

Growing Blueberries in Your Home Garden

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Photo: Lynn Ketchum

Plump, juicy blueberries are a great pick for Oregon gardens. By growing them yourself, you can harvest pounds of delicious fruit all season long from a variety of available cultivars. What's more, blueberry bushes lend year-round beauty to the landscape: After a profusion of white or pink blossoms in spring, the green leaves of summer turn red in fall, and the wood of many cultivars glows brightly in winter.

Blueberries grow well in western Oregon and can be grown with moderate success in other parts of the state. It is important to choose a type and cultivar adapted to your region. In some regions, plants may only grow well in raised beds or containers.

Blueberries in the wild

The cultivated blueberries you grow in your home garden or buy at the market have many wild relatives. You can find wild blueberry species from the coast to the eastern and southeastern mountain valleys. While our native blueberries are commonly called huckleberries, they are not true huckleberries. Huckleberries belong to the genus *Gaylussacia*, rather than *Vaccinium*, and are not native to this region.

Native blueberry species produce a low yield per plant compared to our home garden cultivars, but many are prized for their fruit quality. While many of these species are available from native plant nurseries, they often do not perform well outside their native habitat.



Figure 1A. Oval-leaved huckleberry.

Credit: Bernadine Strik, © Oregon State University



Figure 1B. Mountain huckleberry

Credit: Bernadine Strik, © Oregon State University



Figure 2. Red huckleberry, with ripe fruit.

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Native blueberries include:

- **The mountain huckleberry** (*Vaccinium membranaceum*) and **oval-leaved huckleberry** (*V. ovalifolium*). These are native throughout mountain and foothill areas from the coast, southeastern valleys, to eastern Oregon (Figures 1A, 1B). Plants are deciduous and grow from 1 to 9 feet tall, depending on climate and species. Berries are dark blue, purple or black in color. They may be slightly flattened (mountain huckleberry), and they have good flavor.
- **The Cascade bilberry** (*V. deliciosum*) and **dwarf bilberry** (*V. cespitosum*). Bilberry are shorter, spreading shrubs that produce dark-colored fruit with excellent flavor; you can find these at higher elevations throughout the region.
- **The red huckleberry** (*V. parvifolium*) grows up to 10 feet tall and is deciduous. It has green stems and red berries (Figure 2). Plants are mainly found in the coastal and Klamath mountains and western slopes of the Cascades up to about 5,000 feet in elevation.
- **The evergreen huckleberry** (*V. ovatum*) is commonly found as an understory plant throughout most of western Oregon but may grow in open areas on the coast (Figure 3A). This species is also sold as a landscape plant because it is evergreen and produces many pinkish flowers. It has very small blue fruit (Figures 3B, 3C) and red new shoot growth (Figure 3A). Stems are sometimes collected from native plants for floral arrangements.



Figure 3A. Evergreen huckleberry, showing new red growth at the Oregon Coast.

Credit: Bernadine Strik, © Oregon State University



Figure 3B. Flowers of evergreen huckleberry.

Credit: Bernadine Strik, © Oregon State University



Figure 3C. Fruit of evergreen huckleberry.

Credit: Bernadine Strik, © Oregon State University

Blueberries in your garden

You can grow several types of blueberry successfully in your home garden. All are woody shrubs with a similar growth habit, but plant height varies with type.

Plants have a shallow root system, generally no more than 1 to 1.5 feet deep, and a woody plant base called a crown. Once shoots lose their leaves in the fall, they are called canes. Shoots are produced from buds on the crown and on canes.

Canes may vary in age from one to about five years. New, vigorous, upright-growing shoots (in growing season) or 1-year-old canes (winter) that grew from the crown or older wood on the bush are called whips. In all blueberry types, flowers and fruit are produced on 1-year-old wood (last year's growth). In winter, flower buds appear as fat buds at the tip of this wood (Figure 4). These enlarged buds only produce a flower cluster. Leaf or vegetative buds (small and scale-like) are found lower on the 1-year-old wood (Figure 4); these only produce a shoot.

All blueberry types can be long-lived, bearing fruit for more than 50 years. In general, northern highbush blueberry cultivars are immature or are establishing from the planting year (year 1) through the seventh growing season (year 7). Plants are mature, maintaining their expected yield (see "Harvest") after year 7, depending on the region. However, proper management of soil pH, fertilization and pruning, is critical to good plant performance. Plants should be pruned at planting and each winter (see "Pruning"). They will produce fruit for the first time one or two years after planting and yield will continue to increase until they are mature (see "Harvest").

Blueberry types

Several types of blueberry are available as nursery plants through online catalogs or retail outlets. Not all types are suitable for your region. There are various cultivars within each type (see "Cultivars").

Northern highbush blueberry

Plants grow 6 to 7 feet high at maturity. All northern highbush cultivars are winter cold hardy for any region or microclimate in Oregon. Some frost damage may occur to growing parts, depending on the year and the region (see "Common problems"). While these cultivars will produce fruit with self-pollination, it is best to choose more than one cultivar; cross-pollination improves berry size and quantity. Each cultivar has a three- to five-week-long fruiting season. Cultivars differ in ripening time: early-season ('Duke' and 'Spartan'); midseason ('Bluecrop' and 'Liberty') and late-season ('Darrow'). In the Willamette Valley, ripe fruit is produced from late June–July, July–August, and August–September for early-, mid-, and late-season cultivars, respectively. While these cultivars ripen at different times, they all bloom at the same time. Any two cultivars enable good cross-pollination.



Figure 4. Buds on 1-year-old wood (last season's growth). The buds at the tip are flower buds. The buds below the pruners are leaf or vegetative buds.

Credit: Bernadine Strik, © Oregon State University

Southern highbush blueberry

Plants grow to about 6 feet high at maturity. This type is not suitable for any region of Oregon. Southern highbush blueberry cultivars grow well here, but plants bloom in February in the Willamette Valley, leading to most or all of the flowers being lost to frost and no fruit. In southeastern, Central, and eastern Oregon, plants are not hardy enough to survive the winters. Unfortunately, some retail outlets in these regions do not distinguish between southern and northern highbush cultivars and sell both. Do your research before you buy. Commonly sold southern highbush cultivars include ‘Emerald’, ‘Jewel’, ‘San Joaquin’, ‘Star’, ‘Misty’, ‘O’Neal’, ‘Biloxi’, ‘Meadowlark’ and ‘Snowchaser’. Since this type is not adapted to Oregon, it is not included in the list of cultivars.

Northern and southern highbush blueberry hybrids

Plants grow 6 to 7 feet high at maturity. There is currently one hybrid cultivar, ‘Legacy’, that is available for home gardeners and is adapted to the Willamette Valley and southwestern Oregon. It is not cold-hardy enough to grow in southeastern, Central, or eastern Oregon. In these regions, gardeners won’t get a consistent crop from year to year; plants will likely lose flower buds to winter cold injury (see “Common problems”). While ‘Legacy’ will produce fruit with self-pollination, choose a northern highbush cultivar as a pollinator; cross-pollination improves berry size and quantity. ‘Legacy’ bushes produce up to double the fruit yield of northern highbush cultivars in adapted areas when they are managed well (see “Harvest”). Plants typically do not lose all their leaves in winter.

Lowbush blueberry

Plants grow to about 1 foot tall. Lowbush blueberries (mainly *V. angustifolium*) are harvested from managed wild stands in Maine and eastern Canada. The fruit is frozen and sold throughout North America as “wild blueberries.” While some lowbush plants are sold in retail outlets (cultivars such as ‘Tophat’, ‘Brunswick’ and ‘Burgundy’), Oregon gardeners may find it difficult to achieve high yields for various reasons. Lowbush blueberries are not included in suggested cultivars.

Northern highbush and lowbush blueberry hybrids (“half-highs”)

Half-high cultivars were developed by crossing northern and lowbush blueberry species. Mature plants are 2 to 4 feet tall, depending on cultivar (see “Cultivars”). These are very cold hardy, especially as they are often covered with insulating snow in very cold regions. Yield and berry weight are considerably less than for northern highbush cultivars. These do not produce much fruit with self-pollination, so choose more than one half-high cultivar for cross-pollination. This type of blueberry is sometimes considered for container plantings or for planting in the landscape where there is insufficient space for a northern highbush cultivar.

Rabbiteye blueberry

Plants grow up to 9 feet tall at maturity. This type of blueberry (*V. virgatum*) is native to the southeastern U.S. and is only adapted to the Willamette Valley and southwestern Oregon; the winters in other regions may be too cold for consistent fruit production. There are various blue-fruited cultivars available that ripen late in the Willamette Valley (August to late September). These do not produce fruit with self-pollination, so choose more than one rabbiteye cultivar for cross-pollination. While ‘Pink Lemonade’ is somewhat self-fertile and will produce berries if it’s the only rabbiteye cultivar in the yard, choose another rabbiteye cultivar to increase berry size and quantity.

Ornamental blueberries

Plant height varies by cultivar. While all blueberry types and cultivars are attractive in the landscape, some have been specifically developed for this market. For example, ‘Sunshine Blue’ is a southern highbush blueberry noted for its pretty foliage. As with other southern highbush cultivars, it is not well-adapted for fruit production in these regions of Oregon. Regardless, you can expect nice foliage and some fruit in the landscape if pruned well (see “Pruning”). Other ornamental blueberry cultivars include ‘Jelly Bean’ and Peach Sorbet’. ‘Perpetua’, released by the cooperative breeding program in Oregon, has beautiful glossy foliage and produces two crops of fruit per season (Figure 5). While these are all beautiful ornamental cultivars, suited to the landscape, choose better-tasting and higher-yielding cultivars for fruit production.



Figure 5. The ornamental blueberry ‘Perpetua’ produces flowers and fruit twice per year. Photo taken in mid-July in the Willamette Valley.

