	10	4		X	X
	Eriogonum niveum	snow buckwheat				N	1/4 - 1/2 or seedlings	500,000	3	4		X	X
	Eriogonum umbellatum	sulphur buckwheat				N	1/4 - 1/2 or seedlings	209,000	6	4		X	X
	Purshia tridentata	antelope bitterbrush				N	seedlings	N/A	N/A	6		X	X
	Rhus glabra	smooth sumac				N	seedlings	N/A	N/A	4		X	X
	Salvia dorrii	purple sage				N	seedlings	N/A	N/A	2		X	X

TABLE 3 CONTINUED: POLLINATOR PLANT LIST 9 - 12 INCH PRECIPITATION

* Species that germinate and establish well.

\# Requires scarification.

& Requires scarification and inoculation.

^ Plant 90 shrub seedlings per acre of each species. Plant in clumps of 10 or in rows.

TABLE 4: POLLINATOR PLANT LIST 12 - 16 INCH PRECIPITATION

BASE MIX		Bloom Color and Time								Soils		
Scientific Name	Common Name	spring	summer	fall	Origin N = native, I = introduced	Seeding Depth (in)	Seeds/lb	Seeding Rate (PLS lbs/ac)	Plant Spacing (ft)	fine	med	coarse
* Achillea millefolium	yarrow				N	0 - 1/8	2,500,000	1	N/A		X	X
* Chrysothamnus viscidiflorus	yellow rabbitbrush				N	1/8 - 1/4	732,000	3	4		X	X
Eriogonum heracleoides	Wyeth's buckwheat				N	1/4 - 1/2	136,000	10	4		X	X
* Gaillardia aristata	blanket flower				N	1 /4 - 1/2	200,000	7	N/A		X	X
* Helianthus annuus	common sunflower				N	1/2 - 1	45,000	30	N/A	X	X	X
* Linum perenne	blue flax				I	1/4 - 1/2	278,000	5	N/A		X	X
* Medicago sativa	alfalfa				I	1/4 - 1/2	200,000	6	N/A	X	X	
* Sanguisorba minor	small burnet				I	1/2 - 1	48,000	26	N/A	X	X	X
Solidago missouriensis	Missouri goldenrod				N	1/4 - 1/2	2,000,000	1	N/A		X	X
GRASSES												
Pseudoroegneria spicata	bluebunch wheatgrass				N	1/4 - 1/2	139,000	9	N/A		X	X
Poa secunda	big bluegrass				N	1/8 - 1/4	925,000	2	N/A		X	X
Poa secunda	Sandberg bluegrass				N	1/8 - 1/4	1,000,000	2	N/A	X	X	X

TABLE 4 CONTINUED: POLLINATOR PLANT LIST 12 - 16 INCH PRECIPITATION

ALTERNATIVE FORBS		Bloom Color and Time								Soils		
Scientific Name	Common Name	spring	summer	fall	Origin N = native, I = introduced	Seeding Depth (in)	Seeds/lb	Seeding Rate (PLS lbs/ac)	Plant Spacing (ft)	fine	med	coarse
& Astragalus filipes	basalt milkvetch				N	1/4 - 1/2	120,000	10	N/A		X	X
Balsamorhiza sagittata	arrowleaf balsamroot				N	1/2 - 1	55,000	24	N/A		X	X
Chaenactis douglasii	Douglas' dustymaidens				N	1/4 - 1/2	350,000	4	N/A		X	X
Cleome lutea	yellow bee plant				N	1/4 - 1/2	101,000	14	N/A	X	X	
Crepis atribarba	slender hawksbeard				N	1/8 - 1/4	800,000	3	N/A		X	X
& Dalea ornata	western prairie clover				N	1/4 - 1/2	140,000	10	N/A	X	X	X
Erigeron filifolius	threadleaf fleabane				N	1/4 - 1/2	300,000	4	N/A		X	X
Erigeron linearis	linearleaf daisy				N	1/4 - 1/2	250,000	5	N/A		X	X
Erigeron pumilus	shaggy daisy				N	0 - 1/8	1,800,000	1	N/A		X	X
* Eriophyllum lanatum	Oregon sunshine				N	1/8 - 1/4	810,000	3	N/A	X	X	X
& Hedysarum boreale	Utah sweetvetch				I	1/2 - 1	46,000	28	N/A	X	X	X
Helianthella uniflora	little sunflower				N	1/2 - 1	41,000	32	N/A	X	X	X
* Linum lewisii	Lewis flax				N	1/4 - 1/2	260,000	5	N/A		X	X
Lomatium dissectum	fernleaf biscuitroot				N	1/2 - 1	45,000	30	N/A	X	X	X
Lomatium triternatum	nineleaf biscuitroot				N	1/2 - 1	45,000	30	N/A		X	X
* Machaeranthera canescens	hoary tansyaster				N	0 - 1/8	1,300,000	1	N/A		X	X
* Medicago sativa ssp. falcata	yellow blossom alfalfa				I	1/4 - 1/2	211,000	6	N/A	X	X	
Oenothera pallida	evening primrose				N	1/8 - 1/4	700,000	3	N/A		X	X

TABLE 4 CONTINUED: POLLINATOR PLANT LIST 12 - 16 INCH PRECIPITATION

@	Onobrychis viciifolia	sainfoin				I	1/2 - 1	30,000	44	N/A		X	X
	Penstemon attenuatus	taper-leaved penstemon				N	0 - 1/8	1,500,000	2	N/A	X	X	
	Penstemon specious	showy penstemon				N	1/4 - 1/2	400,000	3	N/A		X	X
	Phacelia hastata	whiteleaf phacelia				N	1/4 - 1/2	153,000	8	N/A		X	X
	Phacelia heterophylla	varileaf phacelia				N	0 - 1/8	1,100,000	2	N/A		X	X
#	Sphaeralcea munroana	Munro's globemallow				N	1/8 - 1/4	500,000	3	N/A		X	X
	Symphyotrichum spathulatum	western mountain aster				N	0 - 1/8	1,290,000	2	N/A	X	X	

	SHRUBS ^		Bloom Color and Time								Soils		
	Scientific Name	Common Name	spring	summer	fall	Origin N = native, I = introduced	Seeding Depth (in)	Seeds/lb	Seeding Rate (PLS lbs/ac)	Plant Spacing (ft)	fine	med	coarse
%!	Amelanchier alnifolia	serviceberry				N	seedlings	N/A	N/A	10	X	X	X
	Caragana arborescens	Siberian peashrub				I	seedlings	N/A	N/A	10	X	X	X
*	Chrysothamnus viscidiflorus	yellow rabbitbrush				N	1/8 - 1/4 or seedlings	732,000	3	4		X	X
*	Ericameria nauseosa	rubber rabbitbrush				N	1/8 - 1/4 or seedlings	693,000	3	4		X	X
	Eriogonum heracleoides	Wyeth's buckwheat				N	1/4 - 1/2 or seedlings	136,000	10	4		X	X
	Eriogonum umbellatum	sulphur buckwheat				N	1/4 - 1/2 or seedlings	209,000	6	4		X	X

TABLE 4 CONTINUED: POLLINATOR PLANT LIST 12 - 16 INCH PRECIPITATION

%!	Prunus virginiana	chokecherry		N	seedlings	N/A	N/A	12	X	X	X
	Purshia tridentata	antelope bitterbrush		N	seedlings	N/A	N/A	6		X	X
	Rhus glabra	smooth sumac		N	seedlings	N/A	N/A	4		X	X
!	Rosa woodsii	Woods rose		N	seedlings	N/A	N/A	6		X	X
	Salvia dorrii	purple sage		N	seedlings	N/A	N/A	2		X	X

* Species that germinate and establish well.

\# Requires scarification.

@ Requires inoculation.

& Requires scarification and inoculation.

^ Plant 90 shrub seedlings per acre of each species. Plant in clumps of 10 or in rows.

% Should not be planted near orchards due to risk of transmission of pests and disease.

! Should not be planted near cherry orchards due to potential of attracting spotted wing drosophila.

