

Backyard Wildlife Habitat

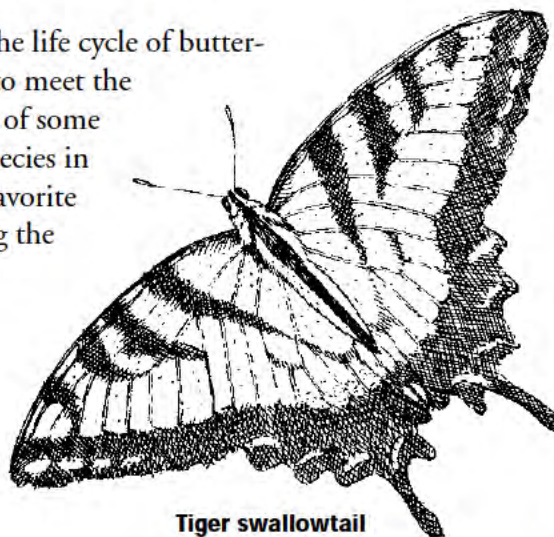
Create a Butterfly Garden

S. Lamb, S. Chambers, and N. Allen

Butterflies are some of the most beautiful, fragile animals in nature, sometimes called “flying flowers.” Butterflies and moths pollinate flowers, and both adults and larvae are an important food source for birds, bats, and other wildlife. Nearly 700 kinds or species occur in North America. About 20 species commonly are found in the Pacific Northwest.

Attracting butterflies to your yard and garden is easy if you create a habitat that meets the butterflies’ needs for growth and development. Butterfly larvae, or caterpillars, eat leaves. Adult butterflies feed on nectar from colorful, fragrant flowers. Putting in the right plants for both of these increases your chances of attracting and keeping butterflies in your garden. Suitable habitat also includes shelter from wind and rain, open sunny areas for basking, and mud puddles for water and nutrients.

This publication describes the life cycle of butterflies, how to design your garden to meet the specific needs of butterflies, a list of some of the most common butterfly species in the Pacific Northwest and their favorite food sources, and a chart showing the different times of year the adult butterflies of each species are active.



Tiger swallowtail

Life cycle

Butterflies undergo a complete change or **metamorphosis** through four different life stages: egg, larva (caterpillar), pupa (chrysalis), and adult. The development of a butterfly from egg to adult can take from 3 weeks to several months, depending on the species and the time of year.

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Female butterflies lay eggs singly or in clusters on specific host plants. Usually, they lay their eggs on the undersides of the leaves, which provides protection from both predators and weather.

Tiny caterpillars hatch from the eggs and spend all of their time eating leaves and growing. (Some caterpillars born late in the summer overwinter in this stage and then begin eating in the spring.) When the caterpillar becomes too large for its skin, it molts, or sheds its skin. This occurs at least four times.

After the final molt, the caterpillar searches for a twig or leaf to which it can attach itself. The caterpillar then forms an outer shell around its body, called a pupa or chrysalis. It usually takes 1 to 2 weeks for the pupa to develop. (Some pupae spend the winter in this stage and emerge in the spring.)

During this stage, the transformation from caterpillar to adult butterfly is completed. A newly formed butterfly emerges and flies away to look for a mate and continue the cycle. See Table 1 for the time of year to expect adult butterflies.

Designing your garden

Protection from wind

A butterfly garden can be any size, but it needs to be in a sunny, open area protected from wind. Determine from which direction the prevailing wind comes, and plant larger shrubs, vines, or trees as a windbreak (Figure 1). The windbreak should protect from wind without decreasing the amount of sunlight.

You already may have an effective border area in your yard. If you are going to plant additional species, choose nectar-producing trees, shrubs, and vines that provide both food and protection. Pink or white viburnum, oceanspray, and rhododendron are excellent choices for shrubs. A trellis or wall covered with honeysuckle or clematis makes an attractive barrier. Nectar-producing trees include cottonwood, dogwood, cherry, apple, or plum.

Nectar plants for adult butterflies

After emerging, adult butterflies look for sources of nectar (Table 2). Color, fragrance, size, and shape are all important characteristics of the best nectar flowers.

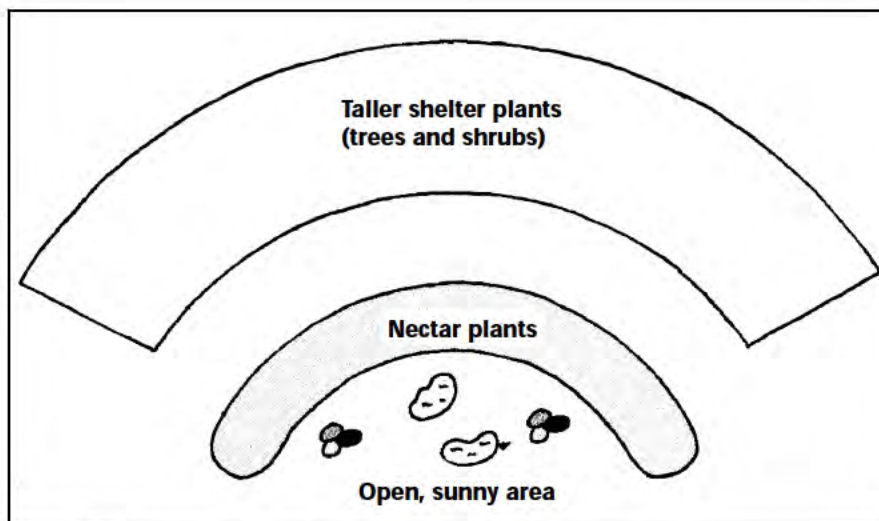


Figure 1. An example of a butterfly garden design.

Table 1. Butterfly species and the time of year they are active.

Common Name	Species	April	May	June	July	August	Sept.
Early spring species							
Sara orangetip	<i>Anthocharis sara</i>	■	■				
Spring azure	<i>Celastrina argioulus</i>	■	■				
Late spring/Early summer species							
Silvery blue	<i>Glaucopsyche lygdamus</i>		■	■	■		
Brown elfin	<i>Callophrys augustus</i>		■	■	■		
Mourning cloak	<i>Nymphalis antiopa</i>				■		
Western oak dusky wing	<i>Erynnis propertius</i>		■	■	■		
Wide-ranging species (late spring through early fall)							
Cabbage white	<i>Pieris rapae</i>		■	■	■	■	
Satyr comma or Golden anglewing	<i>Polygonia satyrus</i>		■	■	■	■	
Red admiral	<i>Vanessa atalanta</i>		■	■	■	■	
Monarch	<i>Danaus plexxipus</i>		■	■	■	■	
Western tiger swallowtail	<i>Papilio rutulus</i>						■
Western swallowtail	<i>Papilio zelicaon</i>						■
Field crescent	<i>Phyciodes mylitta</i>		■	■	■	■	
Painted lady	<i>Vanessa cardui</i>		■	■	■	■	
American painted lady	<i>Vanessa virginiensis</i>		■	■	■	■	
Western painted lady	<i>Vanessa carye</i>		■	■	■	■	
Common ringlet	<i>Coenonympha tullia</i>		■	■	■	■	
Summer species							
Clodius parnassian or American apollo	<i>Parnassius dodtus</i>			■	■	■	
Pale swallowtail	<i>Papilio eurymedon</i>			■	■	■	
Purplish copper	<i>Lycaena helloides</i>			■	■	■	
Summer/Early fall species							
Woodland skipper	<i>Ochlodes sylvanoides</i>			■	■	■	■
Lorquin's admiral	<i>Limenitis lorquini</i>			■	■	■	■
Large wood nymph	<i>Cercyonis pegala</i>			■	■	■	■
Gray hairstreak	<i>Strymon melinus</i>			■	■	■	■
Orange sulfur	<i>Collas eurytheme</i>				■	■	■
Pine white	<i>Neophasia menapia</i>				■	■	■
California tortoiseshell	<i>Nymphalis californica</i>				■	■	■
Great spangled fritillary	<i>Speyeria cybele</i>				■	■	■

Butterflies are nearsighted and are attracted to large patches of a particular type of flower. If you want to attract a particular species, a large splash of brightly colored flowers of one species is more effective than several different colors or species mixed together. However, planting several kinds of good nectar-producing flowers usually attracts more species of butterflies.

Fragrance may be even more important than color for attracting butterflies. Many nectar-producing flowers, such as lavender, lilac, and honeysuckle, emit strong fragrances to attract pollinators.

The size and shape of flowers is also important. Larger butterflies, such as swallowtails, prefer to land on flowers with large compact heads ("composites") because they

Table 2. Butterflies commonly found in the Pacific Northwest with host and nectar plants for each species.

Species	Host plants	Nectar plants
Anise swallowtail	Desert-parsley*, dill, carrot, garden parsley, anise	Desert-parsley*, garden mint, zinnia, penstemon*, lanтана
Western tiger swallowtail	Big-leaf maple*, willow*, aspen*, cottonwood*	Common lilac, rhododendron*, honeysuckle*, milkweed*, mock orange*, lavender, verbena, sweet-william
Pale swallowtail	Buckbrush*, cherry*, plum, hawthorn*, cascara*, oceanspray*	Oceanspray*, columbine*, garden mint, thistle*, blackberry*, penstemon*, sweet-william
American apollo	Bleeding heart*	Blackberry*
Gray hairstreak	Pea*, mallow*, buckthorn*, borage*, rhododendron*, rose*, pine*	Goldenrod*, milkweed*, clover*, winter cress*
Pine white	Pine*, Douglas-fir*, true fir*, hemlock*, redcedar*	Dusty miller, daisies, coreopsis, lobelia, goldenrod*, strawflower
Orange sulfur	Alfalfa, clover*, and other legumes	Alfalfa, mustard, thistle*, aster*, red-oster dogwood*
Sara orangetip	Hedge mustard, winter cress	Cherry, plum, strawberry, monkey flower*, dandelion, violet*, rockcress
Brown elfin	Apple, bitterbrush*, manzanita*, rhododendron*, azalea, salal*	Cherry*, plum, willow*, osoberry*, bitterbrush
Purplish copper	Knotwood*, cinquefoil*, dock*, sorrel*	Mint*, heather*, clover* and many composites
Spring azure	Dogwood*, oak*, buckthorn, madrone*, cherry*, plum, oceanspray*, salal*	Cherry*, plum, willow*, wild-lilac*, milkweed*, wild mustard*
Silvery blue	Mostly lupine*; also wild pea*, vetch*, clover*	Cherry*, plum, coneflower, desert-parsley*, lupine*
Lorquin's admiral	Willow*, oceanspray*, cottonwood*, cherry*, apple	Thistle*, dogbane*, wild mustard*, blackberry*, privet
Red admiral	Stinging nettle*	Daisy, aster*, thistle*, dandelion, goldenrod*, milkweed*, fireweed*
Painted lady	Mostly thistle*, sunflower*, pearly everlasting*, hollyhock	Oregon-grape*, rabbitbush, zinnia, dandelion, aster*, cosmos, milkweed*, purple coneflower
Mourning cloak	Elm, cottonwood*, willow*, birch*, wild rose*, hawthorn*	Willow*, milkweed*, clove pink, rockcress
California tortoiseshell	Wild lilac*	Willow*, garden lilac, thistle*, sneezeweed*, goldenrod*
Myliitta crescent	Thistle*	Pearly everlasting*, hawkbit, goldenrod*, aster*
Satyr comma	Stinging nettle*	Dandelion, aster*, blackberry*, also rotting fruit
Common ringlet	Grasses*	Dandelion, sweetclover, buttercup*
Common wood nymph	Grasses*	Coneflower, garden mint, sunflower, fleabane*, penstemon*, clematis
Great spangled fritillary	Violet*	Gloriosa daisy, thistle*, verbena, milkweed*
Monarch	Milkweed*	Milkweed*, lanтана, lilac, cosmos, goldenrod*, zinnia
Woodland skipper	Grasses*	Bluebeard, lavender, oxeye daisy*, garden sage, pearly everlasting*, black-eyed susan*, aster*

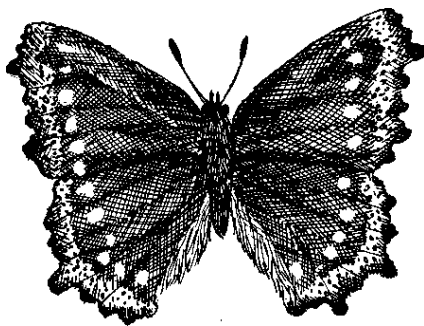
* Many wild varieties are native to the Pacific Northwest.

provide a platform for the butterflies to rest on while feeding. Composites include asters, goldenrod, zinnia, marigolds, and yarrow. Other flower types that butterflies prefer have tightly packed clusters of flowers. Some examples are lantana, honeysuckle, and milkweed. For your butterfly garden, choose a selection of plants that blossom at different times of year to provide nectar throughout the spring, summer, and fall.

Species that attract butterflies include native and non-native plants (see Table 2). Plants that are native to the Pacific Northwest are recommended for several reasons. Native plant gardens are better adapted to the climate and, once established, may need less water and maintenance. Butterflies recognize native plants more easily and often use them for food, shelter, and reproductive sites.

Be careful not to plant species that are too aggressive and/or invasive, such as English ivy. English ivy can out-compete all other plants, including native plants, and limit the diversity of your garden habitat. It spreads quickly to adjacent areas, climbing tree trunks and other vertical structures, and produces seeds that are carried by birds to other areas.

The popular, non-native butterfly bush (*Buddleia davidii*) is no longer recommended for planting, because it also is invasive. Alternatives to butterfly bush are California lilac (*Ceanothus thrysiflorus*) or chastetree (*Vitex agnus-castus*), which have similar foliage and flowers.



Mourning cloak

Avoid ornamental flowering plants that have been hybridized to produce showy or “double” flowers. Instead, choose the simple, old-fashioned varieties, because they are better sources of nectar.

Host plants for caterpillars

After it hatches, the caterpillar spends most of its time feeding on the host plants’ leaves, which provide all of its nutritional requirements. Caterpillars are very particular about their host plants. Many starve to death if they cannot find the right plant. If you know which food each species prefers, you can attract more species of butterflies (see Table 2). Putting in the right host plants near nectar plants encourages butterflies to remain in your garden from generation to generation.

Minerals and water

In addition to nectar, butterflies need minerals and water. Butterflies do not drink from open water. They get the moisture and minerals they need from moist areas around water. This is called “mud-puddling.”

You can create butterfly puddles with a bucket or any non-toxic container that holds water. Find a sunny spot that is out of the wind and near nectar plants. Bury the container in the ground, and fill it almost to the top with wet sand. Place a few twigs or rocks on top of the sand for perches.

Male butterflies require additional sodium during the mating season. You can supply it by occasionally adding a little salt to your puddle. If you are concerned about cats or other predators, you can put wet sand in a birdbath or other elevated container.

Winter shelter

A few butterfly species overwinter as adults. Most species either spend the colder months in the larval stage or move to warmer locations. To encourage adult butterflies to stay in your yard year-round, it is important

to provide adequate shelter. Hibernating adults or larvae may seek cover under leaf litter or mulch, in tree holes or **cavities**, in log piles, under loose tree bark, in crevices of tree trunks and walls, or in a vacant shed.

A log pile is an excellent addition to any wildlife garden. It provides shelter for many small mammals and amphibians as well as butterflies. Butterflies may use log piles for perching, roosting, and hibernation. See EC 1542, *Attract Reptiles and Amphibians to Your Yard* for instructions on how to build a log pile (“For more information,” page 7).

Some butterflies have taken shelter in tin coffee cans or empty birdhouses. The only requirement is that there has to be a gripping surface for them to cling to. Some retailers advertise butterfly hibernation boxes, but these do not attract butterflies.

Basking sites

Butterflies are **ectotherms**, which means they need the sun to warm their blood and flight muscles. A butterfly must have enough sun exposure. Butterflies rarely take flight when temperatures are less than 60°F. To encourage butterflies to be active in your garden, you need to maintain a large, open, sunny space, preferably in the center of the garden. If this is not possible, any south-facing site will work.

Also, butterflies enjoy **basking sites**. These can take many forms. Large, flat, light-colored rocks with high sun exposure are ideal, but butterflies also use brick walkways, cement, or gravel.