Credit: Bernadine Strik, © Oregon State University

Cultivars

Choose a blueberry type that is cold hardy for your region. Cultivars differ in fruiting season, berry size and flavor. The main factor affecting berry size is cultivar. For example, ‘Chandler’ has very large berries, whereas ‘Mini Blues’ has very small berries. However, pruning technique or lack of pruning also impact berry size. A poorly pruned ‘Chandler’ bush, for example, will produce small berries. For each cultivar, it’s important to prune well to get normal berry size and to have a long plant life.

The northern highbush cultivars listed are adapted to all regions of Oregon; these are cold hardy and adapted to [USDA cold hardiness zones](https://planthardiness.ars.usda.gov/PHZMWeb/) (https://planthardiness.ars.usda.gov/PHZMWeb/) 4 to 8. The exception is the hybrid cultivar ‘Legacy’, which only reliably produces fruit in the Willamette Valley and southwestern Oregon. Half-high cultivars are also adapted to all regions. In contrast, the blue-fruited rabbiteye cultivars (zone 7 to 9) are only adapted to microclimates with warmer winters such as the Willamette Valley.

The list below presents suggested cultivars in approximate order of ripening by type. While many other cultivars are available — especially northern highbush cultivars — these feature characteristics important for the home garden. These measures include great flavor, disease resistance, and a range in ripening time and berry size. All have blue fruit unless otherwise noted.

Remember to choose more than one cultivar within a blueberry type. This will help achieve cross-pollination, and result in better berry size and yield. Many home gardens across Oregon have enough bees to ensure good pollination. Also, if you plant multiple cultivars that ripen at different times, you will lengthen the harvest season. For more information, see:

- [Blueberry Cultivars for the Pacific Northwest](https://catalog.extension.oregonstate.edu/pnw656) (https://catalog.extension.oregonstate.edu/pnw656), PNW 656
- [Selecting Berry Crop Varieties for Central Oregon](https://catalog.extension.oregonstate.edu/ec1621) (https://catalog.extension.oregonstate.edu/ec1621), EC 1621

You can find descriptions of newer cultivars online through various nurseries. Many of these cultivars and more are available through local retail and mail-order nurseries. Do your research to determine the type of blueberry the cultivar belongs to. Make sure it’s adapted to your region. Plants often sell out quickly, so order well in advance of spring planting.

Northern highbush cultivars

In order of ripening

- 'Duke' (medium size; crisp texture)
- 'Spartan' (large size; very good flavor)
- 'Patriot' (large size; good flavor)
- 'Bluecrop' (medium size; good flavor)
- 'Top Shelf' (large size; good flavor)
- 'Toro' (large size; good flavor; low plant vigor; susceptible to root rot)
- 'Jersey' (small-medium size; good flavor)
- 'Calypso' (medium size; can be bland and have mealy texture in Willamette Valley)
- 'Blueray' (medium size; good flavor)
- 'Mini Blues' (very small; excellent flavor)
- 'Liberty' (medium size; very good flavor)
- 'Chandler' (very large; very good flavor)
- 'Darrow' (large size; good flavor)



'Duke'



'Spartan'



'Bluecrop'



'Top Shelf'



'Calypso'



'Mini Blues'



'Liberty'



'Chandler'



'Darrow'



'Legacy'



'Pink Lemonade'



'Powderblue'

Northern highbush and southern highbush hybrid

- 'Legacy' (mid- to late season; long fruiting season; large size; very good flavor)

Half-high

- 'Polaris' (up to 4 feet tall; small to medium size; sweet)
- 'Northland' (up to 4 feet tall; medium size; sweet)
- 'Northcountry' (up to 3 feet tall; medium size; sweet)
- 'Northsky' (up to 3 feet tall; small size; sweet)
- 'Chippewa' (up to 4 feet tall; medium size; sweet)
- 'Northblue' (up to 3 feet tall; medium size; sweet)

Rabbiteye

- 'Pink Lemonade' (pink fruit; medium size; good flavor)
- 'Powderblue' (medium size; good flavor)
- 'Tifblue' (small size; fair flavor)

Site selection

Blueberry plantings may produce for more than 50 years, depending on type, soil, pest pressure and pruning practices. Carefully select a site. Ideal environmental conditions for blueberries are full sun exposure and fertile, well-drained sandy loam or clay loam soils with moderate water-holding capacity. While plants can tolerate partial shade, yield and fruit quality may be lower. Blueberry plants are sensitive to wet or heavy soils, and some cultivars are susceptible to root rot (see “Drainage”). Raised beds or mounded rows, if constructed correctly, can create enough height for adequate drainage (Figure 6).



Figure 6. Raised beds constructed of wood to grow berry crops; Willamette Valley.

Credit: Bernadine Strik, © Oregon State University

Soil nutrient testing and modification

Before planting blueberries, have a soil sample tested. Collect soil samples up to a year or more in advance. This allows adequate time to amend the soil, if necessary. Take samples from the top 12 to 18 inches of soil, where the roots will grow.

Blueberries require a soil pH of 4.5 to 5.5. If the test results indicate that soil pH is too low (too acidic) or too high (too basic) for blueberry production, amend the soil to improve the pH (see “Soil pH;” below). A typical soil analysis will also include phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg) and sodium (Na). Test for organic matter and for boron (B), especially in the Willamette Valley where B deficiency is common. Nitrogen (N) levels in soil are not useful because N is not added prior to planting. Instead, supply N with fertilizer after planting.

Recommended soil nutrient ranges for blueberries:

- Phosphorus (P) - Bray 1 testing: Deficient at <25-45 ppm
- Phosphorus (P) - Olsen testing: Deficient at <10 ppm
- Potassium (K): Deficient at <100-150 ppm
- Calcium (Ca): Deficient at <1,000 ppm
- Magnesium (Mg): Deficient at <60 ppm
- Boron (B): Deficient at <0.5-1.0 ppm
- Organic matter: Deficient at >4%

For more information, see:

- [A Guide to Collecting Soil Samples for Farms and Gardens, EC 628](https://catalog.extension.oregonstate.edu/ec628) (<https://catalog.extension.oregonstate.edu/ec628>)
- [Analytical Laboratories Serving Oregon, EM 8677](https://catalog.extension.oregonstate.edu/em8677) (<https://catalog.extension.oregonstate.edu/em8677>)
- [Soil Test Interpretation Guide, EC 1478](https://catalog.extension.oregonstate.edu/ec1478) (<https://catalog.extension.oregonstate.edu/ec1478>)

Soil that is not ideal for blueberries (soil with the wrong pH, poor drainage or the wrong soil type) can usually be improved. Gardeners can increase organic matter content, build raised beds, modify soil nutrient levels and modify soil pH to the ideal range with amendments, if needed.

Soil pH

One of the most common problems for home gardeners is a soil pH too high for optimal growth. Blueberries are acid-loving plants, like rhododendrons, and are adapted to soils with a pH ranging from 4.5 to 5.5. Soil that is too alkaline, with a pH higher than ideal, is a common source of poor plant growth. Signs of high soil pH include plants

with yellow, green-veined leaves, especially on younger leaves (Figure 7). Even if your soil is within the ideal pH range initially, incorporating high-pH organic matter such as composts can increase soil pH above the recommended range. Choose the correct organic matter as an amendment (see “Organic matter”).

In many regions of the Willamette Valley and the foothills of the Cascade Mountains, native soils have a pH within the ideal range for blueberry plants. However, many home garden soils have been modified during construction or when gardening, and the pH is too high for good blueberry growth. Alongside sidewalks or foundations, the lime that leaches from concrete may increase soil pH over time. If possible, avoid planting along these structures. Soils in many regions of Central or eastern Oregon are naturally alkaline with a soil pH that is too high for blueberry.

Ideally, test the soil a year before planting to allow enough time for modifying soil pH, if needed. If the soil pH is too high (above 5.7), apply elemental sulfur to acidify it. If the soil pH is slightly high — between 5.5 and 5.7 — sulfur is not needed: Fertilizer applications after planting will lower soil pH over time. How much sulfur is needed depends on soil type and the current pH. To acidify a clay loam soil with a starting pH from 5.7 to 6.5, apply 2 to 5 pounds of elemental sulfur per 100 square feet, respectively. More sulfur may be needed to acidify heavier soils. In sandy-type soils, apply approximately 1 to 3 pounds of sulfur per 100 square feet. The goal is to get the soil pH to 5.5, the upper end of the suitable range for blueberry.

In some of the sandy soils found in Central and eastern Oregon, soil pH will creep up (become alkaline again) after planting, even if you modify the soil pH properly prior to planting. For this reason, grow plants in constructed raised beds or containers with an acidic potting mix to keep blueberry plants growing well much longer than in native soil.

If your soil pH is too low (below 4.5) for blueberry production, incorporate finely ground limestone at a rate of approximately 5 to 10 pounds per 100 square feet to raise the soil pH to a target pH of 5.5. You can also use high-pH composts to add organic matter and increase soil pH. However, avoid composts with a high salt content (electrical conductivity, or EC), such as fresh animal manures or mushroom composts. Incorporate amendments into the soil about a year prior to planting, as it takes time for the soil pH to adjust after the addition of lime or other amendments. For more information, see [Acidifying Soil for Blueberries and Ornamental Plants in the Yard and Garden, EC 1560](https://catalog.extension.oregonstate.edu/ec1560) (<https://catalog.extension.oregonstate.edu/ec1560>); [Acidifying Soil in Landscapes and Gardens East of the Cascades, EC 1585](https://catalog.extension.oregonstate.edu/ec1585) (<https://catalog.extension.oregonstate.edu/ec1585>); [Applying Lime to Raise Soil pH for Crop Production \(Western Oregon\), EM 9057](https://catalog.extension.oregonstate.edu/em9057) (<https://catalog.extension.oregonstate.edu/em9057>); [Eastern Oregon Liming Guide, EM 9060](https://catalog.extension.oregonstate.edu/em9060) (<https://catalog.extension.oregonstate.edu/em9060>)



Figure 7. Yellow leaves with green veins show that this blueberry is growing in soil with a pH that is too high for optimal growth.