TABLE 5: POLLINATOR PLANT LIST 16 - 18 INCH PRECIPITATION

BASE MIX		Bloom Color and Time								Soils		
Scientific Name	Common Name	spring	summer	fall	Origin N = native, I = introduced	Seeding Depth (in)	Seeds/lb	Seeding Rate (PLS lbs/ac)	Plant Spacing (ft)	fine	med	coarse
* Achillea millefolium	yarrow				N	0 - 1/8	2,500,000	1	N/A		X	X
Eriogonum heracleoides	Wyeth's buckwheat				N	1/4 - 1/2	136,000	10	4		X	X
* Gaillardia aristata	blanket flower				N	1/4 - 1/2	200,000	7	N/A		X	X
* Linum perenne	blue flax				I	1/4 - 1/2	278,000	5	N/A		X	X
Lomatium dissectum	fernleaf biscuitroot				N	1/2 - 1	45,000	30	N/A	X	X	X
* Medicago sativa	alfalfa				I	1/4 - 1/2	200,000	6	N/A	X	X	
* Sanguisorba minor	small burnet				I	1/2 - 1	48,000	26	N/A	X	X	X
Solidago missouriensis	Missouri goldenrod				N	0 - 1/8	2,000,000	1	N/A		X	X
Symphyotrichum spathulatum	western mountain aster				N	0 - 1/8	1,290,000	2	N/A	X	X	
GRASSES												
Pseudoroegneria spicata	bluebunch wheatgrass				N	1/4 - 1/2	130,000	9	N/A		X	X
Festuca idahoensis	Idaho fescue				N	1/4 - 1/2	450,000	3	N/A	X	X	X

TABLE 5 CONTINUED: POLLINATOR PLANT LIST 16 - 18 INCH PRECIPITATION

ALTERNATIVE FORBS		Bloom Color and Time								Soils		
Scientific Name	Common Name	spring	summer	fall	Origin N = native, I = introduced	Seeding Depth (in)	Seeds/lb	Seeding Rate (PLS lbs/ac)	Plant Spacing (ft)	fine	med	coarse
Asclepias speciosa	showy milkweed				N	1/2 - 1	72,000	18	N/A	X	X	X
& Astragalus canadensis	Canada milkvetch				N	1/4 - 1/2	270,000	5	N/A		X	
& Astragalus cicer	cicer milkvetch				I	1/4 - 1/2	123,000	10	N/A	X	X	
Balsamorhiza sagittata	arrowleaf balsamroot				N	1/2 - 1	55,000	24	N/A		X	X
Cleome lutea	yellow bee plant				N	1/4 - 1/2	101,000	14	N/A	X	X	
& Dalea ornata	western prairie clover				N	1/4 - 1/2	140,000	10	N/A	X	X	X
Erigeron filifolius	threadleaf fleabane				N	1/4 - 1/2	300,000	4	N/A		X	X
Erigeron pumilus	shaggy daisy				N	0 - 1/8	1,800,000	1	N/A		X	X
* Eriophyllum lanatum	Oregon sunshine				N	1/8 - 1/4	810,000	3	N/A	X	X	X
* Geranium viscosissimum	sticky purple geranium				N	1/2 - 1	55,000	24	N/A		X	
& Hedysarum boreale	Utah sweetvetch				N	1/2 - 1	46,000	28	N/A	X	X	X
Helianthella uniflora	little sunflower				N	1/2 - 1	41,000	32	N/A	X	X	X
* Linum lewisii	Lewis flax				N	1/4 - 1/2	260,000	5	N/A		X	X
Lomatium triternatum	nineleaf biscuitroot				N	1/2 - 1	45,000	30	N/A		X	X
* Machaeranthera canescens	hoary tansyaster				N	0 - 1/8	1,300,000	1	N/A		X	X
* Medicago sativa ssp. falcata	yellow blossom alfalfa				I	1/4 - 1/2	211,000	6	N/A	X	X	
@ Onobrychis viciifolia	sainfoin				I	1/2 - 1	30,000	44	N/A		X	X

TABLE 5 CONTINUED: POLLINATOR PLANT LIST 16 - 18 INCH PRECIPITATION

	Penstemon attenuatus	taper-leaved penstemon				N	0 - 1/8	1,500,000	2	N/A	X	X	
	Penstemon speciosus	showy penstemon				N	1/4 - 1/2	400,000	3	N/A		X	X
	Penstemon venustus	elegant penstemon				N	1/8 - 1/4	1,000,000	2	N/A		X	X

SHRUBS ^		Bloom Color and Time								Soils		
Scientific Name	Common Name	spring	summer	fall	Origin N = native, I = introduced	Seeding Depth (in)	Seeds/lb	Seeding Rate (PLS lbs/ac)	Plant Spacing (ft)	fine	med	coarse
%! Amelanchier alnifolia	serviceberry				N	seedlings	N/A	N/A	10	X	X	X
Caragana arborescens	Siberian peashrub				I	seedlings	N/A	N/A	10	X	X	X
* Chrysothamnus viscidiflorus	yellow rabbitbrush				N	1/8 - 1/4 or seedlings	732,000	3	4		X	X
! Crataegus douglasii	black hawthorn				N	seedlings	N/A	N/A	8	X	X	X
* Ericameria nauseosa	rubber rabbitbrush				N	1/8 - 1/4 or seedlings	693,000	3	4		X	X
Eriogonum heracleoides	Wyeth's buckwheat				N	1/4 - 1/2 or seedlings	136,000	10	4		X	X
Eriogonum umbellatum	sulphur buckwheat				N	1/4 - 1/2 or seedlings	209,000	6	4		X	X
! Mahonia aquifolium, M. repens	Oregon grape				N	seedlings	N/A	N/A	4		X	X

TABLE 5 CONTINUED: POLLINATOR PLANT LIST 16 - 18 INCH PRECIPITATION

%!	Prunus virginiana	chokecherry		N	seedlings	N/A	N/A	12	X	X	X
	Rhus glabra	smooth sumac		N	seedlings	N/A	N/A	4		X	X
!	Ribes aureum	golden currant		N	seedlings	N/A	N/A	6		X	
!	Ribes cereum	wax currant		N	seedlings	N/A	N/A	6		X	X
!	Rosa nutkana	Nootka rose		N	seedlings	N/A	N/A	6		X	X
!	Rosa woodsii	Woods rose		N	seedlings	N/A	N/A	6		X	X
!	Sambucus nigra ssp cerulea	blue elderberry		N	seedlings	N/A	N/A	10		X	X

* Species that germinate and establish well.

@ Requires inoculation.

& Requires scarification and inoculation.

^ Plant 90 shrub seedlings per acre of each species. Plant in clumps of 10 or in rows.

% Should not be planted near cherry orchards due to risk of transmitting X-disease.

! Should not be planted near cherry orchards due to potential of attracting spotted wing drosophila.

TABLE 6: POLLINATOR PLANT LIST 18 - 25 INCH PRECIPITATION

BASE MIX		Bloom Color and Time								Soils		
Scientific Name	Common Name	spring	summer	fall	Origin N = native, I = introduced	Seeding Depth (in)	Seeds/lb	Seeding Rate (PLS lbs/ac)	Plant Spacing (ft)	fine	med	coarse
* Achillea millefolium	yarrow				N	0 - 1/8	2,500,000	1	N/A		X	X
Chamerion angustifolium	fireweed				N	0 - 1/8	6,500,000	0.5	N/A	X	X	X
* Gaillardia aristata	blanket flower				N	1 /4 - 1/2	200,000	7	N/A		X	X
* Linum perenne	blue flax				I	1/4 - 1/2	278,000	5	N/A		X	X
Lomatium dissectum	fernleaf biscuitroot				N	1/2 - 1	45,000	30	N/A	X	X	X
* Medicago sativa	alfalfa				I	1/4 - 1/2	200,000	6	N/A	X	X	
* Sanguisorba minor	small burnet				I	1/2 - 1	48,000	26	N/A	X	X	X
Solidago missouriensis	Missouri goldenrod				N	0 - 1/8	2,000,000	1	N/A		X	X
Symphyotrichum spathulatum	western mountain aster				N	0 - 1/8	1,290,000	2	N/A	X	X	
GRASSES												
Festuca idahoensis	Idaho fescue				N	1/4 - 1/2	450,000	3	N/A	X	X	X
Pseudoroegneria spicata	bluebunch wheatgrass				N	1/4 - 1/2	130,000	9	N/A		X	X