Roosting sites

Butterflies spend more than half of their day at rest (**roosting**). They search for a roost in the early afternoon and spend the night there. They also use the roost during cold or wet weather. An effective roost could be as simple as the underside of a leaf or a protected part of a bush. However, certain species might

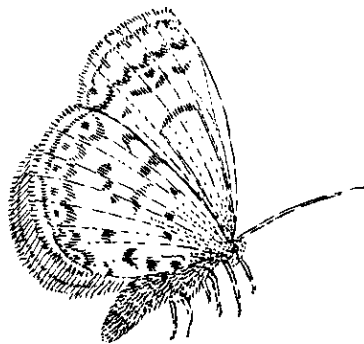
have more specific preferences. If you offer a wide range of shelter such as trees, shrubs, and patches of overgrown grass, you provide more roosting sites.

Maintaining your garden

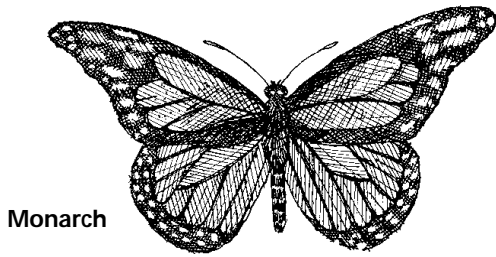
In order to maintain healthy butterfly habitat, do not use pesticides in your garden. Many pesticides not only kill the target insect species but also adversely affect all stages of a butterfly’s life cycle. Some alternatives to pesticides include spot treating individual plants with organic oils or soaps, removing caterpillars from leaves by hand, or simply accepting insects as a natural component of a functioning garden. Also, the absence of chemicals allows natural insect predator populations, such as spiders and ladybug beetles, to increase. These species prey upon unwanted garden insects.

Remember when you prune or clean up dead plants and debris in your yard that there could be adults or larvae using this as habitat for roosting, pupating, or hibernating. If you find a chrysalis while pruning, attach the twig and leaf to a lower branch with a clothespin and watch for the butterfly to emerge in the spring.

Try to leave some areas in your property “wild,” where grass and native, non-invasive weeds can grow undisturbed.



Spring azure



Monarch

Watching butterflies

Butterflies are beautiful, fascinating creatures. Children enjoy watching them and are fascinated with their stages of metamorphosis. Providing butterfly habitat in your yard is a great way to expose children to the wonders of nature.

Butterflies are easy to see during a warm, sunny day. Early in the morning, they are likely to be found basking in an open, sunny area. Later in the morning or early afternoon, most butterflies forage for food and fly around nectar-producing flowers. You also can see them around puddles or wet areas at this time.

You might be able to approach butterflies if you are slow and cautious. However, they are easily frightened. It is important not to approach butterflies from above, as they might view you as a predator.

Many people enjoy keeping a journal of the different species that visit their garden and the time of year they arrive. Butterflies also are excellent subjects for photographers. Once your butterfly garden is complete, sit back, enjoy the beauty you have created, and watch the treasures unfold.

For more information

OSU Extension publications

See these other publications in The Wildlife Garden set:

Attract Hummingbirds to Your Garden,
EC 1541 (2002). \$1.50

Attract Reptiles and Amphibians to Your Yard,
EC 1542 (2002). \$2.00

Create a Garden Pond for Wildlife, EC 1548
(2002). \$1.50

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Other publications

Dennis, John V. and Mathew Tekulsky. 1991. *How to Attract Hummingbirds and Butterflies*. New York: Monsanto Company.

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Logsdon, Gene. 1983. *Wildlife in Your Garden*. Pennsylvania: Rodale Press.

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Attract Hummingbirds to Your Garden

J. Olson and N. Allen

Among the many birds attracted to gardens, hummingbirds can be the most appealing. Not only are these “garden jewels” fun to watch, hummingbirds play an important role in our environment by pollinating flowers and feeding on insects.

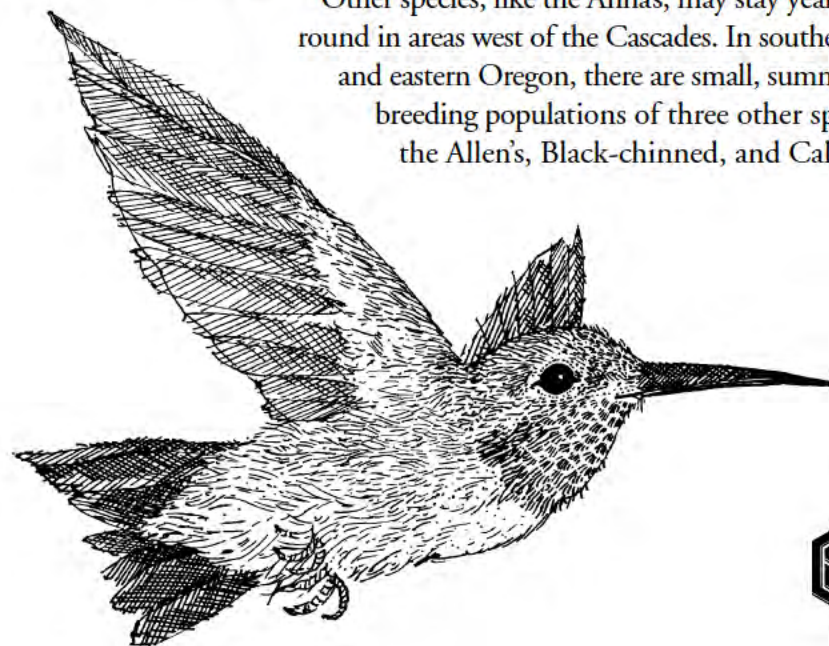
Attracting hummingbirds to your garden is easy. You have a good chance of keeping them there if you meet their basic needs for cover, food, water, and space by planting a hummingbird habitat garden.

Kinds of hummingbirds in Oregon

There are 340 kinds or species of hummingbirds throughout the world, but only 5 species are regular visitors or residents in Oregon. These are called the Allen’s, Anna’s, Black-chinned, Calliope, and Rufous hummingbirds. Oregon “hummers” are 3 to 4 inches long, weigh $\frac{1}{10}$ ounce (less than one nickel), and come in a variety of colors.

The Rufous is the most common hummingbird in Oregon. Rufous hummingbirds begin their migration north from Mexico to the Pacific Northwest in January or February. They migrate south in June, July, or August.

Other species, like the Anna’s, may stay year-round in areas west of the Cascades. In southern and eastern Oregon, there are small, summer breeding populations of three other species: the Allen’s, Black-chinned, and Calliope.



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Table 1 describes each species' range and type of habitat.

Natural history

Hummingbirds are unique in many ways. The hummingbird has the largest brain, heart, energy output, and breast muscles in proportion to body size of any bird. They are the only birds that can truly hover and fly backwards. They can do this because their wings rotate at the shoulder. Other birds have limited rotation in the shoulder joint.

Hummingbirds have striking courtship displays. Males usually reach the breeding

areas first to stake out the best territories. Once they establish a territory, nesting and courtship rituals begin.

Some males rise 60 to 90 feet into the air, dive suddenly towards the ground, and then arc upwards again. While diving, the male hummingbird can reach speeds of 60 miles per hour and up to 200 wing beats per second. Sometimes, he makes a whistling noise. The male performs these displays to attract females, ward off other males, and defend nesting and feeding territories.

Hummingbird nests are usually 1½ inches in outer diameter. They are lined with plant down and secured with spider web and insect silk to the tops of horizontal tree limbs,

Table 1. Oregon hummingbird range and habitat types.

Species	Range in Oregon	Habitat
Allen's	Breeding population April–September along the coast and coastal slopes of mountains south of Coos County.	Coastal scrub, riverside thickets in moist canyon bottoms, and brushy edges near meadows of redwood and other coniferous forests. Also breeds in suburban gardens.
Anna's	Year-round resident in western Oregon. Some breeding populations found east of the Cascade mountains.	Chaparral-covered hillsides and canyons, sparse forests with open canopies, and residential and agricultural areas.
Black-chinned	Breeding population May–September in eastern Oregon.	Riverside woodlands, wooded canyons, open ponderosa pine woodlands, and mountain chaparral. Also found in parks and small towns. The nest often is built in a tree over a creek or dry creek bed.
Calliope	Breeding population April–September in southwestern Oregon, except the coast; the east slope of the Cascade mountains, and in northeastern Oregon.	Riverside areas and open forests at the edges of meadows of alder, willow, or aspen thickets.
Rufous	Most common hummer in Oregon. Breeding population April–September throughout western, central, and northeastern Oregon.	Conifer forest, broadleaf and riverside forests, mountain meadows; coast to above timberline.

shrubs, vines, or large fern fronds. Females use a nest year after year, simply adding to the previous year's nest.

The female usually lays two white eggs and incubates them for 14 to 21 days. Once the young hatch, the mother feeds them regurgitated nectar and small insects for about 3 weeks.

Hummingbirds can live up to 5 years in the wild.

Threats to hummingbirds

Weather is the main threat to hummingbirds. They can die of cold weather, long rainy spells, dry weather that causes flowers to wither, and storms during their migration.

Hummingbirds also are prone to disease and exhaustion. They are prey for predator birds, such as American kestrels, sharp-shinned hawks, and crows. Other predators include frogs, snakes, lizards, and bass. Squirrels, rats, mice, jays, and crows eat hummingbird eggs from the nest.

Chemicals from pesticides and fertilizers are a threat. Hummingbirds can be affected if these chemicals pollute their food.

Hummingbirds are not shy. They will feed from plants or feeders placed close to your house or windows. But, they can be injured if they fly into the window glass. To prevent injury, place feeders either very close to windows so the birds become familiar with the glass, or at least 20 feet away to help prevent collisions.

Elements of a hummingbird garden

Hummingbirds are attracted to a variety of species and structures that fulfill their habitat needs. They like trees, bushes, vines,

flowers, hanging and potted plants, hummingbird feeders, and water. They feed on tree sap and the insects that are attracted to it. Tall, medium, and small trees, shrubs, and flowers and grassy areas provide the birds many spots to feed, nest, or perch in the garden.

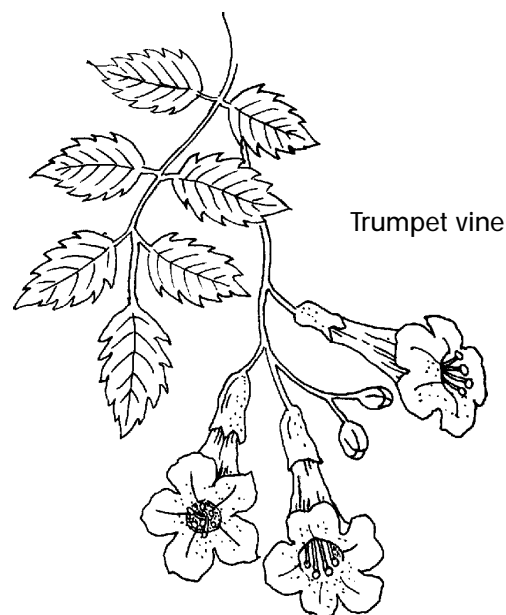
Plants

Hummingbirds are stimulated by color, especially the color red. Clumps of bright red, orange, and pink flowers are more visible to them than other colors. Plants with red, tubular-shaped flowers are an excellent choice for your garden.

If you have electric fences with red insulators, paint them white or black so hummingbirds won't be attracted to them and shock themselves.

A typical hummingbird plant has many flowers with open blossoms. The flowers are on the outside of the plant, so hummingbirds can feed from them without hitting their wings against the foliage. It is important to leave enough space around flowers for hummingbirds to maneuver.

Most hummingbird plants do not have fragrance. Fragrance is not important for



attracting hummingbirds, as it is for butterflies.

Wildflowers that are native to your area are a good choice. They provide the highest quality nectar and are plants the birds recognize. Also, they are better adapted to the local climate, elevation, and soils, so they are more likely to thrive.

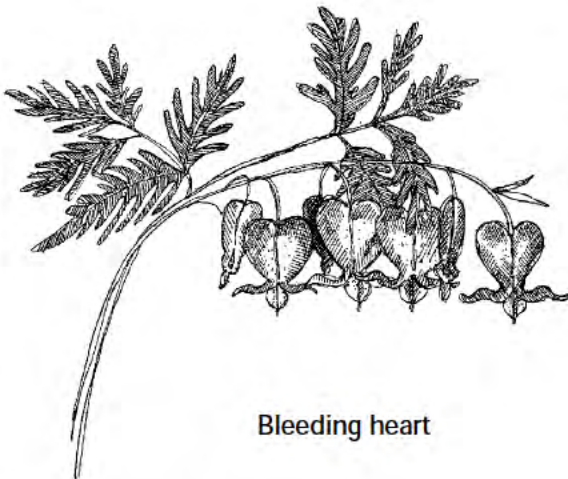
Think of blooming periods when you decide which species to plant. Put in plants that bloom in succession from early spring to late summer to ensure a food source for hummingbirds throughout their stay. This also extends your chance to see them!

Table 2 lists preferred hummingbird plants. The list includes species that are native to the Pacific Northwest. You also can ask about native plants at your local nursery, or contact a Master Gardener through the Oregon State University Extension office in your county.

Water

Hummingbirds need water, too. They use water mostly for bathing. They meet most of their drinking needs from nectar.

You can provide water with a birdbath, sprinkler, or pond. If you buy a birdbath, make sure it has a rough surface for good footing and is no deeper than 1½ inches. If



Bleeding heart

you already have a birdbath, you can put rocks in it to make the water shallower.

Perches

Perching spots are also beneficial. Usually, hummingbirds use broken tree limbs, the insides of bushes, fence posts, and even TV antennas for perches. If you have removed dead tree limbs and wish to supply perches, attach ¼-inch wood dowels to trees or other objects near the birds' territory. Good spots are above the garden or near your bird feeder.

Hummingbird feeders

To attract hummingbirds to your yard, you only might need to put up a hummingbird feeder. These provide a primary food source close by, so the hummingbird saves energy.

Making a nectar solution

Commercial nectar solutions are more expensive than homemade ones. And, they may contain preservatives, dye, food coloring, or flavoring which can harm hummingbirds. You can make a safe, simple nectar solution at home.

Use one part cane sugar to four parts water. **Do not use honey, artificial sweeteners, or food coloring.** Boil the solution for at least 30 seconds to retard fermentation and mold growth. Do not microwave the solution, because the microwaves break down sugar molecules and can change the nutritional value. Let the solution cool before you fill the feeder.

You can store the solution in the refrigerator for up to 2 weeks before it begins to ferment.

(Continued on page 6.)

Table 2. Characteristics of hummingbird plants.

Nectar plants	Plant height	Blooming period	Light needs	Soil needs
<i>Trees</i>				
Dogwood *	20-30'	June	F-sun, P-shade	Moist to dry
Crabapple *	20-30'	June	F-sun, P-shade	Moist
<i>Shrubs and brambles</i>				
Siberian pea-shrub	10-15'	Early May	F-sun, P-shade	Moist to dry
Hardy fuchsia	3-6'	July	F-sun, P-shade	Moist
Wild azalea	3-8'	Late spring	F-sun, P-shade	Moist
Red-flowering currant *	6-10'	March and April	F-sun, P-shade	Moist to dry
Salmonberry *	5-8'	Early spring	F-sun, P-shade	Moist to dry
<i>Garden perennials and wildflowers</i>				
Columbine *	6-24"	Spring to summer	F-sun, P-shade	Moist to dry
Paintbrush *	8-20"	Spring	F-sun, P-shade	Moist to dry
Bleeding heart *	8-18"	April to June	P-shade	Moist
Coral bells *	1-3'	April to August	F-sun, P-shade	Moist to dry
Lavender	8-18"	April to June	P-shade	Moist
Cardinal flower	8-18"	April to June	F-sun, P-shade	Moist to dry
Beebalm	1-3'	April to August	F-sun, P-shade	Moist to dry
Penstemon *	1-3'	April to August	F-sun	Moist to dry
Cape-fuchsia	1-3'	July to September	P-shade	Moist
Scabiosa	2-3'	Summer	F-sun	Moist to dry
Hedge-nettle *	2-3'	Summer	F-sun	Moist
California-fuchsia*	Varies	Late spring	F-sun	Moist to dry
<i>Annual garden flowers</i>				
Clarkia*	6-36"	Summer	F-sun	Dry
Sweet William	6-24"	Summer	F-sun	Moist
Sage	Varies	April to September	F-sun	Dry
<i>Vines</i>				
Trumpet vine	3-4'	Late summer	F-sun	Moist
Scarlet runner bean	30-40'	Spring	F-sun	Moist to dry
Orange honeysuckle *	2-3'	Spring	F-sun, P-shade	Moist to dry

Key*Light needs*

F-sun: Plants grow in full sun during all or most of the day.

P-shade: Plants grow in light shade or afternoon shade.

Soil needs

Moist: Plants grow in soil that contains moisture during the growing season.