Credit: Bernadine Strik, © Oregon State University



Figure 8. Blueberry plants showing symptoms of poor drainage. Roots are not getting enough oxygen. The horsetail weeds prefer a wetter soil.

Credit: Bernadine Strik, © Oregon State University



Figure 9. Growing blueberry plants on raised beds made of mounded soil. Plants are mulched with sawdust.

Credit: Bernadine Strik, © Oregon State University

Drainage

Blueberry plants prefer well-drained soil. Poor drainage can lead to root diseases and root death. The soil water table should be at least 14 inches below the soil surface. Roots will suffocate in soils that are waterlogged for more than a few days in a row during the growing season (Figure 8), and the likelihood of root rot will increase. Some soils may be amended to make them suitable. Plants will be more vigorous and produce more fruit when grown on a well-drained, fertile, loam soil with some water-holding capacity.

In the Willamette Valley and southern Oregon, blueberry plants grow best when planted on raised beds. In Central or eastern Oregon, the native sandy-type soils are fast draining, but soil pH often increases after planting (see above). Growing plants in raised beds in these regions allows you to choose a potting soil mixture better suited for longer-term production (see “Container plantings”).

Construct raised beds by mounding soil (Figure 9) or build one using wood (Figure 6). The minimum height for beds made of mounded soil is 1 to 1.5 feet high and for constructed raised beds is 2 to 3 feet deep. Amend soil with any needed nutrients and suitable organic matter. Organic matter aids in soil aeration, drainage, and the capacity to hold water and nutrients.

Organic matter

Blueberry plants grow best in soils that are relatively high in organic matter (greater than 4%) with good aeration and drainage. You can increase soil organic matter by incorporating appropriate materials prior to planting. Only choose organic amendments with a low pH. Many commonly available organic materials for home gardeners have a pH that is too high for blueberry plants. For example, yard- or plant-based composts and any animal manure-based composts have a pH above 7. Manures and some composts, such as mushroom, also often have a high EC — blueberry plants are very sensitive to high salts. For these reasons, incorporating yard-debris, mushroom- or animal-based composts prior to planting blueberries is not recommended in any region of Oregon.

The best materials to use as organic amendments are sawdust or bark from Douglas fir, pine, and most hardwoods — these have a pH of 4.0 to 4.5. Avoid using fresh cedar or redwood tree sawdust or bark, because these may injure young blueberry plants. You can use peat moss as part of a soil mix in containers or raised beds, as it is quite acidic, but it's too expensive to use on a large scale.

For soil plantings, apply organic matter at a rate of 2 to 4 inches deep for each area planted. Incorporate the organic material into the soil by digging or tilling. Mixing the amendment in well ensures uniformity of soil properties. If you apply large amounts of fresh organic material with a high carbon-to-nitrogen ratio (C:N), such as sawdust, you can aid decomposition by applying approximately 3 ounces of N per 100 square feet (Figure 16). Work the soil throughout the entire planting area rather than just trying to amend the planting hole to ensure proper soil requirements for blueberries.

In areas with little summer rain, irrigate the area prior to planting to ensure amendments such as sulfur and organic materials react well with the soil. For more information on use of organic matter in crop production, see [Improving Garden Soils with Organic Matter](https://catalog.extension.oregonstate.edu/ec1561), (<https://catalog.extension.oregonstate.edu/ec1561>) EC 1561.

Planting systems

Container plantings

Any adapted type of blueberry may be grown in raised beds constructed with wooden frames (Figure 6). Fill these raised beds with a mixture of suitable soil (for example, a sandy or clay loam in the Willamette Valley) or a potting soil mixture as described below for containers. Space plants as described below (see “Planting”). For more information on building raised beds, see [Raised Bed Gardening \(https://catalog.extension.oregonstate.edu/fs270\)](https://catalog.extension.oregonstate.edu/fs270), FS 270.

Sometimes, garden soil is not well suited for blueberry production, even after you make all possible amendments. Or, you may have limited space in your yard. In these cases, you can grow blueberry plants in containers (Figure 10) on a deck or balcony. Choose a spot that has good sun exposure.

You can grow any type of blueberry in a container. The larger types, such as northern highbush, need a large container, such as half a wine barrel or a 15- to 20-gallon container (Figure 10). Half-high cultivars perform best in a 10-gallon or larger container. Make sure the potting mix and the container drain well. The pot should have drain holes at the bottom.

A good potting mix must have the correct pH for blueberries, high organic matter and good drainage. Mixes should contain a large portion of well-aged, fine bark (50% to 80%), peat moss (10% to 40%), and perlite or pumice (10%). Pots containing the higher proportions of bark are more difficult to manage, as they dry out faster and are more difficult to fertilize; these higher proportions may be suitable for larger raised beds. Some yard centers sell potting media that have a similar composition to what is recommended here. Make sure that the mix does not contain lime or a high proportion of compost, which would lead to a higher pH than recommended for blueberries.

Follow the planting, fertilizing and pruning recommendations described here.

Planting

Blueberry plants are sold as potted plants (Figure 11A). You may plant blueberries in the fall (early October) in the Willamette Valley or in spring in all regions. Most nursery plants are sold in the spring. Order plants well in advance before desired cultivars sell out.

Due to their ornamental value, blueberry plants may be appropriate for landscape beds, but are easier to manage and protect from birds (see “Common problems”) if planted in rows. Plant spacing in the row often varies with the cultivar, depending on plant vigor.



Figure 10. A northern highbush blueberry plant growing in a half wine barrel container. The plant is covered with netting to protect against birds.

Credit: Amy Jo Detweiller, © Oregon State University

Types of blueberry plants and recommended distance apart:

- Northern highbush cultivars: 3 feet
- ‘Legacy’ cultivar: 4 feet
- Rabbiteye cultivars: 5 feet
- Half-high cultivars: 3 feet
- Spacing between rows: 8+ feet

When planting, dig a hole large enough to accommodate the size of the root ball. Remove the pot. Some plants may be pot-bound — that is, they show a lot of tight root growth on the outside of the potting medium. If so, rub the outside of the root ball vigorously using your gloved hand to rough up the roots (Figure 11A). Set the plant so that the pot’s container mix is level with the soil (Figure 11B). Planting too deep can smother or kill the roots. Fill the planting hole with soil (Figure 11C). Gently press down the soil to remove air pockets. Water the plants thoroughly.

If using an organic mulch, such as sawdust or bark, add this to the entire in-row area (not just mounded around plants) (see “Mulching,” below) (Figure 9).

Prune the new plants to remove the flower buds and shape the bush (see “Pruning”). If you plant in the fall (for example, October in the Willamette Valley or southwestern Oregon), prune the plants in late winter before bud break. If you plant in the spring, prune the bushes immediately, even if they have already started flowering.



Figure 11A. Roughing the tight root ball.

Credit: Amanda Davis, © Oregon State University



Figure 11B. Setting plant into hole.

Credit: Amanda Davis, © Oregon State University



Figure 11C. Filling and leveling soil.

Credit: Amanda Davis, © Oregon State University

Mulching

A mulch can help control annual weeds, conserve soil moisture, and, depending on the type of mulch, provide a source of nutrients and organic matter. In colder regions, mulch reduces soil temperature and may prevent plants from heaving out of the soil from alternate freezing and thawing.

Sawdust from Douglas fir is commonly used in the Willamette Valley (Figure 9), but you can use sawdust from any tree other than Redwood, cedar or black walnut in any region. You can also use other organic materials as a mulch, including wood chips and pine needles. You may use landscape tree leaves. Leaves often break down quickly, needing frequent replenishment, or they may form a hard top layer, making irrigation and fertilization difficult.

Be careful using animal- or mushroom-based composts as a mulch, because the high salts in these materials can lead to salt burn of young plants. In more established plants, you can use yard- or animal-debris compost as part of your mulching program because they may provide nutrients (see “Nutrient management”). However, weed seeds will germinate quickly in these composts. So, to help manage weeds, use only a ½- to 1-inch-deep layer of compost and place a 2- to 3-inch-deep layer of sawdust or similar mulch on top. Compost is an optional component of a blueberry fertilizer program.

Apply no more than a 2- to 3-inch-deep mulch immediately after planting. Over the next five to six years, gradually increase the depth of the mulch to reach 4 to 6 inches total when the plants are mature. Mulch generally decomposes at a rate of about an inch per year in the Willamette Valley, depending on the organic material used. Replenish the mulch every few years after plants are mature to maintain the desired depth. These mulches decompose slowly in Central and eastern Oregon.

When using a fresh organic mulch like sawdust, increase the amount of N fertilizer to compensate for the N immobilized by the bacteria that break down the organic matter (see “Nutrient management”).

A perforated, woven, black plastic groundcover or weed mat (Figure 12) can be useful as an in-row mulch for weed control (see “Weeds and weed management”). Plants grow best when you first apply a thin, 2-inch-deep layer of sawdust or bark as a mulch and then top this with weed mat. It is helpful to be able to open the weed mat mulch so you can apply fertilizers underneath (Figure 13A). Place two strips of weed mat down a row of plants. For the first strip, go down one side close to the blueberry crown. On the second strip cut a “U” to go around the plant crown and overlap this side with the first piece. Pin down the outer sides and the overlapping piece (Figure 13B). To open the weed mat, pull up the pins on the overlapping piece. When you use weed mat as a mulch, place drip irrigation underneath it to ensure plants get adequate water (see “Irrigation,” below).



Figure 12. Perforated black plastic ground cover, or weed mat, used as a mulch.

Credit: Bernadine Strik, © Oregon State University



Figure 13A. Weed mat opened to apply fertilizer.