TABLE 6 CONTINUED: POLLINATOR PLANT LIST 18 - 25 INCH PRECIPITATION

ALTERNATIVE FORBS		Bloom Color and Time								Soils		
Scientific Name	Common Name	spring	summer	fall	Origin N = native, I = introduced	Seeding Depth (in)	Seeds/lb	Seeding Rate (PLS lbs/ac)	Plant Spacing (ft)	fine	med	coarse
Asclepias speciosa	showy milkweed				N	1/2 - 1	72,000	18	N/A	X	X	X
& Astragalus canadensis	Canada milkvetch				N	1/4 - 1/2	270,000	5	N/A		X	
& Astragalus cicer	cicer milkvetch				I	1/4 - 1/2	123,000	10	N/A	X	X	
Erigeron filifolius	threadleaf fleabane				N	1/4 - 1/2	300,000	4	N/A		X	X
Erigeron pumilus	shaggy daisy				N	0 - 1/8	1,800,000	1	N/A		X	X
Erigeron speciosus	showy daisy				N	0 - 1/8	1,892,000	1	N/A		X	X
* Eriophyllum lanatum	Oregon sunshine				N	1/8 - 1/4	810,000	3	N/A	X	X	X
* Geranium viscosissimum	sticky purple geranium				N	1/2 - 1	55,000	24	N/A		X	
Helianthella uniflora	little sunflower				N	1/2 - 1	41,000	32	N/A	X	X	X
* Linum lewisii	Lewis flax				N	1/4 - 1/2	260,000	5	N/A		X	X
Lomatium triternatum	nineleaf biscuitroot				N	1/2 - 1	45,000	30	N/A		X	X
* Medicago sativa ssp. falcata	yellow blossom alfalfa				I	1/4 - 1/2	211,000	6	N/A	X	X	
@ Onobrychis vicifolia	sainfoin				I	1/2 - 1	30,000	44	N/A		X	X
Penstemon attenuatus	taper-leaved penstemon				N	0 - 1/8	1,500,000	2	N/A	X	X	
Penstemon confertus	yellow pentstemon				N	0 - 1/8	4,600,000	0.5	N/A	X	X	X
Potentilla arguta	tall cinquefoil				N	0 - 1/8	4,400,000	0.5	N/A		X	
Potentilla gracilis	slender cinquefoil				N	0 - 1/8	1,700,000	1	N/A		X	X
Solidago canadensis	Canada goldenrod				N	0 - 1/8	4,600,000	5	N/A		X	X

TABLE 6 CONTINUED: POLLINATOR PLANT LIST 18 - 25 INCH PRECIPITATION

SHRUBS ^		Bloom Color and Time								Soils		
Scientific Name	Common Name	spring	summer	fall	Origin N = native, I = introduced	Seeding Depth (in)	Seeds/lb	Seeding Rate (PLS lbs/ac)	Plant Spacing (ft)	fine	med	coarse
%! Amelanchier alnifolia	serviceberry				N	seedlings	N/A	N/A	10	X	X	X
Caragana arborescens	Siberian peashrub				I	seedlings	N/A	N/A	10	X	X	X
Ceanothus sanguineus	red-stem ceanothus				N	seedlings	N/A	N/A	8	X	X	X
! Crataegus douglasii	black hawthorn				N	seedlings	N/A	N/A	8	X	X	X
Dasiphora fruticosa	shrubby cinquefoil				N	seedlings	N/A	N/A	6		X	
Eriogonum heracleoides	Wyeth's buckwheat				N	1/4 - 1/2 or seedlings	136,000	10	4		X	X
Eriogonum umbellatum	sulphur buckwheat				N	1/4 - 1/2 or seedlings	209,000	6	4		X	X
Holodiscus discolor	oceanspray				N	seedlings	N/A	N/A	6	X	X	X
! Mahonia repens	Oregon grape				N	seedlings	N/A	N/A	4		X	X
Philadelphus lewisii	Lewis' mock orange				N	seedlings	N/A	N/A	8		X	X
Physocarpus malvaceus	ninebark				N	seedlings	N/A	N/A	6	X	X	X
%! Prunus virginiana	chokecherry				N	seedlings	N/A	N/A	12	X	X	X
Rhus glabra	smooth sumac				N	seedlings	N/A	N/A	4		X	X
! Ribes aureum	golden currant				N	seedlings	N/A	N/A	6		X	
! Ribes cereum	wax currant				N	seedlings	N/A	N/A	6		X	X

TABLE 6 CONTINUED: POLLINATOR PLANT LIST 18 - 25 INCH PRECIPITATION

!	Rosa nutkana	Nootka rose		N	seedlings	N/A	N/A	6		X	X
!	Rosa woodsii	Woods rose		N	seedlings	N/A	N/A	6		X	X
!	Sambucus nigra ssp cerulea	blue elderberry		N	seedlings	N/A	N/A	10		X	X
$	Symphoricarpos albus	snowberry		N	seedlings	N/A	N/A	4	X	X	X

* Species that germinate and establish well.

@ Requires inoculation.

& Requires scarification and inoculation.

^ Plant 90 shrub seedlings per acre of each species. Plant in clumps of 10 or in rows.

% Should not be planted near cherry orchards due to risk of transmitting X-disease.

! Should not be planted near cherry orchards due to potential of attracting spotted wing drosophila.

$ Should not be planted near apple orchards due to potential of attracting snowberry maggot which resembles apple maggot.

PLANT SELECTIONS AND ESTABLISHMENT PROTOCOLS FOR POLLINATOR HABITAT PLANTINGS

PLANT SELECTIONS

6 – 9" and 9 – 12" PRECIPITATION

- A mixture of **5 flowering species** including one that blooms in spring, one in summer and one in fall is the minimum number of species required.
- **Include 7 or more flowering species** in the seeded mix in case one or more species fails to establish.

12 - 16" PRECIPITATION

- A mixture of **9 flowering species** including three that bloom in spring, three in summer and one in fall is the minimum number of species required.
- **Include 12 or more flowering species** in the seeded mix in case a few of the species fail to establish.

16 - 18" and 18 – 25" PRECIPITATION

- A mixture of **9 flowering species** including three that bloom in spring, three in summer and three in fall is the minimum number of species required.
- **Include 12 or more flowering species** in the seeded mix in case a few of the species fail to establish.

ALL PRECIPITATION ZONES

- Start with the Base Mix in this Technical Note that corresponds to your precipitation zone. These species are known to establish reliably and are usually commercially available.
- Chose additional species from the Alternative Forbs list. These may be less reliable. They have particular challenges related to dormancy, inoculation, commercial availability, or cost. These species should be seeded at rates lower than those in the Base Mix.
- Include grasses in the mix but do not exceed 25% of the mix based on seeds per square foot. Omit grasses from the mix if cheatgrass or other grass weeds are problematic and will be controlled with grass-selective herbicides.
- Species not included on these lists may be substituted only if approved by the State Plant Materials Specialist.
- **BUY CERTIFIED OR CERTIFIED QUALITY SEED.** This means it has been tested for percent germination and purity, which are needed to calculate PLS (pure live seed) seeding rates. Planting uncertified seed will likely result in a tremendous waste of time and money. Also, buying certified seed is required by NRCS Washington and Oregon Practice Standards. If certified seed is not used, NRCS can refuse payment for the practice.

RECOMMENDED ESTABLISHMENT PROTOCOLS

SITE PREP

- **MINIMIZE DISTURBANCE TO THE SITE. DO NOT TILL UNLESS COMPLETELY NECESSARY.** The more a site is disturbed, the more weed pressure it will have in following years and the more likely the seeded stand will fail.
- Chem-fallow the area to be seeded for one or two growing seasons by applying a high rate of glyphosate (1.1 to 2.2 lb ae (acid equivalent)/ac) in the spring and fall. Improve herbicide effectiveness by mowing two weeks prior to herbicide application, and adding surfactants and adjuvants to the glyphosate.
- Control the flush of fall germinating weeds prior to seeding the pollinator mix.
- **IF THE SITE HAS ALREADY BEEN TILLED,** consider establishing a stand of grasses the first year. Control broadleaf weeds with a non-residual burn-down herbicide such as bromoxynil for two years. In year three, spray out strips of grass with glyphosate and seed forbs into these strips.

SEEDING

- Seed forbs and grasses at the same time in a late fall dormant planting.
    - November or December in areas with less than 16” annual precipitation.
    - October 15 to November 15 in areas with more than 16” annual precipitation.

  Most forbs and shrub species need a cold-moist period to break seed dormancy.
- Use one of these three seeding methods:
    - 1) Seed with a no-till drill, and set the depth no deeper than ¼ inch.
    - 2) Seed with a conventional drill with the tubes pulled (tape them above the opener if necessary). This ensures the seed is not buried too deep.
    - 3) Lightly harrow the area (if little residue is present), then broadcast the seed.
- Rice hulls, rice, cracked grain or granular clay may be used to assist seed flow.

MANAGEMENT

- Manage weeds during the first year by mowing to prevent weed seeds from disseminating.
- Manage weeds during the years following by spot spraying, using pre-emergent herbicides or herbicides applied during phases of perennial dormancy.
- Apply a grass-selective herbicide if perennial grass begins to regrow and is competitive or to control cheatgrass or other grass weeds.
- Do not fertilize during the first year of establishment.

SHRUB AND FORB TRANSPLANTS

- Shrub and forb transplants can be planted instead of, or in addition to, a seeded stand. This option is expensive and requires more work in the short-term, but is more likely to result in a successful planting in the long-term.

- Plant seedlings in March or April directly into sod with vegetation that has been killed during the previous growing season with 1-2 applications of glyphosate. Plant in areas that will not be mowed, or in rows to allow for mowing between the rows.
- Suppress weed growth around the transplants with landscape fabric or glyphosate. See Protocols for Organic Pollinator Habitat Plantings (pages 32 and 33) for more details about installing landscape fabric.
- Install protective tubes or other barriers to prevent damage from rodents, rabbits and deer.