Dry: Plants grow in soil that may become dry during the growing season.

* Plant may be native to the Pacific Northwest.

Where to place your feeder

Put your feeder where it will not be in direct sun for extended periods. Sun causes the solution to mold sooner. Also, hot air in the top of the feeder can expand, forcing liquid out.

It's a good idea to place feeders near nectar-producing plants. That way, hummingbirds can get a more complete nutritional balance from a variety of nectars and insects.

Place your feeder where you can clean and fill it easily. Clean and refill it every 4 or 5 days, or when it begins to look cloudy, or if you notice wild yeast forming. Yeast appears as flecks on the surface of the liquid around the edges. You can clean the feeder with a bottle brush, hot water, and a little vinegar.

Hummingbirds can be territorial around feeders. For this reason, most people prefer to have several small feeders rather than one large one.

Feeders also attract insects

Hummingbird feeders can attract ants, bees, and wasps, so you might want to place bee guards over the feeding ports. New feeders usually have them. You also can smear the surface around the feeder openings with petroleum jelly, salad oil, or mineral oil so insects can't get a foothold. Or, move your feeder to a new spot.

Do not use pesticides to kill the insects around feeders. Hummingbirds might ingest chemicals while collecting nectar. Also, the pesticides could kill insects that are food for the hummingbird.

Conclusion

It's fun and easy to attract hummingbirds to your garden. Many of the plants gardeners favor are favored also by hummingbirds. If you know what they need for food, water, cover, and space, you can learn more about hummingbirds, attract more of them to your garden, and keep them there longer. By providing the habitat hummingbirds need, you are helping to ensure their survival. And, you could be rewarded with hours of entertainment watching these "garden jewels."

For more information

OSU Extension publications

See these other publications in The Wildlife Garden set:

Attract Reptiles and Amphibians to Your Yard, EC 1542 (2002). \$2.00

Create a Garden Pond for Wildlife, EC 1548 (2002). \$1.50

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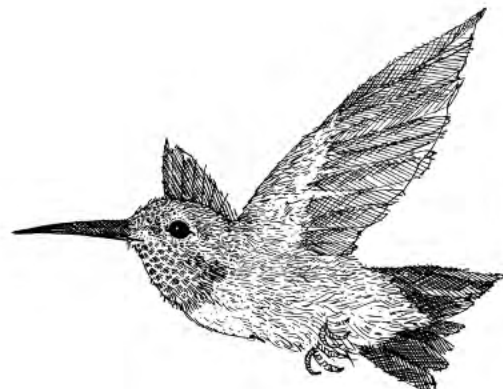
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Feed Wild Birds

E. Henning and N. Allen

Feeding wild birds has become one of America's favorite hobbies. It's easy to attract birds to your yard, and there are many different ways to do so. The most common way is to put out bird feeders for them. Many wild birds such as chickadees, nuthatches, juncos, finches, and jays are regular visitors to feeders in urban areas.

Types of food

You can buy many types of wild bird foods. They usually consist of whole and shelled seeds that are packaged as a single type or in a variety of mixtures.

Different seeds attract different species of birds (see Table 1, page 2). If you're just getting started with a bird-feeding project, you might want to experiment to see which birds are in your area. Start by putting out a seed mix in an open place and see which kinds of birds you attract. Observe which seeds are wasted or pushed aside. Once birds have started coming to your yard, it is easier to lure them to separate feeding stations.

Avoid seed mixes that contain only a small amount of sunflower seeds. These mixes can be wasteful and messy. Commercial wild



Figure 1. Tube feeder with perch. Illustration courtesy of Wild Birds Unlimited, Inc.

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and Wildlife; and
Nancy Allen, Extension
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Oregon State University

Table 1. Common backyard birds and foods they like.

Bird	Sunflower seeds	White millet	Nyjer	Peanuts	Suet
Chickadee	X*			X	X
House finch/Purple finch	X*	X	X		
Sparrows	X	X*	X	X	X
Jays	X			X	X
American goldfinch	X	X	X*		
Dark-eyed junco	X	X*	X	X	X
Spotted towhee	X*	X		X	
Bushtit					X
Downy/Hairy woodpecker	X				X
Nuthatches	X*			X	X
Mourning dove	X	X*		X	
Quail		X*			
Crow/Raven				X	
Varied thrush		X			X

* Indicates favorite seed choice

birdseed mixes usually contain a lot of milo or millet, which most wild birds don't eat. Millet seed and milo also can attract unwanted species such as starlings, English sparrows, and rodents.

Specialty stores sell seed mixes that contain common birds' favorite types of food. If you want to attract a large variety of birds with one product, try a specialty mix. Otherwise, use single types of foods at separate feeding stations (see "Types of bird feeders," page 4).

Sunflower seeds

Black oil sunflower seeds are the most popular food for wild birds that use feeders. Sunflower seeds are the favorite food for many birds that use perches (called **perching** birds) such as chickadees, nuthatches, purple finches, evening grosbeaks, and white-crowned sparrows.

White proso millet

Some species that feed on or near the ground, such as juncos, sparrows, doves, and quail, will eat white proso millet.

Nyjer seed

Nyjer or niger seed (sometimes called thistle) and sunflower chips are favorite seeds for many finches. Goldfinches and pine siskins prefer nyjer, especially during spring through fall. Some people like to mix sunflower chips with nyjer for a "finch mix" type food that can be used all year. Nyjer is expensive, but special feeders allow the birds to access only one seed at a time, which helps prevent waste.

Peanuts

Peanuts, either kernels or in the shell, are attractive to jays, chickadees, and nuthatches. They also attract squirrels.

Use roasted peanuts only. Raw peanuts contain toxins that could be harmful to birds and other animals.

Suet

Another popular food item is **suet**. Suet is fat processed from domestic cows and sheep. Suet attracts many insect-eating birds that need animal fat for energy. This is most important during the winter months, when insects are not readily available. Woodpeckers, chickadees, bushtits, and nuthatches are especially fond of suet.

You can buy suet cakes at specialty stores, but they are simple to make at home. You usually can get suet from a meat market or large grocery store.

Homemade suet cakes

1. Heat to boiling 1 part suet and 6 parts water.
2. Add 2 parts cornmeal and ½ part flour.
3. Allow the mixture to cool. Pour into molds to make 1½-inch cakes, and allow to harden. Cupcake tins, butter tubs, or square freezer containers work well as molds.
4. Store in freezer.
 - You can add peanut butter, lard, or vegetable shortening to the mix, or use one of them as a substitute for the suet.
 - You also can add birdseed, chopped nuts, oatmeal, or chopped fruit to the recipe.
 - Do not use suet and other fats during hot weather, because they will spoil.

Grit and eggshells

Many birds use grit to help them digest their food. In areas where snow covers the ground in the winter, birds may benefit from a small tray of sand.

Crushed eggshells provide calcium, which female birds need during the nesting

season. To prepare eggshells, clean them and then dry them in the oven at 200°F for 1 hour to prevent salmonella poisoning. Crush the shells into small pieces and put them on a tray or platform near your feeders.

Foods to avoid

Do not feed birds bakery goods such as bread, donuts, cookies, or crackers. These do not provide the nutrition birds need. They mold easily, and birds can get sick and die from eating moldy food. Also, bakery goods can attract unwanted species such as starlings, rats, and mice.

Storage

Store bird food in a hard plastic or metal resealable container. This helps keep the food dry and keeps out mice and rats. (Rodents easily can chew through a paper or plastic bag.) A 5-gallon container with a tight-fitting lid stored on a shelf is ideal.

When to feed

Winter (usually from October through April) is the ideal season to feed birds, because their natural foods are not abundant. By providing food for wildlife during severe cold weather, you can help them get enough food to maintain sufficient body heat. Feeding during the summer months is not as important, because their natural food is readily available. But, some birds will visit your feeders year-round.

Birds usually do not depend on only one feeder for their survival. It is more likely that they feed from several sources each day. But, once you start a winter feeding program, be sure to continue until spring when the birds' natural foods are more abundant.

Bird feeders do not prevent birds from migrating. Migrating birds can benefit from feeders, especially in the fall and spring.

Types of bird feeders

Bird feeders come in various shapes and sizes. Some feeders are very specialized for a certain type of food, such as those for hummingbirds (see EC 1541, *Attract Hummingbirds to Your Garden*).

Tube feeders

Tube feeders commonly are used for nyjer and sunflower seeds (Figure 1, page 1). These feeders have several perches so many birds can feed at the same time. Since the birds take one seed at a time at their own feeding ports, there usually is less waste. Some tube feeders also have a tray under them to catch spilled seeds.

Hopper feeders

Hopper feeders have a container, or **hopper**, that releases seed as birds eat it (Figure 2). They often are used for sunflower seeds. Hopper feeders hold a large amount of birdseed, and they accommodate many types of birds. But, they can be messy and may need to be cleaned more often than tube feeders.

It's best not to use seed mixes in hopper feeders. Mixes encourage overcrowding at your feeder. This also can be wasteful, because birds will scatter other seeds in search of their favorites.

Platform feeders

Platform feeders usually are placed near the ground. They offer an open area for ground-feeding birds that enjoy white millet and some seed mixes.

These feeders have two problems: (1) undesirable species may be attracted to them, and (2) birds are more vulnerable to

predators. Cover the platform feeder with 1½-inch wire mesh to exclude large birds, cats, or other mammals (Figure 3). Smaller birds can get in, but larger birds and animals cannot.

Suet feeders

A suet feeder usually is a wire cage in which you place a block of suet. Some hang upside down, which discourages starlings but allows other birds to feed. Others have a board that extends below the feeder to serve as a tail prop for woodpeckers (Figure 4).

Many suet feeders are designed to exclude larger birds such as jays, crows, starlings, and magpies as well as raccoons. If these species are not a problem, you can spread suet on pinecones or in knots in trees.



Figure 2. Hopper feeder.
Illustration courtesy of Wild Birds Unlimited, Inc.

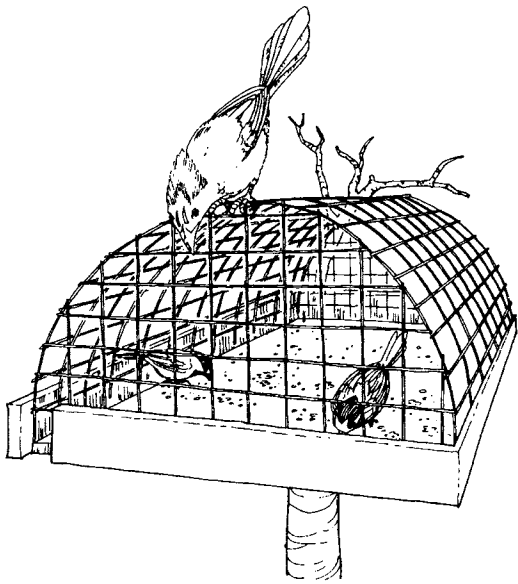


Figure 3. Platform feeder with cage.
From: *Landscaping for Wildlife in the Pacific Northwest*, University of Washington Press and Washington Department of Wildlife.



Figure 4. Suet feeder with tail prop.
Illustration courtesy of Wild Birds Unlimited, Inc.

Where to place your feeders

You can hang feeders, mount them on poles, or attach them to a window. Place feeders in a quiet, undisturbed area, away from noisy traffic, pets, and household doors, and out of strong winds.

Birds often like to fly to a perch before landing on a feeder. They are more likely to use feeders that are near other perches, such as a dead tree, a branch, other vegetation, a pole, or another manmade structure. You can create perches by placing dead branches or sticks in the ground or attaching them to fences.

Specialty poles made for hanging bird feeders include perches for birds. They can be placed almost anywhere and are less likely to attract squirrels.

Feeders hung on tree branches provide natural perches. But, squirrels easily can get to them there. Shields can help (see “Protect your feeders,” page 6), but squirrels often jump on the feeder from below the shield.

The important thing is to put your feeder where a cat cannot ambush birds and squirrels cannot jump to it. Place your feeders 5 to 6 feet off the ground and about 6 to 8 feet from nearby vegetation. You might need to put your feeder in a few different places before you find the right one.

Be sure there is escape cover for the birds within 10 feet of feeders. Planting shrubs or dense foliage or creating a brush pile will provide shelter from many predators and stormy weather and may even provide nesting habitat.

Bird feeders can be messy. Place feeders over a hard surface, such as cement, that is easy to clean. Or, put a tray underneath your feeder just above the ground to catch the fallen seeds and allow ground-feeding birds to eat them. Shelled seeds are more expensive, but you won't have the mess of seed shells under your feeder.

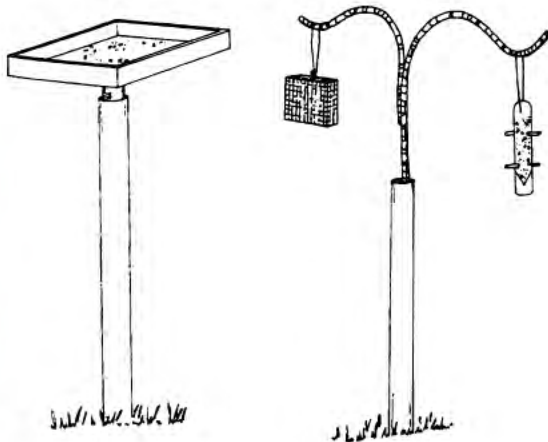


Figure 5. Squirrel-proof posts.
From: *Landscaping for Wildlife in the Pacific Northwest*, University of Washington Press and Washington Department of Wildlife.

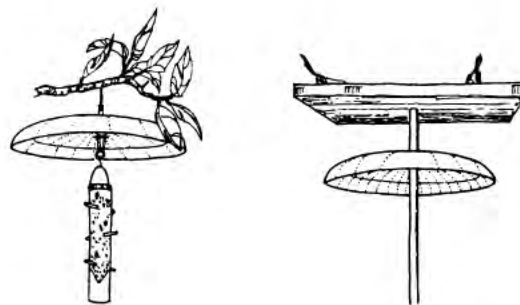


Figure 6. Umbrella shields.
From: *Landscaping for Wildlife in the Pacific Northwest*, University of Washington Press and Washington Department of Wildlife.

Protect your feeders

Jays intimidate other birds at feeders and spill much of the food in search of the bigger seeds. Some feeders have a weighted bar that prevents larger, heavier birds, such as jays, from eating the seeds. When a heavy bird lands on the bar, it closes the lid, and the bird cannot get the seeds.

Squirrels can climb almost anything, including narrow poles. But, they may be thwarted by a smooth pole that is too big for them to wrap their feet around. Put a metal or PVC tube that is at least 5 inches in diameter around the pole on which a feeder is mounted (Figure 5).

You can use an umbrella shield, or **baffle**, to discourage squirrels and other animals. Place it above the feeder (which also protects the feeder from rain) or beneath it (Figure 6).

Keep the feeder clean

It is important to clean your feeders so you don't spread salmonella and other avian

diseases. Please be sure to follow the instructions below.

- Have on hand a bottlebrush, white vinegar, a putty knife, and stiff-bristled brushes as cleaning tools.
- Clean all types of bird feeders regularly, inside and out. Clean them twice a month or once a week during high use.
- Scrape bird droppings and old food off feeders. Rinse or wipe clean with a disinfectant solution of 1 part vinegar to 20 parts water. Allow feeders to dry before refilling.
- To prevent mold, keep feeders and birdseed dry. If your feeder is not protected from rain, put out only enough food for 1 or 2 days.
- Move feeders to different spots to prevent buildup of wasted seed on the ground. Or, clean up under feeders regularly.
- If you use a tray to catch seeds underneath feeders, make sure to clean out the tray daily if it is exposed to rain.
- If you find sick or dead birds near your feeder, take it down immediately, discard

the food, and clean it thoroughly. Wait 2 or 3 weeks, and then put it up in a new spot.

- If you find an injured or sick bird, call your local wildlife rescue center for advice.

Attracting wild birds to your yard with feeders offers hours of enjoyment. Watching their behavior and feeding habits is a great way to get children interested in nature. Children also might enjoy the responsibility of helping to clean and refill feeders.

Many bird watchers keep a journal or bird checklist of all the birds that visit their yard. Photographing or drawing them is also a great way to record the beauty and diversity of the many bird species you might see. But most important is the delight of knowing you are helping your “little feathered friends.”

For more information

OSU Extension publications

See these other publications in The Wildlife Garden set:

Attract Hummingbirds to Your Garden,
EC 1541 (2002).

Attract Reptiles and Amphibians to Your Yard,
EC 1542 (2002).

Create a Garden Pond for Wildlife, EC 1548
(2002).

Create a Butterfly Garden, EC 1549 (2002).