Credit: Bernadine Strik, © Oregon State University



Figure 13B. Overlapping pieces of weed mat are held in place with landscape staples. The staples can easily be removed as needed.

Credit: Bernadine Strik, © Oregon State University

Irrigation

Blueberries need adequate water to thrive, either from irrigation or rainfall. They have a shallow, fibrous root system, so they’re susceptible to drought injury (Figure 14). Fruit is made up of mostly water, so sufficient irrigation during fruit production is essential for the best yields and fruit quality. Adequate water is also needed during the growing season for good shoot growth and fruit bud development for next year’s crop.

Newly set plants do not have well-developed root systems, so plants can be easily stressed. Irrigate several times a week or as needed so that the root zone and soil are thoroughly wetted but standing water does not accumulate. Established blueberry plants require from 1.5 to 3 inches of water per week, depending on plant age, vigor, stage of growth, soil type and weather. Monitor irrigation carefully, whether done by hand, sprinklers or drip systems, to ensure you are adequately watering. With each irrigation, wet the soil to a depth of 0.5 to 1 foot. The rooting area

should be wet enough that the soil does not fully dry out between irrigation cycles. Sandy soils will require more frequent water applications than heavier soils. You can dig down into the soil to check if the soil is wet — but not too wet — between irrigations. It should be wet down to about 1 foot. Using organic materials such as sawdust as part of your mulching program can help conserve soil moisture (see “Mulching”).

Drip irrigation is ideal for blueberry production because it can conserve water and reduce weed problems and disease. Overhead sprinklers wet the canopy, which can encourage disease. Irrigate with a double line of drip irrigation (Figure 9), one on each side of the plant or row, with ½-gallon emitters spaced every 18 inches. Alternatively, use one drip line per row in the first or second year after planting, then add an additional line on the other side of the plants when they get older. Soaker hoses will also work, provided you monitor soil moisture to ensure the proper amount of water is being applied. Place the drip lines under any weed mat mulch because irrigation water typically runs off the weed mat before it can penetrate to the blueberry plants, especially in raised beds constructed of mounded soil.



Figure 14. Blueberry showing brown leaves/burning of the tips, symptoms of drought or water stress.

Credit: Bernadine Strik, © Oregon State University



Figure 15. A young plant with nitrogen deficiency.

Credit: Bernadine Strik, © Oregon State University

Nutrient management

Healthy blueberry plants with sufficient nutrients and growing in soil with a suitable pH (see “Soil pH”) have good growth and medium-to-dark-green leaves (Figure 19). Leaves with other colors (pale green, yellow, red or pink-tinted, or yellow with green veins) indicate a problem with nutrients, soil pH outside the ideal range (Figure 7), root disease or plant stress (due to excess water, for example; Figure 8). In particular, plants deficient in N will have older leaves that are pale green or yellow compared to the more green younger leaves; leaves may also have reddish color, and shoot growth may be poor (Figure 15). Blueberry plants cannot access nutrients in soils when pH is too high or too low, even when those nutrients are present in abundance: Soil pH and nutrient availability are interrelated.

Plants need to be pruned well to have good growth (see “Pruning”). Applying fertilizer will not correct problems related to poor pruning.

Blueberry plants will need fertilizer from the planting year through their entire productive life. There are many formulations of solid (granular) and liquid inorganic and organic fertilizers available. Most all-purpose garden fertilizers or organic products contain P (phosphate) and K (potash) as well as nitrogen (N), and some also contain Ca (feather meal, for example). Fertilizer sources range considerably in their nutrient content. For example, suitable common inorganic fertilizers available include 21–0–0 (ammonium sulfate; 21% N), 46–0–0 (urea; 46% N), 9–15–13 (rhododendron food; 9% N, 15% phosphate and 13% potash), and various slow-release sulfur coated urea products. Organic sources include cattle manure (0.6–0.4–0.5), horse manure (0.7–0.25–0.6), yard-debris compost (1–0.2–0.6), cottonseed meal (6–7–2), feather meal (12–0–0), bone meal (2–15–0), and fish emulsion (3–1–1). Avoid using fresh manure products after planting, as this may be a food safety risk.

The main nutrient needed by blueberry plants after planting in all home garden soils is N, specifically the ammonium source of N; this is similar for any acid-loving plant such as azaleas, rhododendrons and lingonberries. Many all-purpose garden fertilizers, such as 16–16–16, contain mainly the nitrate source of N and are thus not suited for blueberry plants. Since blueberry plants cannot take up or use nitrate N, even if it’s applied, they will be deficient for N, particularly in the early part of the growing season (Figure 15). This can only be corrected by applying the correct type of fertilizer, with ammonium N. The best options for blueberry are listed above.

Depending on the type of fertilizer product, there are different application methods to ensure maximum availability of N to the plants. Inorganic granular fertilizers are taken up rapidly by the plants and are often applied in equal portions, or splits, throughout the spring and early summer to ensure maximum efficiency of plant uptake and minimize the risk of salt stress to the blueberry plants (Figure 16). Granular organic fertilizers such as feather, soybean or cottonseed meals require longer periods of time for N to be available. Therefore, it’s best to apply granular organic fertilizers about a month before the time specified for inorganic fertilizers. In general, liquid fertilizers are available relatively quickly to plants but may also move out of the root zone quickly. So, for liquid fertilizers, divide the total amount of N into smaller, more frequent applications, such as weekly. Apply liquid fertilizers over roughly the same time periods as for inorganic fertilizers (see below). If you choose to use liquid fish fertilizer, be aware that it is salty and will injure plants unless the product is diluted 1:10 (1 part fish to 10 parts water) prior to using.

Common slow-release garden fertilizers and soluble products (those added to water) often have a significant portion of their total N as ammonium and are suitable for blueberry. Rather than using the percent total N in the product, use the percentage of ammonium N to calculate how much to apply.

Fertilizer recommendations for N are given in total weight of actual N per plant for the year. How much fertilizer to apply depends on the percentage of N in the product. To calculate how much N to apply during the year, divide the amount of N you need by the percentage of N in the fertilizer (Figure 16).

The recommended N rate to apply to blueberry plants varies with plant age (year 1 is the planting year or first growing season). These rates are suggested starting points. Observe the growth on your plants and increase the amount of ammonium N you apply if needed.

Recommended total rate of nitrogen fertilizer to apply per plant for northern highbush blueberry cultivars and hybrids*:

- **Year 1** (planting year/first growing season): 0.4–0.6 ounces per plant
- **Year 2** (second growing season): 0.6–0.7 ounces per plant
- **Year 3**: 0.7–0.9 ounces per plant
- **Year 4**: 0.8–1.0 ounces per plant
- **Year 5**: 1.0–1.1 ounces per plant
- **Year 6**: 1.2–1.5 ounces per plant
- **Year 7**: 1.3–1.8 ounces per plant
- **Mature** (Years 8+): 1.5–2.1 ounces per plant

*Recommended rates of N to apply to blueberry plants are based on planting age. Apply the higher end of the range if you have just applied fresh sawdust mulch under the bush, but only for the year you applied it.

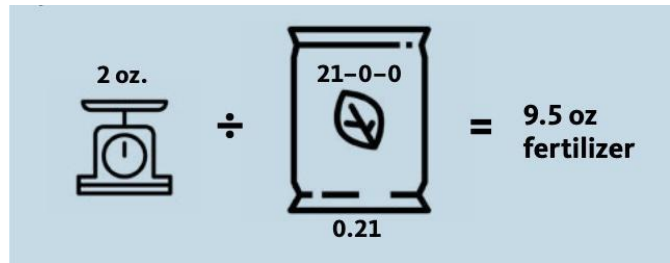


Figure 16. Calculating fertilizer applications

To calculate how much N to apply, divide the amount of N needed by the percentage of N in your fertilizer. For example, if the recommendation is to apply 2 ounces of N and you are using 21–0–0 fertilizer (21% N), the calculation would be 2 ounces ÷ 0.21 (decimal equivalent of 21%), or 9.5 ounces of the fertilizer product.

Photo: Scale by Ralph Schmitzer/Noun Project; Fertilizer bag by ic2icon/Noun Project

New plantings

If you plant in October, do not fertilize until spring of the following year (year 1). In year 1, apply a total of 0.4 to 0.6 ounces of N per plant for northern highbush cultivars. In half-high and rabbiteye cultivars, use from 0.2 to 0.3 ounces of N per plant in the planting year. Refer to the fertilizer calculation example to determine how much fertilizer product is needed. Use the higher rate if you have just applied fresh sawdust as a mulch — this fresh material will immobilize some of the N fertilizer, making it unavailable to the blueberry plants. See recommendations above.

Divide the total amount of N recommended into several applications to ensure the plant has time to take up the fertilizer before it moves below the root zone. This will also prevent salt stress to plants (Figure 17). When using granular inorganic fertilizer, divide the total N into thirds, applying one-third in each of late April, late May and late June in the Willamette Valley and southwestern Oregon; shift applications about a month later in Central and southeastern Oregon. Make inorganic fertilizer applications more frequently on sandy soil, dividing the total rate into more split applications. Many organic fertilizers, such as feather, soy or cotton seed meals, take longer to release N and are not good fertilizer choices in the planting year.

Spread granular fertilizer products evenly in a circle about 2 inches from the crown. To avoid burning the plants, do not pile fertilizer in one spot or against the crown, or the base of the plant. When using liquid fertilizers, divide the total rate of N or fertilizer product needed into many applications during a similar time period, such as weekly applications from late April through late July. Adjust fertilizer amount or rate and timing, depending on your growing region and how well plants are growing.

In raised beds or containers, use a similar rate and timing of N applications. Slow-release fertilizer products are appropriate for container plantings.

Most garden soils have sufficient phosphorus (P) and potassium (K) for blueberry growth. However, if soil testing prior to planting indicated low P or K, use a well-balanced fertilizer such as the organic products mentioned above or rhododendron food.