THERE ARE MULTIPLE CHALLENGES ASSOCIATED WITH ESTABLISHING FORB PLOTS. Many forb seedings fail due to low germination, weed competition, and neglect. Establishing, monitoring and maintaining forb plantings is expensive and labor-intensive. The area may have to be re-established if an adequate stand is not achieved the first time.

HABITAT CONSIDERATIONS

- Use the Xerces Pollinator Habitat Assessment Form and Guide to determine other components besides plants that may be missing from your habitat.

PLANT SELECTIONS AND ESTABLISHMENT PROTOCOLS FOR ORGANIC POLLINATOR HABITAT PLANTINGS

INITIAL CONSIDERATIONS

- Weeds must be controlled prior to planting forbs because there are very few organic methods for controlling weeds after a planting.
- Organic weed control methods prior to planting include: 1) plastic mulch solarization, 2) vinegar-based herbicide, 3) planting a smother crop and 4) tillage. The first two methods are expensive and not reliable. The smother crop option involves planting a cover crop or succession of cover crops and mowing or crimping them before seed set. The tillage option typically results in an unmanageable weed problem.
- If irrigation will be used to help establish the forbs and shrubs, irrigation should also be used to prepare the area for planting. It will encourage flushes of weeds.
- After planting, one of the weed control options is mowing, which must be performed frequently throughout the growing season and may damage the forb seedlings. Another option is hand-weeding, however this option is only feasible in small areas.
- **THE BEST OPTION FOR ESTABLISHING ORGANIC POLLINATOR HABITAT INVOLVES PLANTING FORB AND SHRUB SEEDLINGS INTO PLASTIC OR FIBER BARRIER.** This option is expensive and requires more work in the short-term, but is more likely to result in a successful planting and will require less work in the long-term.

ESTABLISHMENT PROTOCOLS – TRANSPLANTING FORB AND SHRUB SEEDLINGS

SITE PREP - LARGE AREAS OR RANGELAND

- If a large tilled field is to be planted, seed it first to grasses then follow with transplanting forbs and shrubs. This can be done immediately or the following year.
- If forbs and shrubs will be added to existing rangeland, scalp areas where transplants will be planted.
- Acquire pieces of fabric mulch.

SITE PREP - SMALL AREAS OR FIELD BORDERS

- Acquire plastic landscape fabric.
- Compare width of fabric to width of area. Rectangular shaped areas are best.
- Install fabric with a fabric-laying machine or install by hand. To install by hand, first rototill perimeter of fabric area and remove soil to form a trench. Lay fabric so the edges lay in the trench. Cover edges with the soil previously removed. Doing this will help prevent rodents from getting under the mulch and damaging the seedlings.
- Secure fabric with landscape staples.
- Multiple widths of fabric can be joined together by overlapping them, folding and securing with landscape staples.
- If sod or dense weeds are present, install the fabric several months prior to planting to kill the existing vegetation.

PLANTING

- Select plant species from appropriate precipitation zone list in this Technical Note.
- Cut or burn openings in the fabric mulch large enough to dig a hole for the seedling root mass. Secure the fabric near the plant with landscape staples.
- Use a spade to dig a hole large enough for the seedling root mass. Loosen soil on the sides.
- Plant seedling so root mass is near the surface, but not protruding from the surface.
- Pack soil around the seedling with the spade to remove air pockets in the soil.
- Install protective tubes or other barriers to prevent damage from rodents, rabbits and deer.

MANAGEMENT

- Mow weeds around the edges of the fabric.
- Hand-pull weeds around the base of each plant.
- Cut larger holes in the fabric around the base of each plant as needed to allow unrestricted growth.

ESTABLISHMENT PROTOCOLS - PLANTING SEED - NOT RECOMMENDED

SITE PREP

- Eliminate existing vegetation with the least amount of disturbance possible.
- Grow smother crops for one to two growing seasons to prevent weeds from establishing and to prevent soil erosion. Do not allow smother crops to produce seed.
- Plant forbs into crimped or mowed smother crop residue, or in seedbed where smother crop residue has been incorporated with minimum tillage.

SEEDING

- Seed grasses and forbs together in the late fall. Most forbs and shrub species need a cold-moist period to break seed dormancy.
- Drill the seed no deeper than ¼ inch. Do NOT harrow after seeding. To acquire very thin soil coverage, either use press wheels, drag chains, or a roller packer.
- Rice hulls, cracked grain or granular clay may be used to assist seed flow.
- Do not attempt to "interseed" forbs into an area with established growing grasses or weeds. The forbs will not be able to compete.

MANAGEMENT

- Mow the stand as needed to prevent weeds from producing seed.
- Hand-pull, hoe or use flame-weeding to control invasive noxious weeds.

HABITAT CONSIDERATIONS

- Use the Xerces Pollinator Habitat Assessment Form and Guide to determine other components besides plants that may be missing from your habitat.

PLANT PHOTOS AND DESCRIPTIONS

Additional information for many of these species can be found in NRCS Plant Guides and Fact Sheets, available for download from the PLANTS Database: www.plants.usda.gov. Seeding rates are PLS lb/ac. Rates should be adjusted appropriately when used as part of a seed mixture.

FORBS

Western yarrow. Clarence A. Rechenthin, PLANTS Database

Achillea millefolium, western yarrow
Origin: native
Mature Height: 0.5 - 1.5 ft
Growth Rate: rapid
Growth Habit: upright to prostrate
Wildlife Value: good forage
Attracts: butterflies, some bees
Flowers: white to yellow
Bloom: June – August
Precip Range: 6 – 25 in
Seeding Rate: 1 lb/ac

Canada milkvetch. William S. Justice, PLANTS Database

Astragalus canadensis, Canada milkvetch
Origin: native
Mature Height: 1 – 2.5 ft
Growth Rate: moderate
Growth Habit: prostrate to upright
Wildlife Value: good forage and seeds food source
Attracts: bees, butterflies and is host for some white and sulphur butterfly larvae
Flowers: June - July
Bloom: cream
Precip Range: 16+ in
Seeding Rate: 5 lb/ac

Showy milkweed. Teresa Prendusi, US Forest Service

Asclepias speciosa, showy milkweed
Origin: native
Mature Height: 1.5 - 4 ft
Growth Rate: moderate to rapid
Growth Habit: upright
Wildlife Value: nectar for butterflies, bees and other insects
Attracts: butterflies, bees, beneficial insects
Flowers: pink
Bloom: June - July
Precip Range: 16 – 30 in
Seeding Rate: 18 lb/ac

Cicer milkvetch. University of Wyoming

Astragalus cicer, cicer milkvetch
Origin: introduced
Mature Height: 1 - 3 ft
Growth Rate: moderate to rapid
Growth Habit: upright (lodges at maturity)
Wildlife Value: excellent forage and seeds food source
Attracts: bees, butterflies
Flowers: cream
Bloom: June - July
Precip Range: 16 + in
Seeding Rate: 10 lb/ac

Basalt milkvetch. Clint Shock, Oregon State University

Astragalus filipes, basalt milkvetch
Origin: native
Mature height: 1-3 ft
Growth Rate: moderate to rapid
Growth Habit: upright
Wildlife Value: fair to good forage
Attracts: bees, butterflies
Flowers: white to cream
Bloom: May - July
Precip Range: 6 - 16 in
Seeding Rate: 10 lb/ac

Carey's balsamroot. www.perr.com

Balsamorhiza careyana, Carey's balsamroot
Origin: native
Mature Height: 1 - 2 ft
Growth Rate: slow
Growth Habit: upright
Wildlife Value: fair forage
Attracts: bees
Flowers: yellow
Bloom: April - May
Precip Range: 6 - 16 in
Seeding Rate: 24 lb/ac

Arrowleaf balsamroot. Al Schneider, PLANTS Database

Balsamorhiza sagittata, arrowleaf balsamroot
Origin: native
Mature Height: 1 - 2 ft
Growth Rate: slow
Growth Habit: upright
Wildlife Value: fair forage
Attracts: bees
Flowers: yellow
Bloom: April - May
Precip Range: 12 – 25 in
Seeding Rate: 24 lb/ac

Douglas' dustymaiden. Derek Tilley

Chaenactis douglasii, Douglas' dustymaiden
Origin: native
Mature Height: 1 - 3 ft
Growth Rate: rapid
Growth Habit: upright
Wildlife Value: insects eaten by young birds
Attracts: bees
Flowers: white to pinkish
Bloom: June – July
Precip Range: 6 - 16 in
Seeding Rate: 4 lb/ac