Create Roosts for Bats in Your Yard, EC 1555
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Other publications

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Shalaway, Scott. 2000. *Building a Backyard Bird Habitat*. Stackpole Books, Mechanicsburg, Pennsylvania.

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Build Nest Boxes for Wild Birds

D. Cates and N. Allen

Oregon has 45 species of birds that nest in holes (cavities) in rotting or dead trees (snags). But, though they are very valuable for wildlife, many snags in urban areas are cut down and removed for aesthetic reasons or because they are considered a hazard. If you have some dead trees in your yard, you can make them safer by cutting off their tops and cutting back the branches.

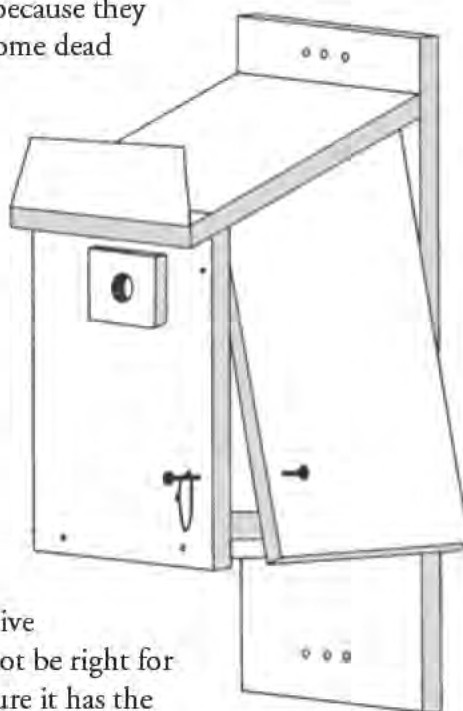
If you have no snags in your yard, you can help replace the loss of natural cavities by adding nest boxes. Nest boxes are a great way to attract wild birds to your yard. They provide birds shelter and a place to raise their young. Some birds that use nest boxes are chickadees, wrens, bluebirds, swallows, wood ducks, and owls.

There are many kinds of decorative birdhouses for sale. But, they might not be right for use. Before you buy a birdhouse, be sure it has the correct dimensions and other features important for birds' welfare and safety.

Or, you can build your own nest boxes. Building your own nest box can be fun and rewarding for you and for children.

Materials

The best hardware for nest boxes is brass or galvanized wood screws or #7 galvanized nails. Screws are recommended, because they make it easier to fix mistakes and replace damaged parts.



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All illustrations from
*Landscaping for Wildlife
in the Pacific Northwest*,
University of Washington
Press and Washington
Department of Wildlife.

Do not use treated, stained, or painted lumber. Toxic fumes may harm the birds, and paint fills the pores and reduces the insulating capacity of the wood. Exterior plywood that is $\frac{5}{8}$ inch thick works well. Or, you can use 1-inch-thick pieces of cedar or redwood. Cedar and redwood have natural preservatives.

For all types of wood, use straight boards with few knots and split ends. If you want a more natural-looking box, you can attach pieces of bark and moss to the outside.

Checklist of tools you need to build a nest box.

- Electric or cordless drill
 - Awl
 - Tape measure
 - Saw
 - Wood rasp or sandpaper
 - Screwdriver and/or hammer
 - Galvanized or brass screws or galvanized nails
 - Carpenter's square
-

Construction

Nest boxes can be very simple in design. The most important features are the size of the box and the entrance hole.

Check that the dimensions of the box are right for the bird species you wish to shelter (see Table 1, page 4). Cut the wood into pieces with the correct dimensions. Figure 1 shows the dimensions and specifications for a basic songbird nest box.

The easiest way to make the entrance hole is to use a hole saw of the correct size attached to a power drill. You also can make an entrance hole with a jigsaw after drilling a start hole, or by drilling many holes within the

entrance hole circumference and filing them down with a wood rasp or file. Be sure the dimensions are correct and the entrance hole is smooth.

Pre-drill screw holes with a drill bit slightly smaller than the screw or nail. This prevents the wood from splitting. Drill all holes before you assemble the box. Roughen the inside surfaces of the box pieces with a wood rasp or sandpaper before you put them together.

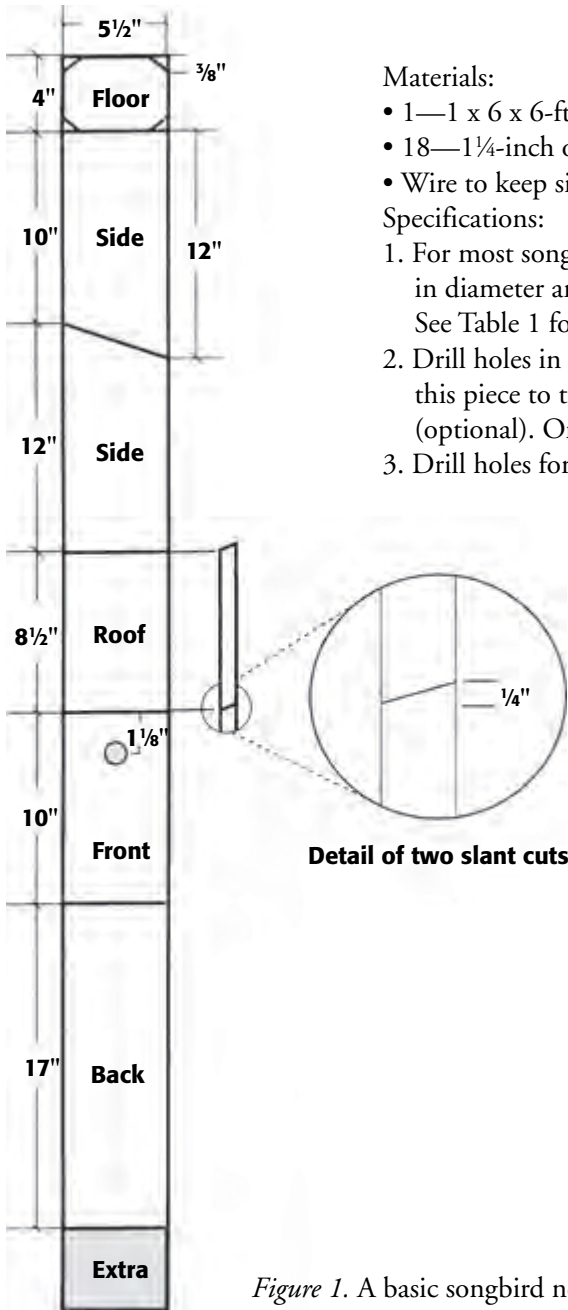
Cut $\frac{1}{8}$ -inch grooves on the inside of the front panel with an awl or hammer claw. These grooves enable young birds to climb out of the box when they are ready to leave the nest (to **fledge**). Drill several $\frac{1}{4}$ -inch holes in the bottom of the box to allow water to drain, and at least two $\frac{1}{4}$ -holes in the sides of the box near the top for ventilation.

Use two pivot screws or nails to pin the top of one of the sides. This allows it to hinge open so you can clean the box inside (see "Maintenance," page 6). Be sure the pivot screw on the opposite side is at the same level as the one in front, so the side will open easily. Use two screws and a wire to keep the side closed firmly, as shown in Figure 3 (page 5).

Follow the assembly order shown in Figure 2 for putting the box together. Figure 3 shows more design ideas.

Finishing touches

You can line the bottom of your finished box with an inch of nesting material such as wood shavings or wood chips. Some birds will use the material itself for nesting, and others will build their nest on top of it. Do not use sawdust, because it soaks up water and gets matted down.



Materials:

- 1—1 x 6 x 6-ft rough cedar, redwood, or plywood board
- 18—1 1/4-inch outdoor wood screws or #7 galvanized nails
- Wire to keep side door shut

Specifications:

1. For most songbirds, the hole must be exactly 1 1/2 inches in diameter and 1 1/8 inches from top.
See Table 1 for dimensions for specific birds.
2. Drill holes in the floor to allow for drainage, and attach this piece to the sides 1/4 inch up from the bottom (optional). Or, cut corners 3/8 inch (see diagram).
3. Drill holes for ventilation near top.

Figure 1. A basic songbird nest box.

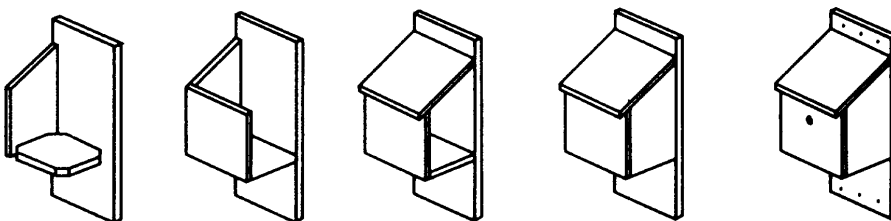


Figure 2. Assembly sequence.

Table 1. Nest box dimensions (in inches) and placement recommendations for common bird species of the Pacific Northwest.

Species	Bottom	Top	Side height	Entrance diameter	Distance of entrance from floor	Placement
American kestrel	8 x 8	12 x 8	12–15	3	9–12	10–30 ft high in open area or edge of a forest
Barn owl	18 x 18	22 x 18	15–18	6	4–6	12–18 ft high in open area
Black-capped chickadee	4 x 5½	8 x 5½	8	1–1½	7	6–15 ft high at edge of a forest
Chestnut-backed chickadee	4 x 5½	8 x 5½	8	1–1½	7	6–15 ft high at edge of a forest
Downy woodpecker	6 x 6	10 x 6	9	1¼	7	5–25 ft high on dead tree at edge of a forest
Hairy woodpecker	6 x 6	10 x 6	12–15	1½	9–12	5–25 ft high on dead tree at edge of a forest
House wren	4 x 4	8 x 4	6–8	1	4–6	6–10 ft high near dense underbrush
Northern flicker	10 x 10	14 x 10	16–18	2½	14–16	5–25 ft high on dead tree at edge of a forest
Northern saw-whet owl	8 x 8	12 x 8	12–15	3	9–12	5–20 ft high in forest near lake, stream, or wetland
Purple martin	6 x 6	10 x 6	6–8	2¼	4–6	10–20 ft high in riparian zone
Red-breasted nuthatch	4 x 4	8 x 4	8	1¼	7	5–15 ft high in open area or at edge of a forest
Tree swallow	5 x 5	9 x 5	6–8	1¼	4–6	6–15 ft high in relatively open area near lake, stream, or wetland
Violet-green swallow	5 x 5	9 x 5	6–8	1¼	4–6	6–15 ft high at edge of a forest
Western bluebird	5 x 5	9 x 5	8–12	1½	6–10	4–10 ft high near open area
Western screech owl	8 x 8	12 x 8	12–15	3	9–12	10–30 ft high in forested area
White-breasted nuthatch	4 x 4	8 x 4	8	1¼	7	5–15 ft high in open area or at edge of a forest
Wood duck	12 x 12	16 x 12	22–26	3 high, 4 wide	18	10–20 ft high next to a body of water

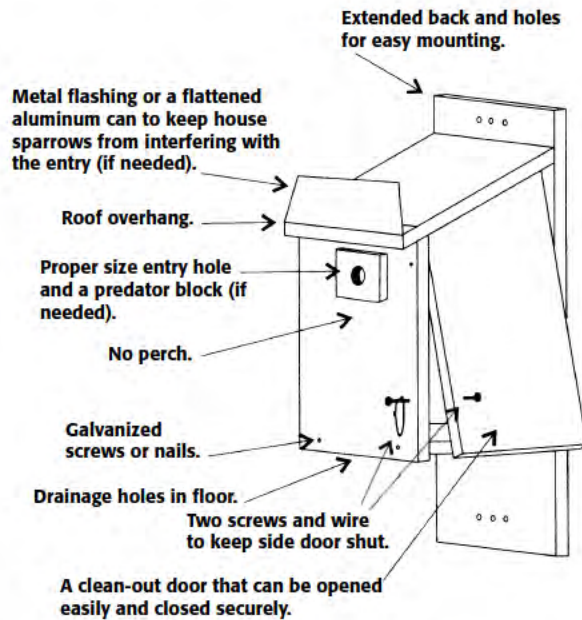


Figure 3. A nest box designed to keep birds warm, dry, and safe from predators.

Where to place the box

Place the nest box where it is easy to mount, clean, and inspect. Put it on a sturdy support at least 6 feet off the ground, in a spot that allows birds safe and easy access (see Table 1).

Put the box in a spot that gets morning sun but is protected from afternoon heat. Be sure the place is sheltered from heavy winds so rain won't be blown into the entrance hole.

It might take a while for birds to use your nest box. Don't be discouraged! If birds haven't used your box after the first year, try moving it to a different spot. Try putting up several boxes. This gives birds more choices, and you'll find out which spots they prefer.

When to put up the box

The best time to put up your box is in February or March for birds that begin nesting in early spring. Observe the behavior of the species you're interested in. Note their arrival time and when they start using the box. Continue to monitor your nest box to be sure predators or competitors do not become a problem.

Competition for nesting space

European starlings, English house sparrows, and many squirrels are cavity nesters and often compete for nest boxes. The size of the entry hole is the most important way to keep out larger species. For example, starlings cannot fit into a box with a 1½-inch or smaller opening.

House sparrows defend their nests very aggressively and are difficult to exclude. Remove their nest again and again until they give up and go somewhere else.

Another way to protect the nest is to attach a piece of metal roof flashing that extends upward several inches from the top of the box (see Figure 3). This keeps sparrows and other birds from attacking the nesting birds, and makes access to the entrance hole more difficult for them.

To prevent competing animals from enlarging the hole, attach a piece of metal with a hole the same size as the entrance on the front of the box. Be sure to file down the edges so they are not sharp.

Protect from predators

Cats, raccoons, snakes, crows, starlings, and house sparrows are the main predators of nesting birds. To protect the entrance, make a

predator block. Attach a block of wood 1 inch thick with a hole the same size as the entrance hole over the front of the box (Figure 3). This creates a short tunnel, which helps prevent other creatures from reaching easily inside the box. Be sure to sand the hole in the block to keep it smooth.

A **baffle** is another kind of predator guard. Place a baffle around a tree or post above or below the nest box to keep mammals from gaining access to it. You can buy baffles at specialty bird shops or home and garden stores. Or, you can create them from a piece of sheet metal or a stovepipe (Figure 4).

Be sure there are natural or artificial perches nearby, such as a dead tree, a branch, a pole, other vegetation, or a manmade structure, so nesting birds can survey the area before entering the nest box. Do not place perches on nest boxes, because they allow easier access for predators.

Maintenance

The best time to clean nest boxes is during late winter before birds begin nesting. Do not try to clean or fix a box while birds are nesting in it.

When you clean a nest box, be sure to do the following:

- Remove old nesting material.
- Unclog drainage holes, entrance holes, and air holes.
- Make sure screws and nails fit properly.
- Do not use insecticides. If necessary, wash out the box with hot water to remove bird droppings or insects.
- Watch out for bees. If bees invade the nest box, avoid the box until they are gone.

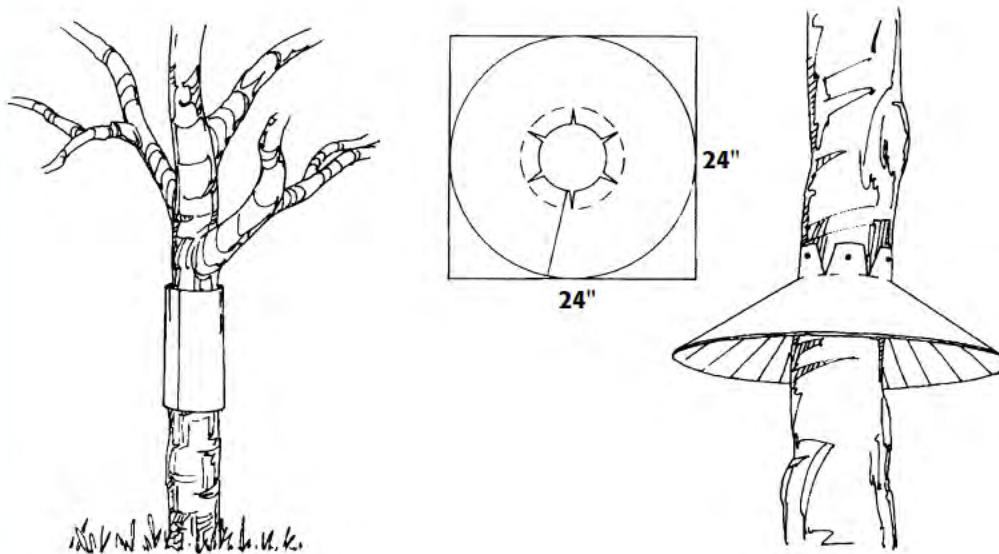


Figure 4. Place a stove pipe or piece of sheet metal around a tree or post to keep mammals away from your nest box. Or, cut a baffle from a piece of sheet metal.