Figure 17. These blackened leaf edges are signs of salt stress, caused by applying too much fertilizer.

Credit: Bernadine Strik, © Oregon State University



Figure 18. 'Duke' blueberry plant during an establishment year in late June in the Willamette Valley. The plant shows ripening fruit and good growth

Credit: Bernadine Strik, © Oregon State University



Figure 19. First pick on a mature 'Bluecrop' bush.

Credit: Bernadine Strik, © Oregon State University

During establishment and maturity

Gradually increase the total rate of N fertilizer applied from year 2 (the year after planting) through the establishment years (3–7 for northern highbush blueberry plants). Then maintain total N rates that promote good growth, plant health and yield through the mature years (see "Nutrient Management"). Northern highbush, 'Legacy' and rabbiteye plants should have good whip growth (growing over 3 feet tall) and lateral shoots that are 6 to 12 inches long by the end of the growing season. Rabbiteye blueberry plants take as long to establish as northern highbush plants, but usually need about half the amount of N fertilizer. Try reducing the recommended rate by half for each year and only increase the amount applied if growth is poor or plants show symptoms of N deficiency (Figure 15). For half-high blueberry plants, try dividing the recommended rate above by half during the establishment years (1–3) and increase if more growth is needed. These plants are shorter, so don't expect as much vigor as for northern highbush cultivars.

In each year, divide the total amount of N recommended into several applications to ensure the plant has time to take up the fertilizer before it moves below the root zone. If using granular inorganic fertilizer, divide the total N into thirds. Apply one-third as the flowering or bloom period begins and the remaining portions in each of the following two months (in each of late April, late May and late June in the Willamette Valley; shift later in other regions, timing with early bloom). Make inorganic fertilizer applications more frequently on sandy soil, dividing the total rate into more split applications. Avoid fertilizing with granular products after Aug. 1 in most regions because this promotes late growth, increasing risk of frost injury and reducing fruit bud set for the next year's crop.

Apply granular organic fertilizers in two equal portions, starting the first about one month earlier than with inorganic fertilizers. Apply half in mid- to late March and the other in mid-May (in the Willamette Valley; shift later, as needed, in other regions). Spread granular fertilizers evenly over an area about the size of the spread of the bush or down the row width in row plantings, without touching the base of the crown (Figure 13A).

When using liquid fertilizers, divide the total rate of N or fertilizer product needed into weekly applications from late April through late July, depending on plant vigor, soil type and weather or production region. In raised beds or containers, use a similar rate and timing of N applications.

Healthy northern highbush and rabbiteye plants will put on 6 to 12 inches of new lateral shoot growth per year, depending on the age of the cane, and will produce new vigorous whips from the crown or higher up from older wood (Figure 18). Their leaves will look green, and yield will be in the expected range (see “Harvest,” below). If plants seem healthy, the nutrient management plan is working. Keep in mind that a good nutrient management plan will not substitute for poor management practices in other areas, especially pruning. Poor lateral growth and whip production may be a result of insufficient pruning, a soilborne disease (such as root rot), competition from weeds, or disease or insect issues (see “Pruning” and “Common problems”).

Monitor the soil pH in the plant row by taking soil samples every few years. Brush aside any mulch layer to the top of the soil surface before taking a sample about 6 to 12 inches from the edge of the blueberry plant crown. Monitoring soil pH is especially important if you observe poor growth or symptoms of improper pH (see “Soil pH”). If soil pH is too high (5.8 or above) in established plantings, apply low rates of sulfur to slowly lower the pH; apply elemental sulfur at a rate of no more than 3 ounces per plant in early autumn. Then check the soil pH again the following autumn. Apply sulfur again at the same rate if soil pH is still too high. Do not apply more than the recommended rate, as it may burn or kill blueberry plants. If the soil pH is slightly above the recommended range (for example, 5.6 to 5.7), fertilization will lower the pH over time, and no sulfur is needed.

Apply fertilizers and sulfur (if needed to lower pH) on the surface of any sawdust mulch present. But increase the rate of N if you’ve just applied fresh sawdust (see “Nutrient Management”). If using black weed mat as a mulch, make sure it can be opened to apply any granular fertilizers (Figure 13A) (see “Mulching”).

In some of the sandy soils found in Central and eastern Oregon, soil pH will creep up after planting, becoming alkaline once again. This can happen even when soil pH is properly modified prior to planting (see “Soil pH”). If this continues to be a problem, transplant to a constructed raised bed with a suitable, low-pH potting mix (see “Container plantings”). Blueberry plants of any age should be transplanted in late winter before bud break. Prune normally (see “Pruning”) but then remove another 25% to 30% of the flower buds to compensate for the transplanting shock.

Harvest

Mature northern highbush blueberry plants will yield from 9 to 15 pounds per bush, depending on cultivar (Figure 19). The hybrid cultivar ‘Legacy’ has a much higher mature yield of 21 pounds per bush. In general, prune plants so they produce their first fruit in the second growing season or the year after planting (see “Pruning”). Plants need to have a lot of shoot growth in the establishment years (years 1–7) to develop a mature bush size (Figure 18). If plants have been well pruned, a small harvest is likely the second year, with yield increasing steadily from the second year through maturity (see below). Once plants are mature, yield will be relatively stable from year to year. Yield may vary by region and is certainly affected by management, particularly pruning. With improper pruning, yield will be higher

when plants are younger, but plant vigor will decline along with yield as plants age (see “Pruning”). Improperly pruned plants are also more difficult and labor intensive to harvest berries from.

Blueberry plants will produce ripe fruit over a two- to five-week period, depending on the cultivar and the weather or region (Figure 20). The timing of this fruiting season varies by cultivar (see “Cultivars”). Blueberries are not yet ripe when they first turn fully blue. They will ripen further — developing better flavor, becoming sweeter (less acidic) — and will increase up to 20% in size if left a few days longer before picking. Protect the ripening fruit from insect and bird predation (see “Common problems”).

Pick regularly. This not only helps ensure berries are harvested at their optimal ripeness, but also reduces insect pests and diseases that are more prevalent on overripe fruit. Depending on the weather, pick berries once a week or every two weeks (Figure 21). Wash your hands and picking containers. During periods of hot or rainy weather, you may need to pick more frequently. Try to avoid picking when fruit is wet from dew, fog or rain, and don’t wash it before storage. Wet fruit will decay faster. Refrigerate fruit immediately for optimal length of storage and quality. Fruit will store for as long as two to six weeks in the refrigerator, depending on the cultivar. (Firmer berries store longer.) Fruit will soften during refrigeration. To minimize moisture loss from the fruit, cover a container with wax paper rather than a tight lid, which will reduce oxygen levels to fruit and create off flavors.



Figure 20. Mature ‘Darrow’ blueberry plants just before first harvest (early August in Willamette Valley).

Credit: Bernadine Strik, © Oregon State University

Range in expected yield per plant for northern highbush blueberry cultivars:

- Year 1 (planting year): 0 pounds/plant
- Year 2: 0.5–1.5 pounds/plant
- Year 3: 2–4 pounds/plant
- Year 4: 4–6 pounds/plant
- Year 5: 6–7 pounds/plant
- Year 6: 7–9 pounds/plant
- Year 7: 9–12 pounds/plant
- Mature: 9–15 pounds/plant



Figure 21. Kids enjoy picking blueberries.

Credit: Bernadine Strik, © Oregon State University

Pruning

To prune well, it’s important to understand how blueberry plants grow and where the best flower buds are produced. Blueberry plants produce two types of shoots: laterals and whips. Whips are vigorous shoots that grow from the crown or from buds on older wood or canes. These are important for replacing older canes as they are removed by pruning (Figures 22A, 22B). Lateral shoots grow from 1-year-old wood — they tend to grow horizontally and in fruiting plants will be below flower or fruit clusters (Figure 23).

Blueberry plants produce fruit on last year’s growth (1-year-old wood) — mainly on laterals, but a little may be on the tips of whips. If you look at the 1-year-old wood in the winter, you can see the flower or fruit buds. They are the fat buds at the tip of last year’s growth (Figure 4); these buds will only produce a flower cluster (no leaves). Farther down the wood you will see smaller, scale-like buds. These are vegetative buds, which will produce a new shoot with

leaves next season. These vegetative shoots are important for good-quality fruit produced farther up on the lateral (Figure 23). These shoots will produce flower buds in late summer through early fall for next year’s crop.



Figure 22A. Vigorous shoots known as whips growing from the crown. Whips eventually replace older canes.

Credit: Bernadine Strik, © Oregon State University



Figure 22B. Whips in winter.

Credit: Bernadine Strik, © Oregon State University

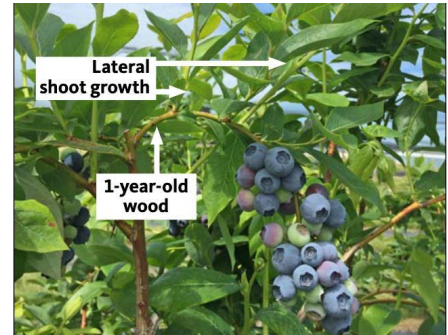


Figure 23. Lateral shoot growth under fruit clusters from 1-year-old wood left at pruning. The weight of the fruit causes the wood to bend downward.

Credit: Bernadine Strik, © Oregon State University

The best fruit and supporting lateral shoot growth will be on 6- to 12-inch- or longer laterals. These laterals also tend to be thicker than the shorter ones, which typically leads to larger berries. Short laterals produce fruit, but berries are small and there is generally little to no good shoot growth under the fruit. This leads to poor fruit quality, and berries may stay sour (Figures 24A, 24B). Sections of canes that have a lot of short, unproductive laterals are called “twiggy” growth; remove any twiggy growth when pruning.