Fireweed. Ben Legler, University of Washington Burke Herbarium

***Chamerion angustifolium*, fireweed**
Origin: native
Mature Height: 2 – 4 ft
Growth Rate: rapid
Growth Habit: upright
Wildlife Value: fair to good forage
Attracts: bees
Flowers: June - September
Bloom: pink
Precip Range: 18+ in
Seeding Rate: 0.5 lb/ac

Yellow beeplant. Idaho Dept. of Transportation

***Cleome lutea*,** yellow beeplant
Origin: native
Mature Height: 2 - 3 ft
Growth Rate: rapid
Growth Habit: upright
Wildlife Value: cover
Attracts: bees
Flowers: yellow
Bloom: May-June
Precip Range: 9 – 18 in
Seeding Rate: 14 lb/ac

Slender hawksbeard. Thayne Tuason

***Crepis attibarba*,** slender hawksbeard
Origin: native
Mature Height: 0.5 – 2.5 ft
Growth Rate: slow
Growth Habit: upright
Wildlife Value: fair forage
Attracts: bees, butterflies
Flowers: yellow
Bloom: May - June
Precip Range: 6 – 16 in
Seeding Rate: 3 lb/ac

Western prairie clover. Kishor Bhattarai, Utah State University

Dalea ornata, western prairie clover
Origin: native
Mature Height: 1 - 2.5 ft
Growth Rate: moderate
Growth Habit: upright
Wildlife Value: excellent forage
Attracts: bees
Flowers: pink, purple
Bloom: June - August
Precip Range: 6 - 18 in
Seeding Rate: 10 lb/ac

Threadleaf fleabane. www. botany.hawaii.edu

Erigeron filifolius, threadleaf fleabane
Origin: native
Mature Height:4 – 20 in
Growth Rate: slow
Growth Habit: upright
Wildlife Value: poor forage
Attracts: bees
Flowers: blue, pink, white
Bloom: June - August
Precip Range: 6 – 25 in
Seeding Rate: 4 lb/ac

Linearleaf daisy. www.wildgingerfarm.com

Erigeron linearis, linearleaf daisy
Origin: native
Mature Height: 2 – 12 in
Growth Rate: slow
Growth Habit: upright
Wildlife Value: poor forage
Attracts: bees, butterflies; larval host for Sagebrush Checkerspot butterfly
Flowers: yellow
Bloom: April - May
Precip Range: 6 – 16 in
Seeding Rate: 5 lb/ac

Shaggy daisy. Utah Valley University Herbarium

Erigeron pumilus, shaggy daisy
Origin: native
Mature Height: 2 – 20 in
Growth Rate: slow
Growth Habit: upright
Wildlife Value: poor forage
Attracts: bees, butterflies
Flowers: white, blue, pink
Bloom: May - July
Precip Range: 6 – 25 in
Seeding Rate: 1 lb/ac

Showy daisy. Rod Gilbert, University of Washington Burke Herbarium

Erigeron speciosus, showy daisy
Origin: native
Mature Height: 6 – 32 in
Growth Rate: slow
Growth Habit: upright
Wildlife Value: poor forage
Attracts: bees, butterflies
Flowers: purple, white
Bloom: June - August
Precip Range: 18 – 25 + in
Seeding Rate: 1 lb/ac

Oregon sunshine. Pamela Pavek

Eriophyllum lanatum, Oregon sunshine
Origin: native
Mature Height: 4 – 24 in
Growth Rate: rapid
Growth Habit: upright
Wildlife Value: food and cover
Attracts: bees
Flowers: yellow
Bloom: May - July
Precip Range: 9 – 25 in
Seeding Rate: 3 lb/ac

Blanketflower. Pamela Pavek

Gaillardia aristata, blanketflower
Origin: native
Mature Height: 1 - 1.5 ft
Growth Rate: moderate
Growth Habit: upright
Wildlife Value: excellent food and cover
Attracts: bees, butterflies
Flowers: orange, yellow
Bloom: July - September
Precip Range: 9 – 25 in
Seeding Rate: 7 lb/ac

Sticky purple geranium. Pamela Pavek

Geranium viscosissimum, sticky purple geranium
Origin: native
Mature Height: 2 - 3 ft
Growth Rate: rapid
Growth Habit: upright
Wildlife Value: good forage
Attracts: bees, butterflies
Flowers: pink, purple
Bloom: May - June
Precip Range: 16 – 25 in
Seeding Rate: 24 lb/ac

Northern or Utah sweetvetch. Al Schneider, PLANTS Database

Hedysarum boreale, northern or Utah sweetvetch
Origin: introduced (native to UT)
Mature Height: 1 - 2 ft
Growth Rate: rapid
Growth Habit: spreading to upright
Wildlife Value: good forage
Attracts: bees, butterflies
Flowers: pink, purple
Bloom: May - June
Precip Range: 9 - 18 in
Seeding Rate: 28 lb/ac

Little sunflower. Ben Legler, University of Washington Burke Herbarium

Helianthella uniflora, little sunflower
Origin: native
Mature Height: 0.75 – 3.5 ft
Growth Rate: slow
Growth Habit: upright
Wildlife Value: food and cover
Attracts: bees, wasps, butterflies
Flowers: yellow
Bloom: June - August
Precip Range: 12 – 25 in
Seeding Rate: 32 lb/ac

Annual sunflower. A. Schneider. PLANTS Database

Helianthus annuus, annual sunflower
Origin: native
Mature Height: 2 - 5 ft
Growth Rate: rapid
Growth Habit: upright
Wildlife Value: good winter food
Attracts: butterflies, bees
Flowers: yellow
Bloom: July-September
Precip Range: 6 - 16 in
Seeding Rate: 30 lb/ac

Lewis flax. Derek Tilley

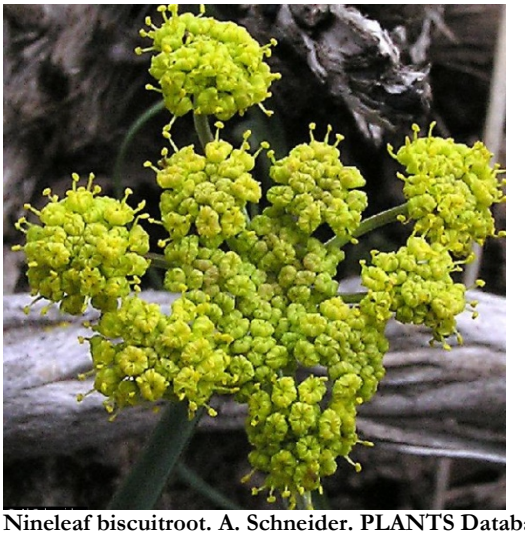
Linum lewisii, Lewis flax
Origin: native
Mature height: 1 - 2 ft
Growth Rate: moderate to rapid
Growth Habit: upright
Wildlife value: excellent food
Attracts: bees
Flowers: light blue
Bloom: May-July
Precip Range: 9 – 25 in
Seeding Rate: 5 lb/ac

Blue flax. Derek Tilley

Linum perenne, blue flax
Origin: introduced
Mature height: 1 - 2 ft
Growth Rate: moderate to rapid
Growth Habit: upright
Wildlife value: excellent food
Attracts: bees
Flowers: light blue
Bloom: May - July
Broadcast Seeding Rate: 4 lb/ac
In-row Spacing: 1 - 2 ft
Precip Range: 9 – 25 in
Seeding Rate: 5 lb/ac

Fernleaf biscuitroot. Dave Skinner

Lomatium dissectum, fernleaf biscuitroot
Origin: native
Mature Height: 0.5 - 3 ft
Growth Rate: slow
Growth Habit: erect
Wildlife Value: good forage
Attracts: bees, flies, beetles, butterflies; host for larvae of Anise and Indra swallowtail butterflies
Flowers: yellow green
Bloom: Ma y- July
Precip Range: 12 – 25 in
Seeding Rate: 30 lb/ac



Nineleaf biscuitroot. A. Schneider. PLANTS Database

Lomatium triternatum, nineleaf biscuitroot
Origin: native
Mature Height: 2 - 3 ft
Growth Rate: slow
Growth Habit: erect
Wildlife Value: good forage
Attracts: bees, flies, beetles, butterflies; host for larvae of Anise and Indra swallowtail butterflies
Flowers: yellow green
Bloom: May - June
Precip Range: 9 – 25 in
Seeding Rate: 30 lb/ac

Hoary tansyaster. Pamela Pavek

Machaeranthera canescens, hoary tansyaster
Origin: native
Mature Height: 2-3 ft
Growth Rate: rapid
Growth Habit: erect
Wildlife Value: fair to good forage
Attracts: bees, butterflies, moths
Flowers: blue to purple
Bloom: August-October
Precip Range: 6 - 18 in
Seeding Rate: 1 lb/ac