For more information

OSU Extension publications

See these other publications in The Wildlife Garden set:

Attract Hummingbirds to Your Garden,
EC 1541 (2002)

Attract Reptiles and Amphibians to Your Yard,
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Create Roosts for Bats in Your Yard, EC 1555
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Create Roosts for Bats in Your Yard

S. Chambers and N. Allen

For many years, fear and ignorance have led humans to kill large numbers of bats. Bats have lost much of their habitat. Many sites that bats use for shelter, such as old-growth trees, dead trees or **snags**, wooden barns and bridges, and caves, have been destroyed or vandalized. Bats also have suffered from pesticide use.

But, people finally are recognizing that bats are a vital part of a healthy ecosystem. One way you can help bats survive is to create habitat for bats in your yard. Creating habitat for bats can be as simple as putting up a bat house. This publication offers information on bats and ways to create roosting habitat for them.

Debunking popular myths about bats

Bats do not entangle themselves in people's hair

The term "blind as a bat" is inaccurate. Bats are not blind; most have good vision. They also locate objects using **echolocation**, which means they can detect sound waves bouncing off of objects. They are very skillful at locating and avoiding objects as they fly. Bats will not

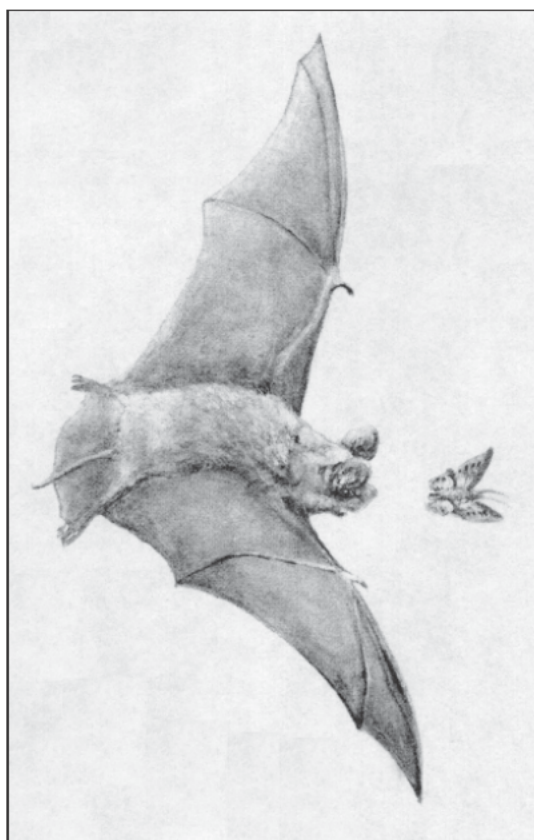


Illustration reprinted with permission from Bat Conservation International, Inc.

Sommer Chambers,
student, Department of
Fisheries and Wildlife;
and Nancy Allen,
Extension wildlife
instructor; Oregon
State University

become entangled in your hair or otherwise attack you. If they do fly near you, it may be that they are hunting insects that are attracted to you.

Bats don't all carry rabies

Worldwide, most human rabies infections come from domestic animals such as cats or dogs. Bats can carry rabies, but the percentage of infected bats is very small, less than 0.05 percent.

Your chances of being bitten by a bat are very small. But, bats that seem to be injured or unhealthy might have rabies or other diseases. Do not handle them.

No bats in the United States feed on blood

Bats that consume blood, called vampire bats, live only in Latin America. Their primary food source is livestock. These little bats ingest very small amounts of blood from the animal and do not hurt it. Healthy bats do not prey on humans.

Bats' importance to our ecosystem

Bats play an important role in controlling insect populations. In North America, bats are the primary predators of night-flying insects. Some species of bats can capture several hundred insects an hour, including insect species that can devastate valuable plants or crops.

In tropical areas and deserts worldwide, bats play a vital role in pollinating plants and spreading seeds. Bats that lap nectar (called **nectivorous** bats) pollinate important economic crops such as bananas, peaches, and mangoes. Thus, bats are important to the economy as well as to the environment.

Native species

There are 15 kinds or **species** of bats in Oregon. All 15 species can be found east of the Cascade Mountains, and 12 of the 15 on the west side.

The little brown bat, long-legged bat, and big brown bat are three of the most common bats found in Oregon. Others include the yuma myotis, pallid bat, Mexican free-tailed bat, and California myotis. The Western pipistrelle is found in eastern Oregon. It is the smallest bat in the U.S., weighing just over $\frac{1}{10}$ of an ounce!

Natural history

Bats range in size from 3 to 5 inches long and weigh less than an ounce. For their size, bats are the world's longest-lived mammals. Their average life span is probably 4 to 8 years, but some bats are known to live more than 20 years in the wild.

Bats mate in the fall, but for most Oregon species, the egg is not fertilized until after the bats awaken from hibernation the following spring. (This is called **delayed fertilization**.) After mating, 3 of the 15 Oregon species migrate to warmer regions for the winter. The rest seek out a good place to hibernate for up to 6 months, from October to April.

In order to stay alive through the winter, hibernating bats need a place that allows them to keep their average body temperature a couple of degrees above freezing. They use caves, buildings, rock crevices, or hollow trees for shelter.

It is very important not to disturb hibernating bats. If you disturb them, they might need to use stored fat reserves that are meant to get them through the winter. This can cause them to starve. Bats might be active on warm winter days, but normally they do

not awoken from hibernation until springtime.

In the spring, pregnant females roost together and bear their young in what are called **nursing colonies**. Females that are not pregnant and males roost in other places. Unlike other mammals of their size, bats have very low reproductive rates, with females of most species producing just one pup per year. Typically, a single baby bat is born after 1½ to 2 months of pregnancy. The young remain with their mothers in nursing colonies for about 3 weeks before they can fly.

Bats are **nocturnal** creatures, which means they are active mostly at night. Generally, they do not venture out of their roosts before dusk. Some species emerge at dusk to feed, while others wait until the sky is darker before they come out.

Elements of bat habitat

Like all animals, bats need food, water, and shelter. A suitable habitat for bats also includes the right temperature, a pesticide-free environment, and roosting places where the bats will not be disturbed.

Food

All of Oregon's bats are **insectivores**. This means that their primary food source is insects. They eat a variety of insects in the air and on the ground. Some of their favorites are moths, grasshoppers, mosquitoes, spiders, ants, beetles, and flies.

You can attract bats to your yard by planting spearmint, phlox, stock, and nicotiana, which attract night-flying moths that bats eat.

Water

Most species of bat require an open water source within a mile of their primary roost. Typically, this could be a stream, pond, lake,

or river. Bats have been known to use large water troughs for livestock if they are kept full of clean water.

Shelter

Bats spend more than half of their lives in roosts. They spend an hour or two foraging and then rest in night roosts, which usually are close to food sources. They may hunt again before dawn, and then they return to their day roost. Bats often use bat houses for their nurseries or day roosts.

In winter, bats tend to choose cool places to hibernate such as caves, rock crevices, and cavities in rocks or trees. During the rest of the year, they use a variety of other roosting sites, such as under bark, in foliage, in buildings, and under bridges. Roosting needs usually are specific for each species.

No insecticides

If you want to attract bats to your yard, do not use insecticides. Insecticides not only kill the insects that bats eat, but they also can harm the bats directly. In many cases, bats keep insect populations low enough that there is no need for insecticide use.

Bat houses

Whether you build or buy a bat house, be sure to contact Bat Conservation International (BCI) for the most current list of "bat-approved" bat houses. If you would like to build your own, you can order *The Bat House Builders Handbook* from BCI. You can buy a ready-made bat house from BCI or the Oregon Department of Fish and Wildlife (see "For more information," pages 7–8). Bat houses also are available at some home and garden or specialty stores. Be sure that these bat houses match the specifications given by BCI.

The big brown bat, little brown bat, yuma myotis, pallid bat, Mexican free-tailed bat, and California myotis all are known to use bat houses in Oregon. The little brown bat uses bat houses most commonly.

Good design

There are certain design elements that increase the chances that bats will use your bat house. It should be at least 2 feet tall and 14 inches wide with a 3- to 6-inch landing extending beyond the bottom of the house (Figure 1). The inside can have one or more chambers which are partitioned $\frac{3}{4}$ inch apart. A bat house for nursing colonies should have 3 to 4 chambers and be able to house up to 200 bats (Figure 2).

Bats prefer a surface they can grip on both the roost partitions and landing areas. Either rough wood or plastic mesh stapled to these places works well.

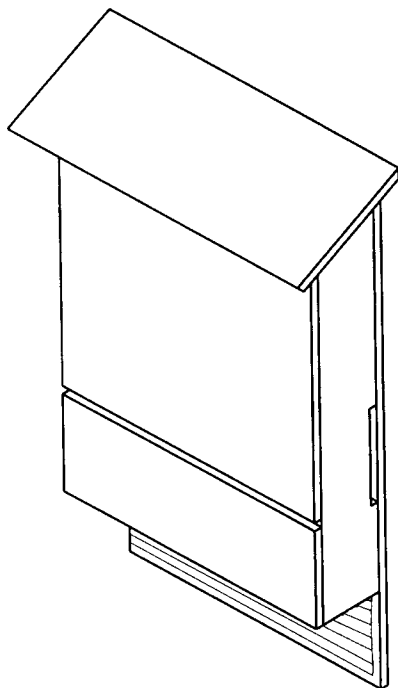


Figure 1. Bat house design. Illustration reprinted with permission from Bat Conservation International, Inc.

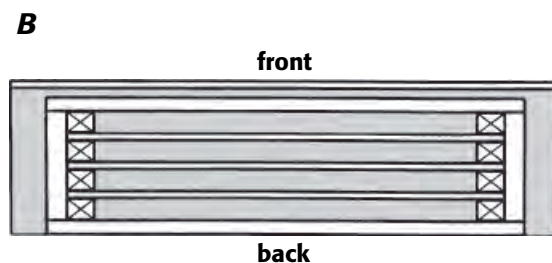
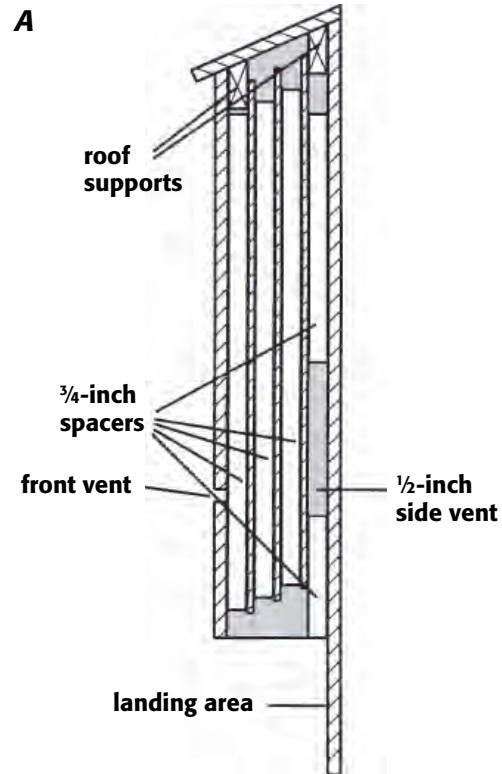


Figure 2. A nursery house for bats. (A) Side view. (B) Bottom view. Illustration reprinted with permission from Bat Conservation International, Inc.

Bats (like humans) prefer houses that are well insulated and are not drafty or wet. Your bat house should be covered with at least two coats of exterior latex paint to prevent moisture and air leaks and wood decay. It should be painted a dark color and have vents (see “Temperature,” page 5).

Where to place the bat house

Bats prefer to hunt for food in areas that have a variety of vegetation and that are near water, so bat houses are most successful in those places. Preferred habitats include orchards and other areas that mix agricultural and natural vegetation. Nursery colonies of bats are usually within 1 mile of a natural water source. If possible, place a bat house along a natural flyway for bats, such as borders of streams, rivers, and lakes, or on forest edges.

Do not place bat houses near the ground because of predators (climbing snakes, raccoons, house cats, and owls), or in dense vegetation because it obstructs their flight. The ideal bat house spot would be 15 to 30 feet above the ground attached to a pole or the side of a building (Figure 3). Bat houses attached to trees are not as successful, probably because they get less sun and are more exposed to predators.

To attract nursery colonies, group three or more bat houses together, mounted either back-to-back on a pole or next to each other on a building. The females can move their young between houses to find the best temperature and to evade parasites.

Temperature

Proper sun exposure is very important for bat houses to be successful. They need to receive 8 to 10 hours of direct sunlight daily.

You can modify your bat house to create favorable temperatures based on the climate where you live. If the average daytime temperature in July is less than 80°F, paint bat houses black to increase solar heat retention. If average daytime temperature in July is between 80 and 100°F, paint the house a medium color, such as tan, and place it where it will get 6 hours of sunlight a day.

Where temperatures are greater than 85°F, add ventilation slots to the bat house so roosting bats won't overheat. Make the slots

½ inch wide to minimize light and keep out predators. Do not cover the ventilation slots with plastic mesh, because it could obstruct the airflow and cause the bats to suffocate.

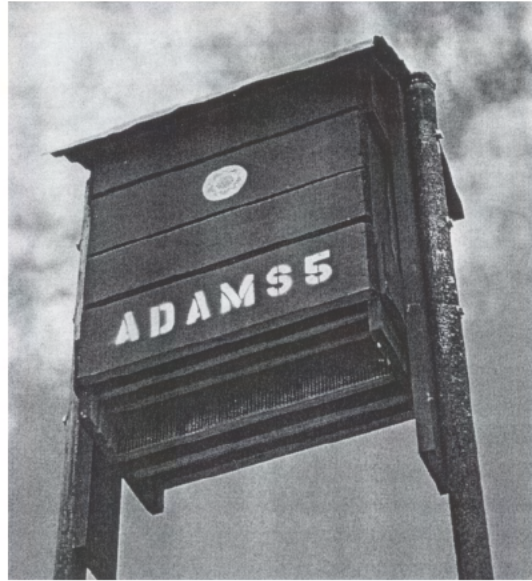


Figure 3. Two bat houses mounted back to back. The houses are mounted 15 feet high on poles to protect the bats from predators and to increase exposure to sun.

Illustration reprinted with permission from Bat Conservation International, Inc.

If you are grouping more than one house, you can paint them different colors and see which ones the bats use.

Maintenance

Bat houses need very little maintenance. Houses that have been caulked and painted carefully might not need repairs for several years. If needed, recaulk and paint in the winter when bats are not likely to be there.

Bat droppings can pile up underneath your bat house. Remove them regularly. You can use them as fertilizer in your garden.

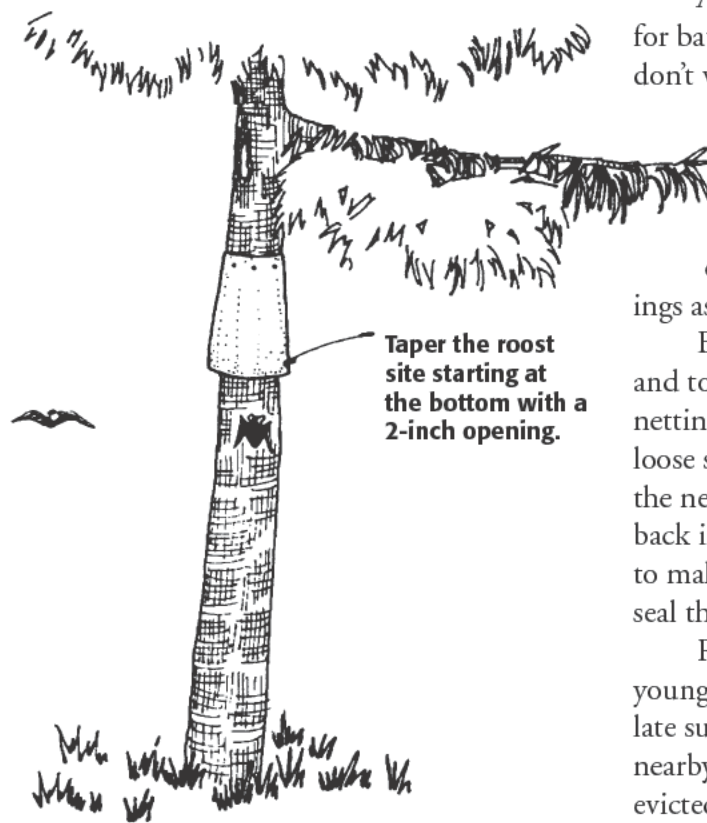


Figure 4. A “bat wrap,” a quick and easy roost site for bats. Keep the area below the roost free of side branches. Because bats need a high roost, full sun, and free access, large conifers are the best trees for bat wraps.