Northern highbush and rabbiteye blueberry plants need to be pruned every year starting at planting. During the establishment years, prune plants hard, removing a relatively large portion of their growth, so that the plants grow well. They need to develop to full, mature plant size during these establishment years. If pruned too little, the plants will produce too much fruit and too little lateral and whip growth (Figure 25); such plants won’t develop to full size or have a normal progression of yield. By contrast, if plants are pruned too severely (by removing too much wood), the bush will produce a lower yield. But these berries will be larger, and the bush will produce a lot of new growth.



Figure 24A. Top view: poor shoot growth under fruit. Laterals were left too short after pruning.

Credit: Bernadine Strik, © Oregon State University



Figure 24B. Bottom view: poor shoot growth under fruit. Short laterals produce small fruit.

Credit: Bernadine Strik, © Oregon State University



Figure 25. A bush that has not been pruned well.

Credit: Bernadine Strik, © Oregon State University

In mature northern highbush and rabbiteye blueberry plants, the most important reason to prune is to promote strong, new growth and to maintain good fruit production and fruit quality. A bush that has good growth will also be easy to prune — by selecting good, new replacement wood and removing wood that is less productive. Correctly pruned bushes will increase in size during the establishment years, and yield per bush will increase steadily from the year after planting to maturity. When plants are mature there should be a good balance between fruit production and growth of vigorous new whips and lateral shoots, which are important for next year’s crop.

Prune all blueberry plants each winter, when the plants are dormant and before bud break. In the Willamette Valley, that’s anytime during the dormant period from December to early March. Prune ‘Legacy’ in very late winter in the Willamette Valley so the plant has had a chance to drop as many of its leaves as possible — this makes pruning easier. In regions of Oregon with colder winters, prune later in winter (late March to early April in Central Oregon) to remove any frost or disease-damaged wood (see “Common problems”).

Most half-high blueberry cultivars need relatively little pruning after planting. Shoot growth is short in many of these cultivars, so pruning is difficult. Instead, leave these unpruned for several years and then renovate them (see “Renovation”) when fruit becomes too small and growth too little.

Prune rabbiteye blueberry plants in winter as described below for northern highbush. However, this type of blueberry, only adapted to the Willamette Valley and southwestern Oregon, does benefit from summer pruning in addition to pruning in winter. In early summer, tip new, vigorous upright whips once by removing about 1 inch of growth. Don’t tip any shoots after the end of June, because late-growing branches produced by tipping do not set as many flower buds for next year’s crop.

Although you can follow guidelines on how to prune, experience is the best guide. For detailed explanations and video demonstrations of pruning methods, see the online course [Pruning Blueberry for Growth, Yield and Quality](https://workspace.oregonstate.edu/course/pruning-blueberries) (<https://workspace.oregonstate.edu/course/pruning-blueberries>). This course from Oregon State University Professional and Continuing Education covers pruning from planting through maturity in the various types of blueberry, including how to renovate older, poorly pruned bushes.

Pruning young plants

The first growing season

Right after planting, prune the new plants by removing about 30% to 40% of the bush. Do this by removing any older wood that has little new growth and any growth that is not upright. This encourages the bush to grow in the desired upright vase or “V” shape. Then prune off any flower buds (on dormant plants; Figures 26A, 26B) or flower clusters on plants that have started growing (Figures 27A, 27B). New plants should not produce fruit their first season. Remove any branches at the top of whips (Figures 26, 27). This will ensure strong vegetative top and root growth the first year. Plants that put their energy into fruit production at too young an age may never recover and will continue to yield less than a well-pruned bush.



Figure 26A. Dormant plant before pruning prior to the first growing season.

Credit: Bernadine Strik, © Oregon State University



Figure 26B. Dormant plant after pruning prior to the first growing season.

Credit: Bernadine Strik, © Oregon State University



Figure 27A. Blueberry plant in spring after planting, before pruning.

Credit: Bernadine Strik, © Oregon State University



Figure 27B. Blueberry plant in spring after planting and pruning.

Credit: Bernadine Strik, © Oregon State University



Figure 29A. A 'Duke' blueberry plant in the second year pruned to about 30 flower buds the prior winter to achieve target yield of 1.5 pounds per plant.

Credit: Bernadine Strik, © Oregon State University

Prior to the second growing season

The pruning method in the winter after the planting year depends on the vigor of the plant. For plants that are still relatively small and need to put on more growth next year, prune to once again remove all fruit buds. Shape the bush as described above. Doing this will mean there will be no crop in the second year.

More vigorous plants have several whips or canes that are 3 feet tall and some good laterals. On these plants, prune to produce a limited crop.

Since fruit production limits bush growth, leave no more than 30 flower or fruit buds per plant on only the more vigorous bushes to produce the expected yield for year 2 as listed above (Figure 29A). Choose to leave the best laterals (at least 6 inches long), distributed on several canes.

Subsequent establishment years

In plants that are not yet mature, follow the same pruning steps as for mature plants. However, because plants still need to develop to full size, you need to remove proportionally more fruit. Follow all the steps so only good-quality fruiting laterals are left on the bush, then remove some of these good laterals to further limit the crop next year (Figures 28A, 28B). A well-pruned bush should produce a good yield but still have strong vegetative growth (Figure 29B).

At pruning time in winter, when a bush is obviously less vigorous or did not grow well last year compared to another bush of similar age, prune the weaker bush more. Take off more good fruiting wood so it will grow more next year. In addition to thinning good fruiting laterals, remove excessive branches at the tips of vigorous whips (Figure 30).

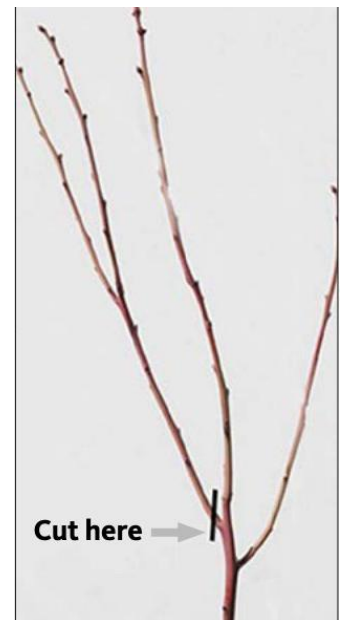


Figure 30. Removing excess branches from a whip in blueberry.

Credit: Drew Olsen, © Oregon State University



Figure 28A. Blueberry plant in winter prior to the third growing season. Before pruning.

Credit: Drew Olsen, © Oregon State University



Figure 28B. After pruning to remove low growth and short laterals, and thinning extra laterals to promote growth.

Credit: Drew Olsen, © Oregon State University



Figure 29B. 'Duke' in the third year pruned to get good growth and a yield of 4 pounds per plant. Photos taken in early to mid-June, Willamette Valley.

Credit: Bernadine Strik, © Oregon State University

Pruning mature plants

Mature or well-established plants may be pruned using some key steps.

Irregular pruning or variable pruning severity from year to year results in erratic yields. Mature plants that have been pruned well during the establishment years that are then abandoned or not pruned well will become large, thick bushes with individual canes competing for light (Figure 33). These will produce small berries of inferior quality. This can be corrected by pruning plants very hard, removing all of the twiggy growth or unproductive canes, keeping the good fruiting laterals and whips. If there are no good fruiting laterals on a bush that has not been pruned well for many years, the bush may be renovated.

When you are pruning blueberry plants, there is no need to worry about leaving stubs, because you will be renewing wood and removing these stubs over the years. There is also no need to use pruning paint to protect any cuts. It is not necessary to disinfect pruners unless there is evidence of systemic disease on the bush (see "Common problems").



Figure 33. A bush that has not been pruned well enough. It has thick growth and a lot of unproductive canes or cane sections that should be removed. It should be pruned to remove low growth and open the center.

Credit: Neill Bell, © Oregon State University

Pruning northern highbush blueberry

- **Keep** the bush fairly open to resemble a vase or “V.” Open bushes have better light penetration to the base of the bush and older wood increasing whip and shoot growth. They also have better air circulation, reducing risk of some diseases (see “Common problems”).
- **Cut out** any wood that’s dead, damaged or diseased.
- **Remove** the low growth (Figure 31) that would touch the ground when loaded with fruit.
- **Remove** whips smaller than pencil size in diameter and those that are shorter than 12 inches, but leave thicker and longer whips to develop into good fruiting wood next year. If the bush produced a lot of whips, keep three or four of the tallest and thickest.
- **Cut out** unproductive canes or twiggy wood by cutting back to the crown or to a strong new whip or shoot growing lower down on the cane (Figure 31). Do not be afraid to cut out a large older cane, if it has no or little good growth on it.
- **Selectively prune** to keep the most productive laterals (generally 6 to 12 inches long). Do this by removing shorter laterals on a cane or sections with shorter laterals. Vigorous plants may still produce too much fruit if you leave all the good, productive laterals on the bush.
- **Thin** the remaining good laterals, as needed, to balance expected fruit crop with the vigor of the bush. You can do this by cutting the top off of tall canes to maintain a good picking height (Figures 32A, 32B). Lateral thinning takes experience and depends on the cultivar.
- **Prune** a weak plant harder than a normally growing plant so that it has a chance to produce as much growth as possible next year. Do this by removing more good fruiting laterals. However, pruning will not fix problems caused by other factors such as improper soil pH, soilborne disease or improper fertilization.

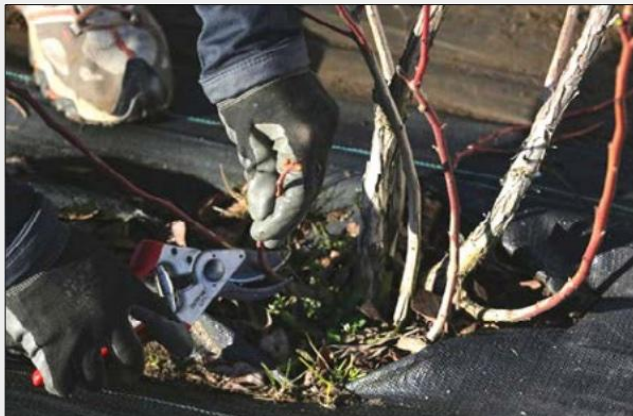


Figure 31. Removing low growth on ‘Duke’ blueberry. Taking off more fruiting wood will encourage growth.