Alfalfa. Midwest Cover Crops Council

Medicago sativa, alfalfa
Origin: introduced
Mature Height: 2-3 ft
Growth Rate: fast
Growth Habit: upright
Wildlife Value: excellent forage
Attracts: bees, butterflies; host of some blue and hairstreak butterflies
Flowers: purple
Bloom: May – July (delay by cutting)
Precip Range: 9 – 25 in
Seeding Rate: 6 lb/ac

Yellow blossom alfalfa. www.agroatlas.ru

Medicago sativa* ssp. *falcata, yellow blossom alfalfa
Origin: introduced
Mature Height: 2 - 3 ft
Growth Rate: fast
Growth Habit: upright
Wildlife Value: excellent forage
Attracts: bees, butterflies
Flowers: yellow
Bloom: May – July (delay by cutting)
Precip Range: 9 – 25 in
Seeding Rate: 6 lb/ac

Yellow sweetclover. J.S. Peterson, PLANTS Database

Melilotus officinalis, white and yellow sweetclover
Origin: introduced
Mature Height: 1 - 3 ft
Growth Rate: rapid
Growth Habit: upright
Wildlife Value: fair forage
Attracts: many bees, butterflies; larval host of some sulphur butterflies
Flowers: white or yellow
Bloom: June - July
Precip Range: 6 - 9 in (will become weedy at higer precip)
Seeding Rate: 5 lb/ac

Blazing star. Pamela Pavek

***Mentzelia laevicaulis*,** blazing star
Origin: native
Mature Height: 1 – 3.5 ft
Growth Rate: rapid
Growth Habit: upright
Wildlife Value: poor to fair forage
Attracts: bees
Flowers: yellow
Bloom: June - August
Precip Range: 6 – 12 in
Seeding Rate: 4 lb/ac

Evening primrose. Al Schneider, PLANTS Database

Oenothera pallida, evening primrose
Origin: native
Mature Height: 4 – 20 in
Growth Rate: moderate
Growth Habit: upright
Wildlife Value: poor to fair forage
Attracts: bees, moths, butterflies
Flowers: white, pink
Bloom: May - June
Precip Range: 9 – 16 in
Seeding Rate: 3 lb/ac

Sainfoin. www.apiculture-populaire.com

Onobrychis viciifolia, sainfoin
Origin: introduced
Mature Height: 2 - 5 ft
Growth rate: rapid
Growth Habit: upright
Wildlife Value: excellent forage
Attracts: larger bees
Flowers: pink
Bloom: May - July (delay by cutting)
Precip Range: 14 – 25 in
Seeding Rate: 44 lb/ac

Taper-leaved penstemon. Pamela Pavek

Penstemon attenuatus, taper-leaved penstemon
Origin: native
Mature Height: 1 – 3 ft
Growth Rate: moderate
Growth Habit: upright
Wildlife Value: fair to good forage
Attracts: bees, butterflies; larval host of some Checkerspot butterflies
Flowers: blue, purple, pink
Bloom: May - July
Precip Range: 12 – 25 in
Seeding Rate: 1 lb/ac

Yellow penstemon. www.wildgingerfarm.com

Penstemon confertus, yellow penstemon
Origin: native
Mature Height: 0.75 – 2 ft
Growth Rate: moderate
Growth Habit: upright
Wildlife Value: fair to good forage
Attracts: bees, butterflies; larval host of some Checkerspot butterflies
Flowers: pale yellow
Bloom: June - July
Precip Range: 16 – 25 in
Seeding Rate: 0.5 lb/ac

Showy penstemon. www.perr.com

Penstemon speciosus, showy penstemon
Origin: native
Mature Height: 0.75 – 3 ft
Growth Rate: moderate
Growth Habit: upright
Wildlife Value: fair to good forage
Attracts: bees, butterflies; larval host of some Checkerspot butterflies
Flowers: blue
Bloom: June - July
Precip Range: 9 – 18 in
Seeding Rate: 3 lb/ac

Elegant penstemon. Derek Tilley

Penstemon venustus, elegant penstemon
Origin: native
Mature Height: 1 – 2.5 ft
Growth Rate: moderate
Growth Habit: upright
Wildlife Value: fair to good forage
Attracts: bees, butterflies; larval host of some Checkerspot butterflies
Flowers: blue - purple
Bloom: June - July
Precip Range: 16 – 18 in
Seeding Rate: 2 lb/ac

Whiteleaf phacelia. Ben Legler, University of Washington Burke Herbarium

Phacelia hastata, whiteleaf phacelia
Origin: native
Mature Height: 1 - 2 ft
Growth Rate: rapid
Growth Habit: upright
Wildlife Value: good forage
Attracts: bees
Flowers: white, lavender
Bloom: May - June
Precip Range: 9 – 16 in
Seeding Rate: 8 lb/ac

Varileaf phacelia. www.swcoloradowildflowers.com

Phacelia heterophylla, varileaf phacelia
Origin: native
Mature Height: 0.75 – 4 ft
Growth Rate: rapid
Growth Habit: upright
Wildlife Value: good forage
Attracts: bees
Flowers: white
Bloom: May - June
Precip Range: 9 – 16 in
Seeding Rate: 2 lb/ac

Tall cinquefoil. Pamela Pavek

Potentilla arguta, tall cinquefoil
Origin: native
Mature Height: 1.5 – 3 ft
Growth Rate: rapid
Growth Habit: upright
Wildlife Value: fair to good forage
Attracts: bees, butterflies
Flowers: pale yellow to white
Bloom: June - July
Precip Range: 18 – 25 in
Seeding Rate: 0.5 lb/ac

Slender cinquefoil. University of Washington Burke Herbarium

Potentilla gracilis, slender cinquefoil
Origin: native
Mature Height: 1 – 2 ft
Growth Rate: rapid
Growth Habit: upright
Wildlife Value: poor to fair forage
Attracts: bees, butterflies
Flowers: yellow
Bloom: June - July
Precip Range: 18 – 25 in
Seeding Rate: 1 lb/ac

Small burnet. J. Duft, PLANTS Database

Sanguisorba minor, small burnet
Origin: introduced
Mature Height: 1 - 2.5 ft
Growth Rate: rapid
Growth Habit: upright
Wildlife Value: excellent forage
Attracts: bees
Flowers: green-red
Bloom: June - August
Precip Range: 12 – 25 in
Seeding Rate: 26 lb/ac

Canada goldenrod. www.discoverlife.org

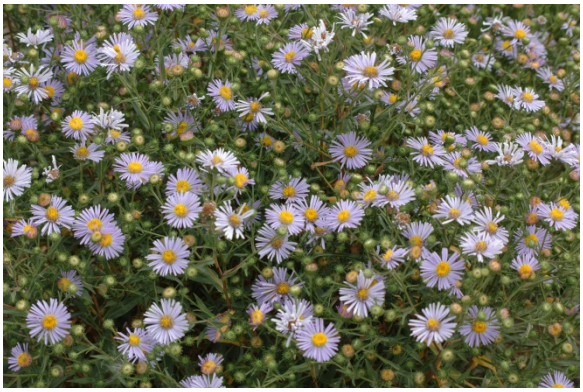
Solidago canadensis, Canada goldenrod
Origin: native
Mature Height: 3 – 5 ft
Growth Rate: rapid
Growth Habit: upright, rhizomatous
Wildlife Value: fair forage and seeds eaten by songbirds
Attracts: bees, butterflies
Flowers: yellow
Bloom: August - October
Precip Range: 18 – 25 + in
Seeding Rate: 0.5 lb/ac

Missouri goldenrod, Pamela Pavek

Solidago missouriensis, Missouri goldenrod
Origin: native
Mature Height: 0.75 – 3 ft
Growth Rate: rapid
Growth Habit: upright, rhizomatous
Wildlife Value: fair forage and seeds eaten by songbirds
Attracts: bees, butterflies
Flowers: yellow
Bloom: August - October
Precip Range: 12 – 25 + in
Seeding Rate: 1 lb/ac

Munro's globemallow. Pamela Pavek

Sphaeralcea munroana, Munro's globemallow
Origin: native
Mature Height: 1.5 - 3 ft
Growth Rate: rapid
Growth Habit: upright, rhizomatous
Wildlife Value: excellent forage
Attracts: bees, flies, butterflies
Flowers: orange
Bloom: May - June
Precip Range: 6 – 16 in
Seeding Rate: 3 lb/ac



Western mountain aster. Pamela Pavek

Symphiotrichum spathulatum., western mountain aster
Origin: native
Mature Height: 0.5 - 3 ft
Growth Rate: moderate
Growth Habit: upright
Wildlife Value: excellent food and cover
Attracts: butterflies, bees, beetles; larval host of some Crescent butterflies (*Phyciodes* spp.)
Flowers: purple
Bloom: July - October
Precip Range: 12 – 25 in
Seeding Rate: 2 lb/ac