Illustration from: *Landscaping for Wildlife in the Pacific Northwest*, University of Washington Press and Washington Department of Wildlife.

Simple roosts

Many bats roost under loose bark on trees in the summer. You can create a similar kind of roost by wrapping a 24- to 36-inch-wide piece of plastic, sheet metal (regular or corrugated), or fiberglass around a large tree (Figure 4). Place the roost as high up as possible and where there is most sun exposure. Attach the top firmly and let the bottom flare out about 1 or 2 inches.

Bats in your house

An attic can be an ideal roosting place for bats. If bats are using your attic, and you don't want them there, hang bird netting (available at garden stores) over the opening they are using to get in. If you don't know where the opening is, watch at dusk to see where they emerge. Bats can get in through openings as small as $\frac{1}{2}$ inch in diameter.

Extend the netting at least a foot below and to each side of the opening. Tape the netting in place, but leave the bottom hanging loose so the bats can get out of the attic. Later, the netting will prevent them from getting back in. Keep the netting up for a few nights to make sure all bats have emerged, and then seal the opening.

Remove bats at a time when flightless young are not present, such as early spring or late summer. If you have a bat house ready nearby, they might move in once they've been evicted from your attic.

In the unlikely event that a bat enters the living space of your house, stay calm! A healthy bat will not hurt you. Most likely, it entered your house by accident. If possible, confine the bat in a room, open a window or door, and turn off the lights. Keep in mind that bats are nocturnal: it could be evening

before the bat leaves, but it should leave without further problems.

If this tactic doesn't work, you can try capturing the bat with a net. Or, if the bat is against the wall or other flat surface, approach slowly and place a large plastic container or jar over the bat. Gently slide a piece of stiff paper or cardboard under the opening to use as a lid. Then, take the bat outside to an open area and release it. Be sure to wear leather gloves. *Never* try to handle a bat.

Observing bats

A chance to watch bats in their natural setting is one of the benefits of attracting bats to your yard. But, because they are night creatures, they can be hard to see! To make it easier to watch them, you can install lamps in your yard. Not only will it be easier to see the bats, the lights also attract the insects that draw bats to feed.

If you want to count how many bats are using your bat house, watch for them to emerge at dusk.

For more information

OSU Extension publications

See these other publications in The Wildlife Garden set:

Attract Hummingbirds to Your Garden,
EC 1541 (2002).

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(2002).

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Build Nest Boxes for Wild Birds, EC 1556
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To order a bat house

Bat Conservation International. For more information about bats, BAT Magazine, or membership in BCI, please visit the BCI web site at <http://www.batcon.org> or write or call: Bat Conservation International, Inc., P.O. Box 162603, Austin, TX 78716, 512-327-9721. For a donation in any amount, you will receive bat house plans and information about bats. Basic membership, which includes a 1-year subscription to BAT Magazine, is \$30.

Oregon Department of Fish and Wildlife,
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Attract Reptiles and Amphibians to Your Yard

D. Cates, J. Olson, and N. Allen

The study of reptiles and amphibians is called **herpetology**. The word “herps” comes from the same root word.

Herps in your landscape are fun to watch, interesting to learn about, and a benefit to your local ecology. You can attract them by adapting your yard to their habitat needs.

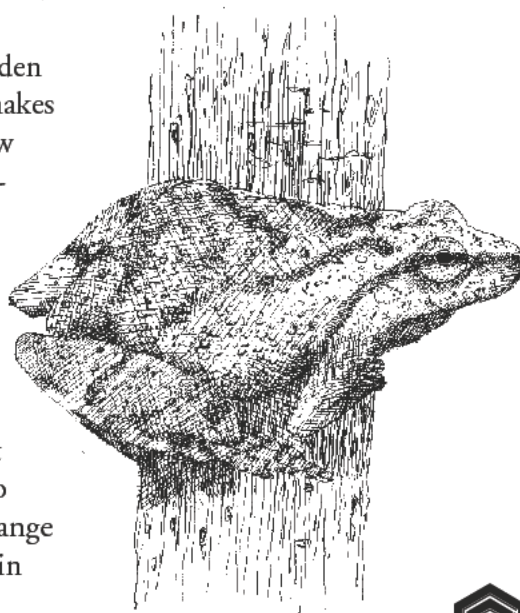
Native species

In the Pacific Northwest, there are about 50 native species of herps. Half are amphibians (frogs, toads, salamanders, and newts), and half are reptiles (snakes, lizards, and turtles). Some of the more common species you might attract to your yard are alligator lizards, fence lizards, garter snakes, chorus frogs, red-legged frogs, and salamanders.

Some herp species are brightly colored, such as painted turtles or young western skinks with their bright blue tails. Others are known by their sounds, such as the Pacific chorus frog with its familiar musical chirping.

Herps help control garden pests. For example, garter snakes and newts are among the few animals that eat slugs; alligator lizards eat aphids; and gopher snakes eat mice, voles, and gophers.

A good way to start your habitat plan is to find out which species live in your region and what habitat they need in order to thrive. Table 1 lists species range and habitat needs for herps in Oregon.



Pacific chorus frog

Douglas Cates and
John Olson, students,
Department of Fisheries
and Wildlife; and
Nancy Allen, Extension
wildlife instructor;
Oregon State University



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Table 1. Descriptions, habitat needs, and range for widespread amphibians and reptiles in Oregon.

Species	Adult			Diet	Habitat	Oregon range
	Coloration	length	Diet			
Snakes						
Common garter (<i>Thamnophis sirtalis</i>)	Bright cream or yellow stripe down the back; stomach usually gray.	2–3 feet	Earthworms, slugs, snails, salamanders, and frogs.	Gardens, wet meadows, heavy underbrush, logs, downed wood, and rockpiles.	Statewide.	
Northwestern garter (<i>Thamnophis ordinoides</i>)	Yellow, red, orange, white, or blue stripes running lengthwise over dark gray or black coloration.	<2 feet			West of the Cascades.	
Western terrestrial garter (<i>Thamnophis elegans</i>)	Grayish brown or black with checkered patterns between yellow stripes running lengthwise.	>3 feet			Statewide, except along the coast and the crest of the Cascades.	
Gopher (Bull) (<i>Pituophis melanoleucus</i>)	Light brown with dark brown blotches (mimics rattlesnake); distinct dark stripe extending across the head down through the eyes.	3–4 feet	Small mammals and birds.	Hotter, drier areas; south-facing slopes.	Statewide, except along the coast and above 2,000 feet in the Cascades.	
Racer (<i>Coluber constrictor</i>)	Olive to bluish gray with pale yellow belly.	2–4 feet	Small mammals, lizards, frogs, and insects.	Warm, dry, open, or brushy areas.	Statewide, except along the coast and the crest of the Cascades.	
Rubber boa (<i>Charina bottae</i>)	Olive green to light or dark brown; rubbery feel and appearance.	<3 feet	Small rodents, mostly mice and shrews.	Rotting stumps, logs, bark, flat rocks, crevices in cliffs, forest litter.	Statewide, except along the coast north of Coos Bay.	
Lizards						
Northern alligator (<i>Elgaria coerulea</i>)	Brown or dark brown or greenish brown, with a longitudinal fold on each side of the body.	10 inches	Beetles, grasshoppers, crickets, aphids, and spiders.	Moist, forested, cool areas with leaf litter.	West and central Oregon up to 6,500 feet.	

Table 1. Descriptions, habitat needs, and range for widespread amphibians and reptiles in Oregon (*continued*).

Species	Coloration	Adult length	Diet	Habitat	Oregon range
Lizards (cont.)					
Western fence (<i>Sceloporus occidentalis</i>)	Gray, brown, or black with bright blue patches underneath.	6–8 inches	Beetles, flies, caterpillars, ants, and aphids.	Requires vertical structure such as logs, rock piles, trees, fences, or building sides.	Statewide, except along the coast and above 5,000 feet in the Cascades.
Western skink (<i>Eumeces skiltonianus</i>)	Wide brown stripe lengthwise on the back bordered by lighter stripes; slender, shiny; young have blue tails.	6–8 inches	Beetles, grubs, ants, and spiders.	Under rocks, logs, or forest litter, in pine or oak woodlands, rocky canyons, and rimrock areas.	Statewide, except along the coast and the crest of the Cascades.
Side-blotched (<i>Uta stansburiana</i>)	Gray to brown; males with light blue spots on back; blue-black spot behind each leg.	2–5 inches	Spiders, mites, ticks, flies, grasshoppers, caterpillars, and beetles.	Dry, rocky, sandy areas.	Widespread in eastern Oregon except northeast quarter.
Turtles					
Painted (<i>Chrysemys picta</i>)	Top of shell is dark olive-green with thin red lines; yellow stripes on neck, head, and legs; shell bottom has red, yellow, and black markings.	Shell is 4–9 inches long	Crickets, flies, dragonflies, beetles, ants, fish fry, snails, mussels, and aquatic plants.	Slow-moving to still bodies of water such as lakes, ponds, streams, and marshes; prefers muddy bottoms with thick aquatic vegetation.	Willamette Valley and Columbia Gorge.
Western pond (<i>Clemmys marmorata</i>)	Olive/dark brown to blackish, often with yellow, black, and brown spots and lines that radiate outward.	Shell is 4–8 inches long	Aquatic plants, crayfish, beetles, earthworms, minnows, and grasshoppers.	Slow-moving to still bodies of water such as lakes, ponds, streams, and marshes; inhabits brackish and sea waters; basks on logs and rocks.	West of the Cascades; rare in Willamette Valley north of Eugene.

Table 1. Descriptions, habitat needs, and range for widespread amphibians and reptiles in Oregon (*continued*).

Species	Coloration	Adult length	Diet	Habitat	Oregon range
Salamanders and Newts					
Northwestern salamander (<i>Ambystoma gracile</i>)	Dark brown, smooth, moist skin; large raised glands on sides of head.	8–10 inches	Insects, worms, slugs, and other soft-bodied invertebrates.	Ponds, lakes, and damp lowland forests under sword ferns, rocks, logs, and bark, and in rodent burrows.	Western Oregon up to 10,000 feet.
Long-toed salamander (<i>Ambystoma macrodactylum</i>)	Brownish black with yellow or green stripe; grayish coloration on belly; long fourth toe of hind foot.	4–6 inches	Larvae, crickets, spiders, and other invertebrates.	Sagelands, forests, and small bodies of water without fish predators.	Widespread in Oregon, except southeast quarter.
Western redback salamander (<i>Plethodon vehiculum</i>)	Blackish gray color with a wide, lengthwise red or yellowish stripe.	2–4 inches	Larvae, crickets, spiders, ants, and other invertebrates.	Doesn't need open water; inhabits moist coniferous forests on talus, boulders, and rock outcrops and under forest debris, wood, and brush piles.	Western Oregon up to snow line; absent from southern Oregon.
Ensatina (<i>Ensatina eschscholtzii</i>)	Reddish, orangish, brown, or tan.	4–5 inches	Spiders, springtails, beetles, mites, termites, and ticks.	Doesn't need open water; moist habitat under logs, rocks, wood or bark piles and in stumps on forest and woodland floors, and in yards.	Western Oregon west of the crest of the Cascades.
Pacific giant salamander (<i>Dicamptodon tenebrosus</i>)	Terrestrial adults have a marbled pattern of tan and reddish-brown or chocolate on top, tan underside; aquatic larvae are drab brown with short, bushy gills.	12–14 inches	Larvae eat insect larvae, tadpoles, and fish. Adults eat snails, slugs, small mammals, lizards, and other amphibians.	Humid mixed conifer and deciduous forests and riparian zones up to 6,000 feet. Uses downed logs. Larvae occupy cold, clear water.	Western Oregon except the Willamette Valley.
Rough-skinned newt (<i>Taricha granulosa</i>)	Brown on top, with an orange-colored belly.	4–8 inches	Aquatic insects, slugs, tadpoles, and other soft-bodied invertebrates.	Wet areas near ponds, lakes, or other permanent bodies of water.	Western Oregon.

Table 1. Descriptions, habitat needs, and range for widespread amphibians and reptiles in Oregon (*continued*).

Species	Coloration	Adult length	Diet	Habitat	Oregon range
Frogs and Toads					
Pacific chorus frog (<i>Pseudacris regilla</i>)	Gray, green, brown, or tan with a black stripe along nose, eye, and shoulder.	2 inches	Insects and spiders.	Bodies of water, moist meadows, forests, or underbrush. Rocks, logs, burrows.	Statewide; most common frog in Oregon.
Red-legged frog (<i>Rana aurora</i>)	Reddish to yellow belly and legs, brownish to olive on top with lighter spots.	4–5 inches	Beetles, crustaceans, larvae, aquatic insects.	Slow moving bodies of water, marshes, and moist forests.	Western Oregon; populations are sensitive and declining.
Western toad (<i>Bufo boreas</i>)	Brown and green back with a pale stripe; dry, warty skin.	Females 5 inches; males 4¼ inches	Algae, insects, earthworms, spiders, crayfish, and various other invertebrates.	Brushy, forested, and mountain meadows near water with logs and rocks.	Statewide except for the Willamette Valley; populations are sensitive and disappearing from some areas.
Great Basin spadefoot (<i>Scaphiopus intermontanus</i>)	Gray or greenish gray; brown or reddish spots and pale stripes on sides and back.	2–3 inches	Grasshoppers, flies, ants, and beetles.	Sagebrush, prairie, open pine forests, and temporary bodies of water.	Eastern Oregon except northeast quarter.

Natural history

Herps are **ectotherms**. That means their body temperature is regulated directly by the environment. To escape very hot or very cold temperatures, most herps hibernate in the winter and aestivate (hibernate) in summer in hot areas. Hibernation sites include burrows, ponds, logs, stumps, and rock piles.

Many amphibians live in water in some life stages and on land in others. Most amphibians lay their eggs in water or in moist locations on land such as rotten logs, leaf litter, or on riverbanks.

Pond-breeding species of salamanders have aquatic young called larvae. Frogs' young, called tadpoles, live in water. Then, as adults, they live mostly on land.

Reptiles usually lay eggs on land. Sometimes, they use moist, protected areas to help conserve the moisture content of their eggs and keep them at moderate, more constant temperatures.

Most herps are secretive. The only ones you are likely to see are garter snakes and frogs.

Elements of a herp habitat

You have more chance to attract herps to your property if it is next to an undeveloped site, greenway, or freshwater area. But, you also can add features to your property, such as ponds, rock walls, brush piles, and basking (sunning) sites, to improve your chances of observing more species. These features provide places for herps to reproduce, feed, bask, shelter, and hibernate.

Although reptiles and amphibians have different habitat needs, they do use many of the same areas.

Ponds

The best way to provide water for herps is to make a pond. A pond can be any size that suits your property. But, all ponds should have the following features.

Your pond should offer both sun and shade. It should be at least 20 inches deep, with a shallow gradient at the edges. It should have lots of plants that grow above the waterline from the pond bottom. A good ratio of open water to plants is 50:50. See "Plants," below.

Big logs, down wood, and plants near your pond provide shelter for your herps. Herps like natural basking sites that protrude out of the water, such as rocks, logs, and fallen limbs.

For larger ponds, you can build a floating platform. Anchor it so that it stays in the middle of the pond.

For details on how to make a pond, see *Create a Garden Pond for Wildlife* ("For more information," p. 11).

Pond plants

Plants are important in the herps' habitat. They provide oxygen, reproductive sites, and cover where the herps can hide and find protection from weather. They provide habitat for insects and other invertebrates that herps eat. Plants also help control algae growth by shading out the sun.

Algae is essential in your pond. It creates oxygen and food for tadpoles. Algae establishes itself in your pond using nutrients and sunlight.

Too much sun or nutrients (such as from decayed vegetation or fertilizer) can cause outbreaks of algae called **blooms**. Algae blooms also occur in new ponds and in the spring before plants get big enough to shade the water. If algae blooms persist, you might need to clean your pond or plant more vegetation.

Native plants are a good choice for your pond. They are more familiar to wildlife and are well adapted to the environment. Plant a mix of submerged, floating, and marginal plants (see Table 2).

Many invasive species, such as purple loosestrife (*Lythrum salicaria*) and reed canarygrass (*Phalaris arundinacea*), are aggressive and will outcompete other plants.