Credit: Drew Olsen, © Oregon State University



Figure 32A. Blueberry bush before pruning. Remove twiggy growth (the short laterals) by cutting back to better cane growth.

Credit: Drew Olsen, © Oregon State University

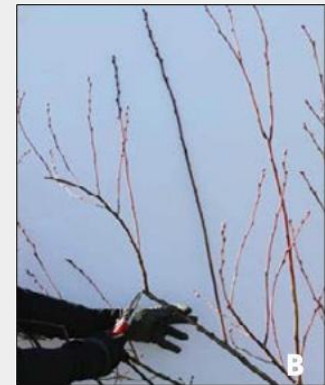


Figure 32B. Blueberry bush after pruning. Thin laterals by topping a cane to maintain good bush height.

Credit: Drew Olsen, © Oregon State University

Renovation

Older bushes that have been neglected or have not been pruned well for many years often have no good fruiting wood to prune back to — all the growth on such bushes is twiggy. These plants will likely benefit from renovation or rejuvenation pruning (Figure 34A). To renovate, cut all the older canes on the bush to a height of about 1 foot (Figure 34B). Then thin the old canes to the best six to 10, depending on cultivar. Choose to leave those on the outside, creating a circle of canes if possible (Figure 34C). A lot of new whips should be produced from these older canes next season. You can tip some of these strong, taller whips in early summer by removing the top 1 inch — this will encourage them to branch. Leave some whips untipped to get some variation in whip height on the bush. Next winter, thin these whips to the best 12 or so. The plant will soon be back in production. This approach will work on all cultivars. However, renovation does not correct problems such as soilborne pests, improper soil pH or nutrient status. In addition, renovation may not work on young plants that have been poorly pruned or otherwise managed. In these cases, the root and crown systems may be too weak after the severe pruning to produce new whips.



Figure 34A. A bush that has not been pruned well. It has only twiggy growth and no good growth to prune back to.

Credit: Neill Bell, © Oregon State University



Figure 34B. A gardener makes renovation cuts to the bush and thins to the best six to 10 canes.

Credit: Neill Bell, © Oregon State University



Figure 34C. Blueberry bush after renovation pruning. Create a circle of canes if possible. Expect a lot of new whips next season.

Credit: Neill Bell, © Oregon State University

Common problems

Weather-related problems

Blueberry plants adapted to your region are cold hardy but may still be susceptible to cold or frost damage to dormant or growing plant parts.

Winter cold injury

Susceptibility to winter cold depends on the type and cultivar of blueberry, the temperature preceding and during the cold event, and the stage of plant dormancy. Substantial winter cold injury to blueberry plants in any region of Oregon is rare when growing the well-adapted northern highbush cultivars (see “Cultivars”). Test for cold damage by slicing flower buds lengthwise a few weeks after a cold event, when tissues have had a chance to warm, or in late winter. Look for brown or dead tissue (Figures 35A, 35B). Damage to vegetative buds is rare. In some cold events, some of last year’s laterals or whips may be killed from the tip downward, showing blackening. Prune out this damaged wood.



Figure 35A. Blueberry flower buds sliced lengthwise. This bud shows no damage.

Credit: Bernadine Strik, © Oregon State University



Figure 35B. Blueberry flower buds sliced lengthwise. This bud shows damage to flowers within the bud.

Credit: Bernadine Strik, © Oregon State University



Figure 36. Frost damage to a late-growing shoot.

Credit: Bernadine Strik, © Oregon State University

Frost injury

The growing parts of blueberry plants may be susceptible to frost damage in late fall (Figure 36) or spring. Frost damage happens when temperatures are just below freezing. Susceptibility to injury depends on the type of blueberry and the cultivar, the temperature and the stage of plant growth. The site will have a large impact on whether frost has the potential to damage blueberry plants. More exposed sites in southeastern, Central and eastern Oregon are at more risk.

Open blueberry flowers are susceptible to frost damage at 28°F. They can tolerate lower temperatures at earlier stages of development. Bloom date in blueberry cultivars varies little, despite a relatively wide range in harvest dates. You can use row covers (also called floating row covers, frost cloth, or spun-bound covers) to protect smaller areas, if low temperatures are in the forecast during bloom. Berries grown in containers can be brought inside if there is a frost event at bloom or during fruiting that may damage the plant.

Hail

Hail can damage fruit during its development, leading to a corky scar. Sometimes this will be a wound or entry point for fruit rot (see “Fruit rots”).

Poor pollination

While rain or cool weather during bloom can reduce fruit set by limiting pollination directly or indirectly through reduced bee activity, this is not a common occurrence in blueberry in Oregon.

Sun damage to fruit

Intense heat such as temperatures greater than 95°F and intense ultraviolet light may damage the fruit of susceptible cultivars. Fruit can be susceptible from the late green stage through ripening. Sections of the berry exposed to the sun will either be sunken and tan or pink in color or will soften and turn a dark pink (Figure 37). Shriveling may also occur. Cultivars differ in sensitivity. Use shade cloth to protect developing fruit if this is a recurring issue.



Figure 37. Sun or heat damage to fruit.

Credit: Bernadine Strik, © Oregon State University

Weeds and weed management

Weeds compete with blueberry plants for water and nutrients, so it is important to keep weeds out of the row. Within the row, blueberry roots grow very close to the soil surface and may grow into an organic mulch such as sawdust. Pull weeds by hand to minimize damage to the shallow blueberry roots. Hoe or cultivate to remove weeds outside of the in-row area. Blueberry roots only grow under the bush canopy within the row. Growing grass or other crops nearby works as long as they are outside this in-row area. Use of mulch in the row — such as sawdust, bark or weed mat — may help control weeds (see “Mulching,” Figures 9 and 12).

Be extremely careful when using certain herbicides to kill weeds in a fence row, driveway or lawn. The active ingredient in some of the available products may drift onto blueberry plants during the growing season, causing damage. In particular, avoid using glyphosate (Roundup) or phenoxy-containing (2,4-D) herbicides (Crossbow and lawn fertilizers containing the ester form of 2,4-D) anywhere near blueberry plants. For detailed information on specific weeds and weed control, refer to the [PNW Weed Management Handbook](https://catalog.extension.oregonstate.edu/weed/). (<https://catalog.extension.oregonstate.edu/weed/>)

Vertebrate pests

Birds and deer can be nuisance pests for blueberries. Fences work best for deer. Many species of birds feed on the fruit and can eat an entire crop if not controlled. They either peck at the fruit, often before it's ripe, or take whole berries. Birds are adaptable, and scare tactics have limited effectiveness. Try using a combination of scare devices such as aluminum plates, flashing tape, eye spot balloons and kites. Change or rotate tactics as birds get used to them. Raptors can also deter berry-eating birds, either by predation or simply by scaring them. Work to improve raptor habitat.

The most effective method of control for birds is a light plastic overhead netting with a small mesh size (Figure 10). Construct a frame over bushes, using wood or PVC pipe (Figure 38). Ensure it is tall enough to cover the bushes, allowing for more growth and an easy picking height. Drape and fasten netting over the frame. Be sure to pin the net down well to the soil to prevent birds from finding a spot to enter. Leave a section that makes it easy for you to enter and pick the fruit. Netting is also a suitable deer protection alternative when it's not possible to fence in an entire gardening area.

Insect pests

Spotted wing drosophila

The most important insect pest in blueberry production in western Oregon is the spotted wing drosophila, or SWD. This pest is not a threat in Central, eastern, or southeastern Oregon.

This vinegar fly looks a lot like the common fruit fly; however, the female lays eggs in developing fruit, generally after it first develops some color. The larvae feed inside the berry (Figure 39) while the fruit is ripening without much evidence of the damage on the outside of the fruit.



Figure 38. A PVC frame with bird net to protect berry plants.

Credit: Bernadine Strik, © Oregon State University

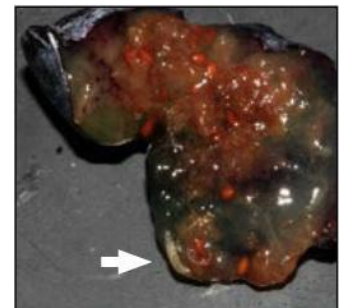


Figure 39. Larva of spotted wing drosophila inside a blueberry.

Credit: Vaughn Walton, © Oregon State University

Populations of SWD build up during the season, so late-fruiting cultivars are more prone to this pest. You can use fine exclusion netting to prevent adults from reaching the berries. Cover bushes before any fruit show color. This will also protect against birds. For more information on how to control and manage this insect, see “Resources.”

Other insects

Other insects that can be problematic in blueberries include root weevils, winter moth, scale and aphids, depending on your growing region. Check with your local OSU Extension office for control recommendations if insects become a problem. Control methods are also outlined in the [PNW Insect Management Handbook](https://catalog.extension.oregonstate.edu/insect/) (<https://catalog.extension.oregonstate.edu/insect/>).

Diseases

Blueberry shock virus

Blueberry shock, a pollen-borne virus, is common throughout the region. The virus is transmitted by bees as they move from the flower of an infected plant to an uninfected one. An infected plant will drop all flowers the following season. This is the shock symptom that gives the virus its name (Figure 40A). The entire plant may go through this shock stage all at once, or one or more canes may show symptoms in one year and the remaining canes in following years as they become infected. After the shock stage, there will be bare sections of wood — where the flowers fell off — with new shoot growth underneath (Figure 40B). There will be no fruit production on the plant or portion of the plant in the shock year. Prune hard the winter following the shock year. The plant will have produced a lot more growth than usual, and leaving too many fruit buds will stress the plant the following season.