SHRUB PHOTOS AND DESCRIPTIONS

Serviceberry. J. McMillian. PLANTS Database

Amelanchier alnifolia, serviceberry
Origin: native
Mature Height: 6 - 15 ft
Growth Rate: slow
Growth Habit: upright
Wildlife Value: good cover and food
Attracts: butterflies, bees
Flowers: white
Bloom: May - June
Precip Range: 12 – 25 in
In-row Spacing: 10 ft

Siberian peashrub. R.A. Howard, PLANTS Database

Caragana arborscens, Siberian peashrub
Origin: introduced
Mature Height: 6 - 20 ft
Growth Rate: rapid
Growth Habit: erect oval shrub
Wildlife Value: nesting
Attracts: large bees (especially bumblebees)
Flowes: yellow
Bloom: April - June
Precip Range: 12 – 25 in
In-row Spacing: 10 ft

Red-stem ceanothus. University of Idaho Herbarium

Ceanothus sanguineus, red-stem ceanothus
Origin: native
Mature Height: 2 – 6 ft
Growth Rate: rapid
Growth Habit: upright
Wildlife Value: elk browse, berries for birds
Attracts: bees, butterflies; larval host for the pale swallowtail and some hairstreak and blue butterflies
Flowers: white
Bloom: May - June
Precip Range: 18 – 25 in
In-row Spacing: 8 ft

Yellow rabbitbrush. www.swcoloradowildflowers.com

Chrysothamnus viscidiflorus, yellow rabbitbrush
Origin: native
Mature Height: 2 – 3 ft
Growth Rate: rapid
Growth Habit: upright
Wildlife Value: food, forage, cover
Attracts: bees, butterflies; larval host of Sagebrush Checkerspot butterfly
Flowers: yellow
Bloom: August - October
Precip Range: 6 – 18 in
Seeding Rate: 3 lb/ac
In-row Spacing: 4 ft

Black hawthorn. Ben Legler, University of Washington Burke Herbarium

Crataegus douglasii, black hawthorn
Origin: native
Mature Height: 12 - 15 ft
Growth Rate: slow
Growth Habit: upright
Wildlife Value: food and cover
Attracts: moths, bees, butterflies
Flowers: white
Blooms: May - June
Precip Range: 16 – 25 + in
In-row Spacing: 8 ft

Shrubby cinquefoil. Ben Legler, University of Washington Burke Herbarium

Dasiphora fruticosa, shrubby cinquefoil
Origin: native
Mature Height: 2 - 4 ft
Growth Rate: slow
Growth Habit: upright
Wildlife Value: food and cover
Attracts: moths, bees, butterflies, beetles, flies
Flowers: yellow
Blooms: May - June
Precip Range: 18 – 25 + in
In-row Spacing: 6 ft

Rubber rabbitbrush. S. and A. Wilson, Lady Bird Johnson Wildflower Center

Ericameria nauseosa, rubber rabbitbrush
Origin: native
Mature Height: 2 - 6 ft
Growth Rate: moderate
Growth Habit: open spreading
Wildlife Value: food, winter forage, cover
Attracts: butterflies, small bees
Flowers: yellow
Bloom: August - October
Precip Range: 6 – 18 in
Seeding Rate: 3 lb/ac
In-row Spacing: 4 ft

Whorled buckwheat. Derek Tilley

Eriogonum heracleoides, Wyeth's buckwheat
Origin: native
Mature Height: 1 - 3 ft
Growth Rate: moderate
Growth Habit: spreading, open sub-shrub
Wildlife Value: cover, fall forage
Attracts: moths, butterflies, bees, beetles; larval host of some blue and copper butterflies
Flowers: white, cream
Bloom: July - September
Precip Range: 9 – 18 in
Seeding Rate: 10 lb/ac
In-row Spacing: 4 ft

Snow buckwheat. Marc Dilley. www.justgetout.org

Eriogonum niveum, snow buckwheat
Origin: native
Mature Height: 1 – 2 ft
Growth Rate: moderate
Growth Habit: spreading, rounded shrub
Wildlife Value: forage for mule deer and bighorn sheep
Attracts: bees, butterflies, moths, wasps; larval host of some blue butterflies
Flowers: white, pink
Bloom: August - September
Precip Range: 6 – 12 in
Seeding Rate: 3 lb/ac
In-row Spacing: 4 ft

Sulphurflower buckwheat. Derek Tilley

Eriogonum umbellatum, sulphurflower buckwheat
Origin: native
Mature Height: 0.5 - 2 ft
Growth Rate: moderate
Growth Habit: spreading, open sub-shrub
Wildlife Value: cover, fall forage
Attracts: moths, butterflies, bees; larval host of some blue butterflies
Flowers: yellow
Bloom: July - September
Precip Range: 6 – 25 in
Seeding Rate: 6 lb/ac
In-row Spacing: 4 ft

Oceanspray. Washington State University Herbarium

Holodiscus discolor, oceanspray
Origin: native
Mature Height: 3 – 9 ft
Growth Rate: moderate
Growth Habit: upright, arching branches
Wildlife Value: browse and cover
Attracts: bees, butterflies; larval host of the pale swallowtail butterfly and some "blues"
Flowers: cream
Bloom: May - July
Precip Range: 18 – 25 + in
In-row Spacing: 6 ft

Oregon grape. Jeff McMillian, PLANTS Database

Mahonia aquifolium, M. repens, Oregon grape
Origin: native
Mature Height: 1 – 2 ft (*M. repens*); 3 – 5 ft (*M. aquifolium*)
Growth Rate: rapid
Growth Habit: creeping (*M. repens*); upright (*M. aquifolium*)
Wildlife Value: food and cover
Attracts: bees
Flowers: yellow
Bloom: May - June
Precip Range: 16 – 25 + in
In-row Spacing: 4 ft

Lewis' mockorange. www.flikr.com

Philadelphus lewisii, Lewis' mockorange
Origin: native
Mature Height: 4 – 8 ft
Growth Rate: slow
Growth Habit: branching shrub
Wildlife Value: food (berries)
Attracts: bees, butterflies
Flowers: white
Bloom: May - June
Precip Range: 12 – 25 in
In-row Spacing: 10 ft

Ninebark. Steve Sutherland, Montana Field Guide

Physocarpus malvaceus, ninebark
Origin: native
Mature Height: 1.5 – 6 ft
Growth Rate: slow
Growth Habit: spreading erect shrub
Wildlife Value: food, cover
Attracts: bees, butterflies, flies
Flowers: white
Bloom: June
Precip Range: 18 – 25+ in
In-row Spacing: 6 ft

Chokecherry. Nevada Native Plant Society, PLANTS Database

Prunus virginiana, chokecherry
Origin: native
Mature Height: 10 - 20 ft
Growth Rate: moderate
Growth Habit: oval to round; suckering
Wildlife Value: excellent food and cover
Attracts: bees, butterflies; larval host of the two-tailed swallowtail butterfly (largest butterfly in the PNW)
Flowers: white
Bloom: May
Precip Range: 12 – 25 in
In-row Spacing: 12 ft

Antelope bitterbrush. G. Monroe, PLANTS Database

Purshia tridentata, antelope bitterbrush
Origin: native
Mature Height: 2 - 6 ft
Growth Rate: moderate
Growth Habit: upright shrub
Wildlife Value: cover, fall forage
Attracts: butterflies, bees, flies; larval host of some hairstreak butterflies
Flowers: yellow
Bloom: May - June
Precip Range: 6 – 16 in
In-row Spacing: 6 ft

Smooth sumac. Larry Allain, PLANTS Database

Rhus glabra, smooth sumac
Origin: native
Mature Height: 3 – 9 ft
Growth Rate: moderate
Growth Habit: many-branched shrub
Wildlife Value: food, cover
Attracts: bees,
Flowers: pale green
Bloom: May
Precip Range: 12 – 25 in
In-row Spacing: 4 ft

Golden currant. Ben Legler, University of Washington Burke Herbarium

Ribes aureum, golden currant
Origin: native
Mature Height: 4 - 6 ft
Growth Rate: moderate
Growth Habit: spreading and upright
Wildlife Value: nesting cover, fruit
Attracts: early spring bees, bumblebees; larval host of some anglewing butterflies
Flowers: fragrant golden yellow
Bloom: April - May
Precip Range: 16 – 25 in
In-row Spacing: 6 ft

Wax currant. www.wikimedia.org

Ribes cereum, wax currant
Origin: native
Mature Height: 3 – 4 ft
Growth Rate: moderate
Growth Habit: compact, rounded
Wildlife Value: berries, cover
Attracts: early spring bees, bumblebees, butterflies, flies; larval host of some anglewing butterflies
Flowers: white, greenish-white, pink
Bloom: April - May
Precip Range: 16 – 25 in
In-row Spacing: 6 ft