Rock piles

Rock piles or rock walls are excellent habitat for herps. Herps use them as cover from predators and weather, as places to raise young, and for basking.

You can build rock piles from bricks, rocks, or broken concrete. You might find rocks in your backyard or collect them from some other place. Or, you can buy them from a quarry or landscaping center. If you collect the rocks yourself, be sure no animals are using them. Preserving natural habitat is more important than creating new habitat.

Where to place a rock pile

Place your rock pile where it receives both sun and shade each day. If your summers are cool, put the rock pile where it will be in the sun for most of the day. If your summers are hot, place the rock pile in a mostly shady spot.

A good place for a rock pile is next to a creek or pond. That way, your herps have two habitats to choose from.

Do **not** put rock piles next to the street. Doing so increases the chances of animals being hit by a car.

How to build the rock pile

Use large rocks to form the bottom layer. If you live in a region where it freezes, lay some rocks below ground level. They provide more shelter from freezing temperatures.

Leave space between some of the rocks in the base layer. The herps can use these cavities

for nesting, hibernating, and shelter. Place some sand, leaves, or straw in the cavities to make them more attractive to the herps.

You can place a plastic, ceramic, or concrete pipe in the base layer so it sticks out of the bottom of the pile (Figure 1). The herps can use it as an entrance to some of the cavities. It should be about 1 to 2 inches in diameter and 2 feet or less in length.

In the second layer, use smaller rocks that cover the cavities. Also, you can cover a section of your rock pile with a piece of black plastic to ensure that part of the shelter stays dry.

Brush piles

Many wildlife species use brush piles. Herps and small mammals usually use the base layer, and birds inhabit the rest. Brush piles provide shelter for herps from rain, sun, and predators. They also provide food by attracting insects.

Table 2. Native plants for ponds.

Submerged plants

Coontail, *Ceratophyllum demersum*
Elodea, *Elodea canadensis*

Floating leaf plants

Water fern, *Azolla mexicana*
Watershield, *Brasenia schreberi*
Duckweed, *Lemna minor*

Marginal plants

Great water-plantain, *Alisma plantago-aquatica*
Inflated sedge, *Carex vesicaria*
Spike rush, *Eleocharis palustris*
Wapato (duck potato, arrowhead), *Sagittaria latifolia*
Hardstem bulrush, *Scirpus acutus*
Wool grass, *Scirpus cyperinus*
Small-fruited bulrush, *Scirpus microcarpus*
Soft-stem bulrush, *Scirpus validus*
Cattail, *Typha latifolia*

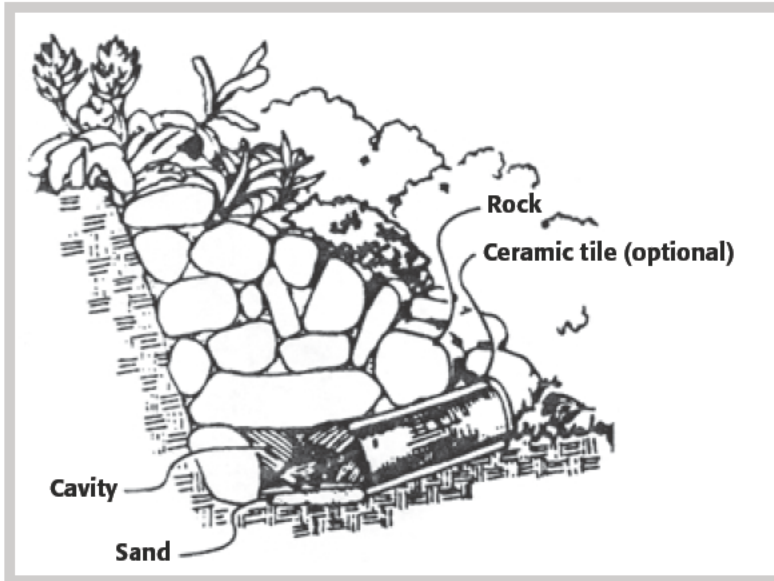


Figure 1. Example for constructing a rock pile.
 (From: *Landscaping for Wildlife in the Pacific Northwest*, University of Washington Press and Washington Department of Wildlife.)

Brush piles can be any size. A pile 3 feet high by 5 feet wide is usually right.

Usually, building materials are easy to find. You can use old fence posts, wood pallets, prunings, and down wood from your own or a neighbor's backyard. Always ask the property owner for permission before you scavenge.

Do not use wood or other materials that have been chemically treated. Remove nails for safety.

Where to place the brush pile

The best places to build brush piles are near a hedgerow, shrub, thicket, or mature tree. Other good choices are near a pond, snag (standing dead tree), or recently cleared area.

If you have enough land, make several brush piles and place them in spots that get different amounts of sunlight. This gives herps choices for prime habitat.

Do not place brush piles in low areas where there is standing water in rainy weather. You want your piles moist, but not soaking wet.

How to build a brush pile

Use big logs for the base layer. Place them parallel to each other on the ground about 6 to 12 inches apart. Be sure there are lots of spaces in the base layer. Pack leaves into these cavities to keep the brush pile moist.

You can place a plastic, ceramic, or concrete pipe in the base layer so it sticks out of the bottom of the pile, as for a rock pile. The herps can use it as an entrance to some of the cavities. It should be about 1 to 2 inches in diameter and 2 feet or less in length.

Use smaller logs to make the next layer. Place them somewhat randomly over the base layer (Figure 2). You can make as many layers as you want, but be sure the pile is stable and won't fall over.

Your brush pile can last for several years if you take care of it. As the top branches collapse and the pile begins to settle over time, add branches and logs to the base and the top of the pile. Do this before spring, so it doesn't disturb nesting sites.

Basking sites

Herps need both sunny and cool places to help them maintain a tolerable body temperature. A key element of habitat that you can provide is a variety of basking structures or sites.

Open areas allow reptiles to sun themselves and raise their body temperature. Large, flat rocks, dark-colored pavement, patches of dirt, and other dense, solid surfaces retain heat and provide an extended source of warmth.

In contrast, shade and ponds provide herps with cooler, damper areas where they can cool down.

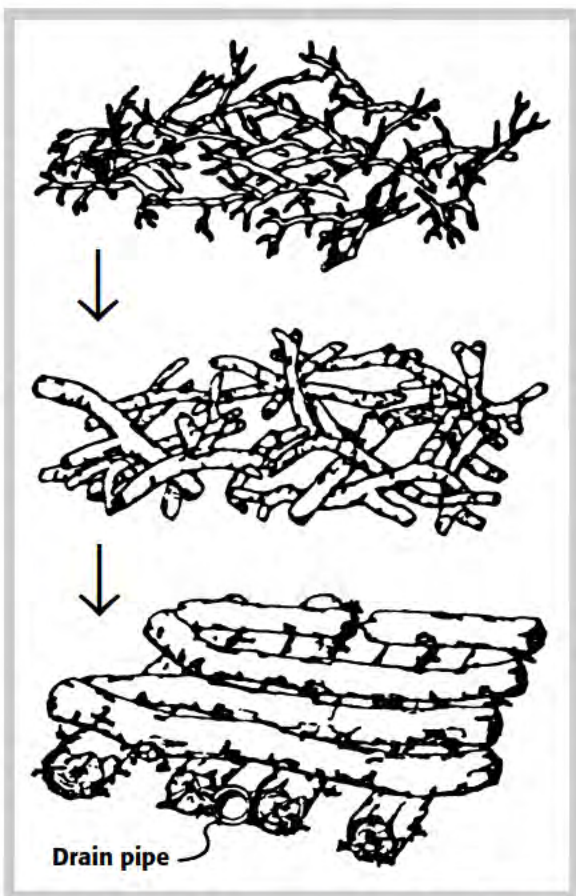


Figure 2. Example for constructing a brush pile. (From: *Landscaping for Wildlife in the Pacific Northwest*, University of Washington Press and Washington Department of Wildlife.)

Travel corridors

To attract and maintain a breeding population of amphibians, your pond should be within ½ mile of another pond or wetland that already has breeding amphibians. There must be an undisturbed, natural pathway from other ponds to yours. This is called a travel corridor.

If you have a lawn, keep your grass taller. This gives herps a safe travel corridor.

Obstacles to success

It can be difficult to keep wild herps in most yards. Loss of habitat, lawnmowers, pesticides, pets, and cars all take their toll.

Because of the barriers to their travel created by urban development, it may be difficult for herps to make it to your property. It might take 1 to several years before you see herps in your yard. Their ability to move into your yard likely depends upon the condition of neighboring landscapes. If your property is surrounded by concrete or highly maintained landscapes, your chances are slim for attracting herps.

If you have a cat or dog, the chances of seeing herps in your yard become even slimmer. Cats and dogs often attack herps. So, either don't have pets, or keep them in restricted sections of your property.

Do not remove herps from wild areas and put them in your yard. They often try to return to their place of origin and get killed on roads or by pets in hostile urban environments. If you provide suitable habitat, reptiles and amphibians will move to your property on their own.

Nonnative species

It is illegal to release nonnative species. Do not release exotic or pet store species of herps into your yard.

Exotics can be extremely detrimental to native species of plants and animals. For example, the bullfrog eats the young of native snakes, frogs, fish, turtles, ducks, and small mammals. This has a very negative effect on their populations.

Furthermore, many exotics die if released. They are not able to tolerate the environmental conditions in the Pacific Northwest.

Coexisting with herps

To help protect and maintain habitat for herps on your property, you must establish a successful coexistence between herps and humans.

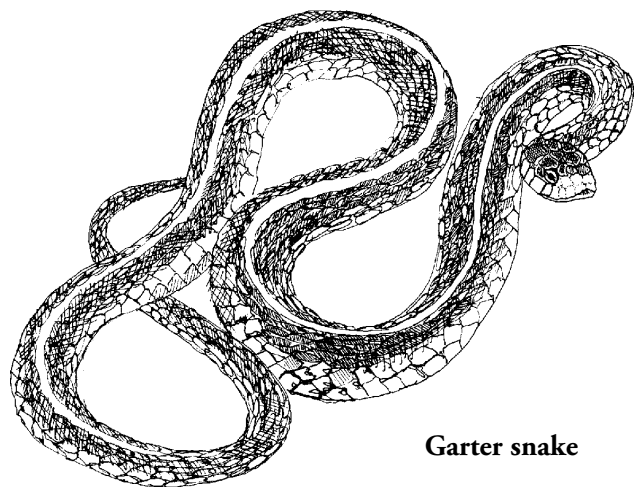
1. Protect and maintain riverbanks, areas with leaf litter, and places with decaying plant matter. Herps need these places to help them regulate their body temperature.
2. Don't mow grass on riverbanks, alongside bodies of water, or next to brush and rock piles.
3. Do not use chemicals such as fertilizers and pesticides in areas used by herps. This is especially important for amphibians, because their skin is extremely sensitive to environmental chemicals. Although reptiles' skin is less permeable, they also are affected adversely by toxic chemicals.
4. Talk to your neighbors. Let them know what you're doing and why, so they will be more likely to help protect herp communities. Encourage your neighbors to create safe travel corridors for amphibians and reptiles.

5. Teach children about herps, so they will respect and admire them and be less likely to harass or harm them.
6. Snakes only bite when they feel threatened. If you leave them alone, they will leave you alone. The only venomous snake in the Pacific Northwest is the Western rattlesnake. It is not common in most areas, and its bite is rarely lethal. It is dangerous, but only if you interact with it in the wrong way.
7. Do not handle "your" herps. Some amphibians, such as toads and newts, have poisons in their skin glands. They might harm you or your pets, if pets eat them. Or, the oils, lotions, and bug repellents on your skin might harm the herps.

Viewing herps

When you watch herps, keep your distance, move slowly, and use binoculars.

To improve your chances of seeing them, learn about the species' natural history. For example, amphibians are more active at lower temperatures than reptiles. You often can see or hear them in early spring. Usually, you don't see reptiles until summer.



Garter snake

You also can look for signs that herps are living in your yard. Some herps may leave tracks or their shed skins. Others' eyes reflect light and seem to glow in the dark.

It can be difficult to catch sight of herps. But, if you create essential habitat on your property, with safe travel corridors to wild habitat, you have a good chance to see these fascinating animals.

For more information

OSU Extension publications

See these other publications in The Wildlife Garden set:

Attract Hummingbirds to Your Garden,
EC 1541 (2002). \$1.50

Build Nest Boxes for Wild Birds, EC 1556
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Create a Butterfly Garden, EC 1549 (2002).
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Create a Garden Pond for Wildlife

S. Lamb and N. Allen

Of all the habitat features that can attract wildlife to your yard, a pond could be the most rewarding. Most animals need water to drink, and many use water for feeding, bathing, breeding, regulating body heat, resting, and cover. In the Pacific Northwest, the species you are likely to attract include amphibians, reptiles, raccoons, deer, dragonflies, songbirds, jays, some waterfowl, and great blue herons.

A pond creates natural beauty for your landscape. The more natural features your pond has, the more attractive it is to wildlife. Ponds can be any shape or size. They can be still or have running water or fountains. Many species are attracted to moving water. Moving water also discourages mosquitoes.

This publication describes how to build a simple pond to attract wildlife, and how to keep it safe and healthy for wildlife and for you.

Planning

Before you begin to build your pond, check with your local zoning or planning office. Be sure that your pond will be safe and legal. Find out if you need to get any permits. There might be restrictions on the size, depth, or even the location of your pond.

Also, check with your insurance company. See if they have other safety requirements.

If you would like professional help building your pond, look in the Yellow Pages under "Ponds" or "Landscape Contractors." If you know people who have a pond, ask them for advice. Ask what worked well for them, and about any problems they encountered.

Size

Your pond should fit in with the natural landscape of the land and have a curved, irregular shape. For smaller yards, a 3- by 5-foot pond is a good size. A larger yard could hold a 5- by 8-foot or larger pond.



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The pond should be at least 20 inches deep at the deepest part. There should be shallow water around the edge or at one end that includes plant shelves. Plant shelves (Figure 1) provide habitat for wildlife and a place for planting marginal plants (see “What to plant,” p. 5). The shelves should be about 8 to 10 inches deep and 8 to 12 inches wide (from the side of the pond), and extend around the perimeter of the pond as long as you want. Plan another shelf 6 inches from the top around the perimeter for rocks to edge the pond.

One side of your pond should have a gradual slope. A good slope is a drop of 6 inches for every 3 horizontal feet.

Location

Consider all underground utilities, tree roots, and other potential obstacles.

Keep your pond above the water table to prevent damage to your liner. You can check the high water line in winter. Dig a small hole the same depth as your proposed pond and observe it for 24 hours. If the hole fills with water on a day with no rain, your water table is high in this spot. Be sure your pond depth is above this level.

Plan where your pond will drain when it overflows from rain or when you clean it. You

can channel water to your yard or down a hill, or you can create a small wetland to collect the excess water.

To see how your pond will look in different locations, you can use a garden hose or string to make an outline. Make sure you can see it from the house or from wherever you want to view it.

Most ponds, unless they are very shallow, should get at least 5 to 6 hours of sunlight per day. This allows enough sunlight for plants to grow but enough shade to help prevent excess growth of algae.

Don't place your pond directly under trees or over-hanging shrubs. Leaves fallen into the pond can make the water too acidic for aquatic life. Leaves decomposing in the pond use up oxygen and can cause odors.

It is important that wildlife can travel safely to your pond. Be sure there is habitat such as tall grass surrounding or next to it. See “Travel corridors,” p. 7.

If you need to fill and change the water, place your pond near a water supply. Filling and changing the water will be easier.

If you plan to have running water and/or a pump and filter, you need to place your pond close to a supply of electricity.

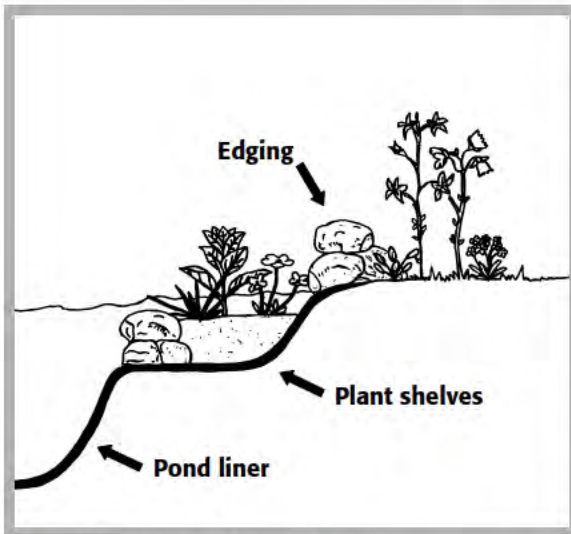


Figure 1. Diagram of plant shelves.

Pumps and filters

If you are going to have fish in your pond, it is a good idea to install a filter and pump. The pump enriches the water with oxygen by “turning the water over,” and filters help clean the water. If you want a waterfall or fountain, you need a pump.

There are two kinds of electric pumps: submersible and surface. Submersible pumps are less expensive and quieter, but they are not as powerful as surface pumps. You must have a surface pump for a larger pond.

Solar pumps and panels are a good choice. But, they only work when there is enough sunlight.

If you use an electric pump, choose a water-cooled pump rather than an oil-cooled one. Oil-cooled pumps can cause oil slicks in your pond if the seal on the motor leaks.

Each pump has its specifications printed on the box. These can help you decide which pump is right for you. Pump capacity and filter depend on the size of your pond. A commercial pump dealer can help you decide which pump is best for your pond.

Whether to place your pump under water or on land depends on the type and brand of pump you buy. Follow the manufacturer's recommendations to ensure the best performance from your pump and filter.

Choosing a liner

After you have planned the size of your pond and chosen the location, the next step is to decide which type of liner to use. There are several types of liners you can use for garden ponds. **To attract wildlife, polyvinyl chloride liners are the best choice.**

Polyvinyl chloride (PVC)

This is the most popular choice for ponds. The material is very flexible and durable, and conforms easily to any shape. If you do not buy a liner that is made specifically for ponds, make sure the words "fish friendly" appear on the packaging or the liner itself. Other types of plastic might give off chemicals toxic to plants and animals.

The thicker the liner, the longer it will last. A 45-mil liner lasts up to 50 years, 32-mil lasts 20 years, and a 20-mil liner lasts 7 to 10 years.

Use a black or dark brown liner so it is less visible when the pond is filled with water. Lighter-colored liners will give your pond the look of a swimming pool.

Concrete

This type of lining is rigid and difficult to build. Concrete requires on-going repair to

any cracks and crumbling that may occur. It also must be leached before you can introduce fish and plants. This type of lining is generally not very practical. We do **not** recommend concrete for wildlife ponds.

Molded fiberglass

This liner is impractical for most garden ponds. It is expensive, heavy, and difficult to install. We do **not** recommend molded fiberglass for wildlife ponds.

Prefabricated polyethylene shell

These liners are durable and easy to install. But, their slopes can be steep and slippery, so they are not good habitat for wildlife. They are more expensive than PVC liners. We do **not** recommend prefabricated polyethylene shells for wildlife ponds.

Butyl rubber

This is similar to PVC, but more expensive. We do **not** recommend butyl rubber for wildlife ponds.

Kiddie pools

These are too shallow and may contain toxic chemicals. We do **not** recommend them for ponds containing wildlife or fish.

Installing a PVC liner

How much do you need?

You can figure out how much liner you need with the following method:

Multiply the depth of the pond by three. Add that figure to the length and to the width. This will allow enough material for an apron around the edge of your pond.

For example, suppose your pond is 15 feet long, 10 feet wide, and 2 feet deep.

$$3 \times 2 \text{ ft} = 6$$

$$15 \text{ ft long} + 6 = 21 \text{ ft long}$$

$$10 \text{ ft wide} + 6 = 16 \text{ ft wide}$$

You need a piece of liner 21 feet long and 16 feet wide.

Excavation

Mark out the shape of your pond with stakes and string, paint, chalk, or a garden hose. If your pond is small, or you don't mind lots of physical labor, you can dig the pond by hand. Otherwise, you can hire someone to dig it for you with a backhoe (look in the Yellow Pages under "Landscape Contractors"). Be sure the place you've chosen for your pond is accessible to machinery.

Before you break ground, decide where you want the excavated dirt to go. You can use it to landscape around your pond or somewhere else in your yard, or you can haul it away. Put the dirt on tarps to make moving it easier or if you want to protect grass.

Preparing the hole

After the hole is dug, make sure the perimeter is level. You can place a level on top of a straight board. Or, use a water level if your pond is too wide for a board.

Remove any rocks or other sharp objects that could puncture the liner. Then, add 1 to 2 inches of damp sand on the plant shelves and bottom. You can put old carpet or newspaper on the vertical surfaces to help protect the liner also.

Placing the liner

Spread the liner out in the sun for about an hour before you install it. It will be softer and easier to work with.

It's easier to place the liner with two people. Place the liner over the excavated hole with overlap equal on all edges. Let it sag naturally into the bottom. Put bricks or rocks on the outside edges of the liner to hold it in place.

One person takes off her or his shoes and gets inside the pool, while the other person adjusts the rocks holding down the liner to make sure the liner fits snugly against the ground. Together, fold and tuck the liner to make it as smooth as possible and to reduce the number of wrinkles. Don't worry about removing all the wrinkles. They won't harm the liner.

Filling the pond

Place the water hose on the liner so the center fills first. As it fills, the water will pull the sides down. Eventually, the liner will "hit" the plant shelves and sink to the bottom, gradually filling in all the contours. While the pond is filling, keep checking the bricks or stones to make sure they are sliding evenly.

If you use chlorinated water, use a dechlorinator, or let the water sit for 2 or 3 days so the chlorine can evaporate before you introduce wildlife or vegetation. Stir the water vigorously with a stick to speed up evaporation.

After the pond is full, let it settle for a day. Then, install your edging and trim the apron.

Edging

You can use rocks or stones as edging to make your pond look more natural. They also hide the liner, keep it in place, and protect the liner from ultraviolet deterioration. You can vary the width and length of the rocks for a more natural look, but make sure they are heavy enough to stay in place.

Sandstone, slate, and granite are excellent choices for edging. Do not use limestone. Lime can leach into the water and be hazardous to wildlife.

Put one stone slightly lower than the others. This is where water will run off when the pond overflows.

Finishing touches

Put sand or small rocks in the shallow areas to provide footing for wildlife. A muddy, beach-like area is important for many species of wildlife. Songbirds drink and bathe in this shallow area. Tadpoles, insects, and other aquatic creatures use this area for cover, basking, and nesting. Some nesting birds use mud. Butterflies get moisture and nutrients from mud.

Encourage wildlife to come to your pond by adding vegetation, floating logs, protruding branches, rockpiles, and brushpiles in or next to your pond (Figure 2). Many species use

rocks, logs, and fallen limbs that protrude out of the water as natural basking sites. A ceramic pipe on the floor of the pond creates a hiding place for aquatic species. For larger ponds, you can build a floating platform and anchor it in the middle of the pond.

Pond plants

Plants are an important part of the wild habitat. They provide cover, oxygen, relief from hot or cold, and breeding sites for wildlife. They also provide food and habitat for the insects and other invertebrates that animals eat.

What to plant

Include a mix of submerged, floating, and marginal plants in your pond (Table 1). Submerged plants grow completely under the water. They release oxygen into the water rather than into the air. Submerged plants provide egg-laying sites, hiding places, and food for a variety of aquatic organisms.

Floating plants also provide excellent habitat for wildlife.

Put marginal plants around your pond and on the plant shelves. They soften the edge of the pond by camouflaging the liner, and create a transition between the water and the edging. They also make a barrier against cats, raccoons, and other land predators.

Put in native plants. They are more familiar to wildlife and are well adapted to the environment. Many non-native species, such as purple loosestrife (*Lythrum salicaria*) and reed-canary grass (*Phalaris arundinacea*), are invasive and aggressive and will out-compete other plants.

The best ratio is half plants to half open water. No more than 65 percent of your pond should be covered with plants during the summer months.

Algae

Plants help control the growth of algae by shading out the sun. Algae creates oxygen and food for tadpoles. It establishes itself in your pond using nutrients and sunlight. But, too much sun or nutrients (such as decayed vegetation or fertilizer) can cause outbreaks of algae called “blooms.” Algae blooms also

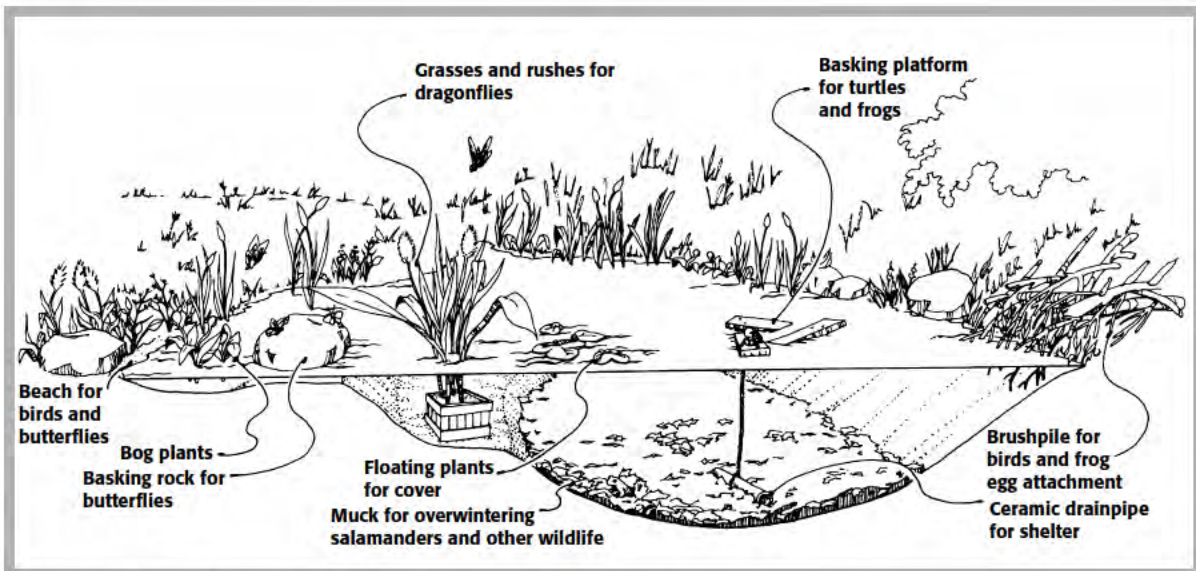


Figure 2. Habitat features in and around a pond.

(From: *Landscaping for Wildlife in the Pacific Northwest*, University of Washington Press and Washington Department of Wildlife.)

occur in new ponds and in the spring before plants get big enough to shade the water. If algae blooms persist, you might need to clean your pond or plant more vegetation.

Taking care of plants

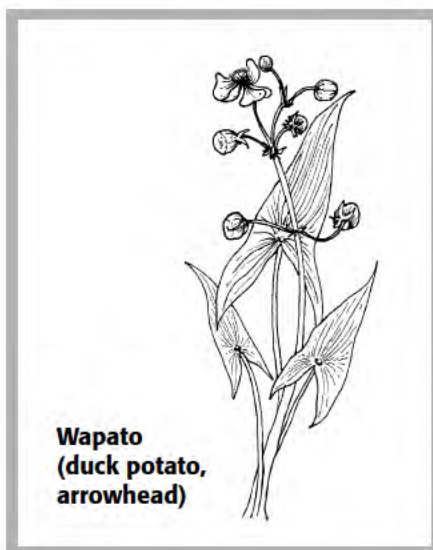
You can make it easier to take care of your pond if you pot the plants in plastic containers. It's simpler to thin, replant, and winterize the plants. Fall is the best time for this. Thin plants if they become too big, or replant them in larger containers. Winterize plants by bringing them inside to stay green *or* putting them in a protected, dark place to go dormant for winter.

Put a heavy rock in the bottom to keep the pots upright. Fill them with regular topsoil or a mixture of ¼ sand, ¼ compost, and ½ garden loam. Be careful not to use materials that float (such as vermiculite or perlite), or you will have a big mess. Put 1 or 2 inches of coarse sand or pea gravel on top of the potting mix to keep the soil in the pots.

Wildlife

Introducing species

To keep your pond healthy and diverse, you need to include microscopic life and small invertebrates. An easy way to introduce them



into your pond is to collect a bucket full of water and mud from a local pond that appears to have a healthy ecosystem, and dump it into your pond. Soon, your pond will establish its own microscopic and invertebrate life.

If you introduce fish, you reduce the number of wildlife species that can survive. Fish eat eggs and larvae of amphibians, dragonflies, and other aquatic species.

Even if you stock your pond with native wildlife species, the habitat you have created may not be suitable for them. You might be putting them at risk if they decide to leave. Or, worse yet, they could die if the conditions are not right. It's best to let wildlife, including reptiles and amphibians, find your pond on their own.

If you are thinking of introducing fish or other species to your pond, contact your local office of the Department of Fish and Wildlife for information on native species.

Table 1. Native plants for ponds.

Submerged plants

Coontail, *Ceratophyllum demersum*
Elodea, *Elodea canadensis*

Floating leaf plants

Water fern, *Azolla mexicana*
Watershield, *Brasenia schreberi*
Duckweed, *Lemna minor*

Marginal plants

Great water-plantain, *Alisma plantago-aquatica*
Inflated sedge, *Carex vesicaria*
Spike rush, *Eleocharis palustris*
Wapato (duck potato, arrowhead), *Sagittaria latifolia*
Hardstem bulrush, *Scirpus acutus*
Wool grass, *Scirpus cyperinus*
Small-fruited bulrush, *Scirpus microcarpus*
Soft-stem bulrush, *Scirpus validus*
Cattail, *Typha latifolia*

Travel corridors

To attract and maintain a breeding population of amphibians, your pond should be within ½ mile of another pond or wetland that already has breeding amphibians. There must be an undisturbed, natural pathway from other ponds to yours. This is called a **travel corridor**. Travel corridors are an important element in attracting wildlife.

Because of the barriers to travel created by urban development, it may be difficult for some species to make it to your property. It might take 1 to several years before you see any in your yard. Their ability to move into your yard depends upon whether neighboring landscapes offer safe travel corridors, too.

Predators

Raccoons raid ponds in search of insects, fish, frogs, snails, and turtles. You can put wire mesh around or over your pond to prevent damage. Make sure the holes in the mesh are large enough to let birds, reptiles, and amphibians move freely in and out of the pond. An electric fence also keeps out unwanted animals.

Exotic species

It is illegal to release non-native species. Do not release exotic or pet store species into your yard.

Exotics can be extremely detrimental to native species of plants and animals. For example, the bullfrog eats the young of snakes, frogs, fish, turtles, ducks, and small mammals. This has a very negative effect on their populations.

Furthermore, many exotics die if released. They are not able to tolerate the environmental conditions in the Pacific Northwest.

Taking care of your pond

Caring for your pond could include removing debris, controlling vegetation, and

dividing and repotting plants. The best time to clean and make repairs is in the fall, because you will disturb plants and wildlife less.

You can place netting over your pond to catch falling leaves. Collect floating-leaf plants with a garden rake. Let the collected vegetation sit at the pond's edge overnight, so excess water can drain and any aquatic wildlife can escape.

Don't worry about keeping the pond totally free of leaves. A 3-inch layer of debris settling on the bottom is welcome. It gives wildlife a place to burrow in the winter.

If you keep your pond free from excess vegetation, you might never need to empty it. But, if you do need to empty your pond, make sure you remove plants and wildlife. Keep them in a non-toxic container with pond water or a mixture of 1 part new to 3 parts old pond water.

After you refill the pond, remember to use a dechlorinator, or let the water sit for a few days for chlorine to evaporate before you return the plants and wildlife.

Coexisting with pond wildlife

To help protect and maintain a healthy pond for wildlife on your property, you must establish a successful coexistence between pond species and humans.

1. Do not use chemicals such as fertilizers and pesticides on your property. This is especially important for amphibians, because their skin is extremely sensitive to environmental chemicals. Excess nutrients from fertilizers that get into your pond will cause algae blooms.
2. Talk to your neighbors. Let them know what you're doing and why, so they will be more likely to help protect habitat. Encourage them to create habitat for wildlife, too. You'll increase your chances of attracting it.

3. Teach children about wild creatures, so they will respect and admire them and be less likely to harass or harm them. Make sure they understand not to play in the pond, for their own safety and the health of the wildlife there.
4. Protect wildlife from pets. Cats and dogs often attack wild creatures. Either train your pets, or keep them in restricted sections of your property.
5. Instead of using fish to help control mosquitoes, place bird and bat boxes near your pond. Other species that eat mosquitoes or their larvae are dragonfly larvae, water striders, snakes, toads, and frogs.

The more habitat features you have on your property that provide food, water, and shelter, the more likely it is that you will attract and maintain wildlife there. Enjoy the beauty you have created and the excitement of watching the wildlife that comes to your new garden pond.

For more information

OSU Extension publications

See these other publications in The Wildlife Garden set:

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