Nootka rose. www.wikimedia.org

Rosa nutkana, Nootka rose
Origin: native
Mature Height: 3 – 6 ft
Growth Rate: moderate
Growth Habit: erect, drooping braches
Wildlife Value: nesting, cover, excellent food
Attracts: bees, butterflies, beetles
Flowers: pink
Bloom: May - July
Precip Range: 16 – 25 in
In-row Spacing: 6 ft

Wood's rose. Don Knoke, University of Washington Burke Herbarium

Rosa woodsii, Wood's rose
Origin: native
Mature Height: 3 - 6 ft
Growth Rate: moderate
Growth Habit: upright to semi-drooping
Wildlife Value: nesting, cover, excellent food
Attracts: bees, butterflies
Flowers: pink
Bloom: May - July
Precip Range: 12 – 25 in
In-row Spacing: 6 ft

Purple sage. Pamela Pavek

***Salvia dorrii*,** purple sage
Origin: native
Mature Height: 1 – 3 ft
Growth Rate: moderate
Growth Habit: rounded, compact
Wildlife Value: food, cover
Attracts: bees, moths, butterflies
Flowers: purple
Bloom: May - July
Precip Range: 6 – 16 in
In-row Spacing: 2 ft

Elderberry. Ben Legler, University of Washington Herbarium

Sambucus nigra* ssp. *cerulea, blue elderberry
Origin: native
Mature Height: 6 - 15 ft
Growth Rate: moderate
Growth Habit: upright
Wildlife Value: nesting, food
Attracts: bees, nesting bees, butterflies, beetles, flies
Flowers: white to cream
Bloom: June - July
Precip Range: 18 – 25+ in
Soil Texture: medium to coarse
In-row Spacing: 10 ft

Snowberry. Ben Legler, University of Washington Herbarium

Symphoricarpos albus., snowberry
Origin: native
Mature Height: 2 - 4 ft
Growth Rate: moderate
Growth Habit: open and spreading
Wildlife Value: food, berries, browse, cover
Attracts: butterflies, bees, hummingbirds; larval host of the Snowberry Checkerspot butterfly
Flowers: pink
Bloom: June - August
Precip Range: 18 – 25+ in
Soil Texture: fine, medium or coarse
In-row Spacing: 4 ft

BUTTERFLY-PLANT RELATIONSHIPS by David James

Butterflies are a highly visible and attractive component of many inland northwest ecosystems. Approximately 160 species occur in this region but populations of many of them are in decline due to habitat degradation and loss. In addition to their value as pollinators, providing vital components of functioning ecosystems and being aesthetically pleasing, butterflies play an important role as indicators of environmental change. Whether environments or habitats change as a result of human interference or natural processes, butterfly populations are often among the first to respond. Conservation of our butterfly resource is therefore important on many levels and using butterfly-attractive plants is one way that landowners can help slow the trend of diminishing butterfly populations. Many of the plants listed in this technical note attract butterflies to feed on nectar. However, a subset of these also serves as hosts for breeding, multiplying their value for butterfly conservation. These plant species, indicated in the plant description section, provide food for larvae as well as adults and will support breeding populations that may persist from season to season. By selecting appropriate plants, landowners and farmers have the opportunity to contribute to native butterfly conservation as well as aiding other pollinators.

BEE-PLANT RELATIONSHIPS

Table 7 below shows the known relationships between several crops and flowers and the bees that visit them. All types of bees listed on this table are native with the exception of honey bees. Please be aware that many relationships between bees and plants have yet to be discovered and documented. Also keep in mind if crop production enhancement is a primary goal for establishing pollinator habitat, selection of plants that attract the same types of bees and bloom at the same time as the crop may not have a positive result. The best strategy for designing habitat usually involves selecting a variety of plants that bloom in succession throughout the season and attract a variety of bees and other insects.

Bumble bee (*Bombus* sp.) visiting a western prairie clover (*Dalea ornata*) flower . Pamela Pavek

TABLE 7: BEE-PLANT RELATIONSHIPS by Jim Cane

	TYPE OF BEE					
	Social bees			Solitary bees		
				CAVITY-NESTERS		MINING4
CROP	BUMBLE	HONEY	SWEAT1	LEAF-CUTTER2	MASON3	
ALFALFA5		x	x	**X**		A
APPLE	x	**X**			**X**	**X**
APRICOT	x	**X**			**X**	x
RASPBERRY	**X**	**X**	x		**X**	**X**
CHERRY		**X**			**X**	**X**
LEGUMES	**X**	x	**X**	**X**	x	**X**
SQUASH	x	**X**	x			P
CUCUMBERS, MELONS	**X**	**X**	**X**			**X**
FLOWER						
ASTRAGALUS	**X**	x		x	**X**	**X**
BALSAMORHIZA	**X**	**X**	**X**		**X**	**X**
CLEOME		**X**	x	x		**X**
CREPIS	x	**X**	x	x	**X**	**X**
DALEA	**X**	**X**		**X**		**X**
HEDYSARUM	**X**	**X**		**X**	**X**	
HELIANTHUS	x	x	**X**	**X**		**X**
LOMATIUM		x	x			**X**
MELILOTUS	x	**X**	x	**X**		**X**
PENSTEMON6	**X**	x			**X**	
PHACELIA	**X**	**X**	x		**X**	**X**
POTENTILLA		x				x
ROSA	**X**	x			x	
SOLIDAGO	**X**	**X**	**X**	**X**		**X**
SPHAERALCEA		x	x			**X**

"**X**" means likely to visit, "x" means minor use. Three purposes are confounded for some like alfalfa: which bees pollinate it commercially and which will benefit from it planted in seed

1 genera with social species include *Halictus* and *Dialictus,* all ground-nesters

2 alfalfa leaf-cutting bee and others in its genus *Megachile.* All cut leaves, some nest shallowly underground

3 all species of *Osmia.* Most use masticated leaf pulp rather than mud in nests, some nest shallowly underground

4 all the many and diverse non-social bees that nest underground. "A" is for the alkali bee, *Nomia melanderi.* "P" is specifically for the squash bee, *Peponapis pruinosa*

5 alfalfa is commercially pollainated by alfalfa leaf-cutting bees and alkali bees, but attracts a large diversity of summer-flying bees

6 species of *Penstemon* differ greatly in their fauna of visitors and pollinators. Several pollen wasps (*Pseudomasaris*) are key pollinators of some species

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Vaughan, M. and S.H. Black. 2007. Agroforestry Note No. 35. *Pesticide Considerations for Native Bees in Agroforestry.* USDA, NRCS and FS. 4p.

Contributions to the original version of this document were made by Dan Ogle, retired Plant Materials Specialist and Frank Fink, retired State Biologist, both from Idaho.

ADDITIONAL SOURCES OF INFORMATION

For more information about establishing plantings see the following Washington Technical Notes in eFOTG:

Plant Materials Tech Note No. 1	Seeding Guide (September 2010)
Plant Materials Tech Note No. 6	Seedbed Preparation and Seed to Soil Contact (March 2005)
Plant Materials Tech Note No. 7	Seed Quality, Seed Technology and Drill Calibration (February 2005)
Plant Materials Tech Note No. 15	Conservation Reserve Program Technology (February 2005)

For more information about pollinators and pollinator habitat:

"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

Agroforestry Note on nest sites: http://www.unl.edu/can/agroforestrynotes/an34g08.pdf

How to Reduce Bee Poisoning form Pesticides:
http://extension.oregonstate.edu/catalog/pdf/pnw/pnw591.pdf

Other NRCS documents: http://plants.usda.gov/pollinators/NRCSdocuments.html

The Xerces Society documents: http://www.xerces.org/

The North American Pollinator Protection Campaign:
http://pollinator.org/nappc/index.html

The Pollinator Partnership: http://www.pollinator.org/

For information about beneficial insects:

The ATTRA Farmscaping to Enhance Biological Control Guide: http://www.attra.org/attra-pub/PDF/farmscaping.pdf

For additional information about the plants listed in this document:

The USDA PLANTS Database: http://www.plants.usda.gov/

For additional information about other plants for pollinators:

The Utah State University Fast Sheet: Gardening for Native Bees in Utah and Beyond
https://extension.usu.edu/files/publications/factsheet/plants-pollinators09.pdf

For sources of plant materials:

Plant Materials Tech Note No. 3	Partial List of Vendors of Conservation Plants and Seed for Oregon, Washington and Northern Idaho (March 2009)

Pollinator habitat in Spokane County, WA, with blanket flower (*Gaillardia aristata*), Wyeth's buckwheat (*Eriogonum heracleoides*), Clarkia (*Clarkia pulchella*), yarrow, (*Achillea millefolium*), and cinquefoil (*Potentilla* sp.).