Once a plant is infected, it will remain infected and can transmit the virus to uninfected plants during the bloom period. There is no control for this virus. However, because it is so common and plants will come back into full production after the shock year, do not remove the plant. Just let the disease run its course through your plants.



Figure 40A. Blueberry shock virus. Plant is in shock symptom stage.

Credit: Bernadine Strik, © Oregon State University



Figure 40B. Blueberry shock virus. Regrowth in same year.

Credit: Bernadine Strik, © Oregon State University



Figure 41A. Botrytis on flowers.

Credit: Bernadine Strik, © Oregon State University



Figure 41B. Green fruit rot at wound from hail damage.

Credit: Bernadine Strik, © Oregon State University

Fruit rots

Blueberry flowers (Figure 41A) and fruit are susceptible to gray mold (*Botrytis* fruit rot) if there is overhead irrigation or rain during the flowering or fruiting period; *botrytis* may also occur on green fruit after it is wounded by hail damage (Figure 41B). Other fruit rots include *Alternaria* (black fungal growth on the berry; Figure 42) and *Anthraco* (showing orange fungal growth, Figure 43). Avoid overhead irrigation during the growing season to reduce risk of fruit rots.



Figure 42. *Alternaria* fruit rot on blueberry fruit.

Credit: Bernadine Strik, © Oregon State University



Figure 43. *Anthraco* fruit rot on blueberry fruit.

Credit: Bernadine Strik, © Oregon State University



Figure 44. Blueberry fruit affected by mummy berry.

Credit: Bernadine Strik, © Oregon State University

Mummy berry

This fungal disease is common in the Willamette Valley and in southwestern Oregon. The fungus overwinters in mummified fruit, which look like small, gray pumpkins slightly smaller than a blueberry fruit (Figure 44). In the spring, about the time of bud break on the blueberry plant, the mummies produce little fruiting cups. These produce spores that infect blueberry leaves and then flowers. Spores are spread by wind, rain and pollinating insects, further infecting plants. Infected flowers turn brown and die, as do infected shoots and leaves. Infected berries look normal early on, but then turn a tan color and will drop before uninfected fruit are ripe and ready for picking. White fungal growth can be seen on the inside of infected berries when they are sliced open (Figure 44). There is some difference in cultivar susceptibility, but the recommended cultivars are quite similar in their susceptibility. It is difficult to pick up all mummies in winter. If you miss one or two, there will be enough spores to infect your plants. Refer to the [PNW Plant Disease Management Handbook \(https://catalog.extension.oregonstate.edu/plant\)](https://catalog.extension.oregonstate.edu/plant) for a table showing susceptibility and photos of symptoms.

Root rot

Phytophthora root rot, a soilborne disease, is aggravated in wet, heavy soil. Symptoms include sections of plants dying in midsummer and whole plants dying over a period of time. Cultivars differ in their susceptibility to root rot; 'Toro' is particularly susceptible in the Willamette Valley when grown on heavier soil. Growing on raised beds constructed of mounded soil or wood instead of heavy garden soil can help reduce the incidence of this disease.

Bacterial blight

Bacterial blight, or *Pseudomonas*, is common in the Willamette Valley and southwestern Oregon, particularly on late-season growth wounded by frost or pruning. This bacterium overwinters on the wood. Only 1-year-old wood is affected. Symptoms first appear as reddish to black cankers or areas on susceptible wood. The wood may die back from a portion of the tip to a large share of a long whip (Figure 45). Young plants can be particularly affected by this disease because such a large portion of the top growth is 1-year-old wood. Cultivars differ in sensitivity, with 'Patriot', 'Chandler' and 'Darrow' being particularly susceptible, as are all rabbiteye cultivars. Once a plant is older, the disease is rarely of concern for yield. Prune out the infected wood when pruning.

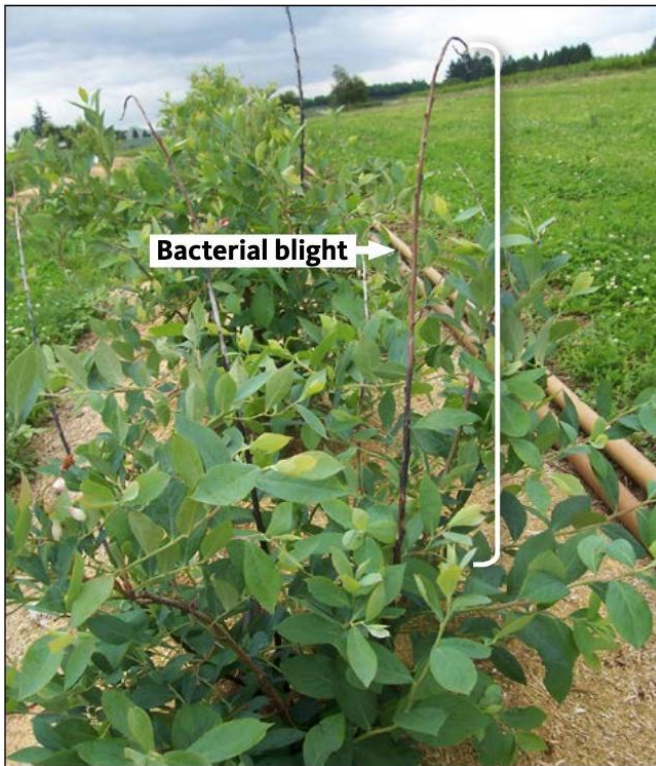


Figure 45. Bacterial blight, or *Pseudomonas*, on a young rabbiteye plant.

Credit: Bernadine Strik, © Oregon State University



Figure 46A. Crown gall on the crown of a young blueberry plant.

Credit: Amanda Davis, © Oregon State University



Figure 46B. Crown gall on a cane of a blueberry plant.

Credit: Bernadine Strik, © Oregon State University

Crown gall

This disease is caused by a bacterium that is present in the soil and then infects blueberry plants through wounds, becoming systemic. Buy certified disease-free plants to minimize the risk of introducing this disease to your planting. When you see this on the crown of a young plant (Figure 46A) you may not be able to save it. Dig it up and destroy it. If you spot cankers on canes (Figure 46B), remove that portion of the cane, cutting below any visible cankers. Disinfect pruners after pruning disease-affected plants.

Other diseases may be found in blueberries. If a disease becomes a problem, check with your local OSU Extension office for control recommendations. Disease descriptions and control methods are also outlined in the [PNW Plant Disease Management Handbook](https://catalog.extension.oregonstate.edu/plant). (<https://catalog.extension.oregonstate.edu/plant>)

Resources

- [A Detailed Guide for Testing Fruit for the Presence of Spotted Wing Drosophila \(SWD\)](https://catalog.extension.oregonstate.edu/em9096), (<https://catalog.extension.oregonstate.edu/em9096>) EM 9096
- [Acidifying Soil for Blueberries and Ornamental Plants in the Yard and Garden](https://catalog.extension.oregonstate.edu/ec1560%26#xd;), (<https://catalog.extension.oregonstate.edu/ec1560%26#xd;>) EC 1560
- [Acidifying Soil in Landscapes and Gardens East of the Cascades](https://catalog.extension.oregonstate.edu/ec1585%26#xd;), (<https://catalog.extension.oregonstate.edu/ec1585%26#xd;>) EC 1585,

- [Applying Lime to Raise Soil pH for Crop Production—Western Oregon](https://catalog.extension.oregonstate.edu/em9057), (<https://catalog.extension.oregonstate.edu/em9057>)EM 9057,
- [Cultural Control Strategies to Manage Spotted Wing Drosophila](https://catalog.extension.oregonstate.edu/em9262%20), (<https://catalog.extension.oregonstate.edu/em9262%20>)EM 9262,
- [Eastern Oregon Liming Guide](https://catalog.extension.oregonstate.edu/em9060), (<https://catalog.extension.oregonstate.edu/em9060>) EM 9060
- [Growing Berries on the Oregon Coast: An Overview](https://catalog.extension.oregonstate.edu/em9177%20), (<https://catalog.extension.oregonstate.edu/em9177%20>)EM 9177
- [Growing Berries on the Oregon Coast: Blueberries](https://catalog.extension.oregonstate.edu/em9179%26#xd;), (<https://catalog.extension.oregonstate.edu/em9179%26#xd;>)EM 9179
- [Nurturing Mason Bees in Your Backyard in Western Oregon](https://catalog.extension.oregonstate.edu/em9130), (<https://catalog.extension.oregonstate.edu/em9130>)EM 9130
- [Improving Garden Soils with Organic Matter](https://catalog.extension.oregonstate.edu/ec1561), (<https://catalog.extension.oregonstate.edu/ec1561>)EC 1561
- [Laboratories Serving Oregon: Soil, Water, Plant Tissue, and Feed Analysis](https://catalog.extension.oregonstate.edu/em8677), (<https://catalog.extension.oregonstate.edu/em8677>) EM 8677
- Oregon State University [Spotted Wing Drosophila information page](http://spottedwing.org/) (<http://spottedwing.org/>)
- [Pacific Northwest Insect Management Handbook, Pacific Northwest Plant Disease Management Handbook, and Pacific Northwest Weed Management Handbook](http://pnwhandbooks.org/), (<http://pnwhandbooks.org/>) revised and reissued annually.
- [Pruning Blueberry for Growth, Yield and Quality](https://workspace.oregonstate.edu/course/pruning-blueberries), (<https://workspace.oregonstate.edu/course/pruning-blueberries>)an online course from OSU Professional and Continuing Education
- [A Guide to Collecting Soil Samples for Farms and Gardens](https://catalog.extension.oregonstate.edu/ec628), (<https://catalog.extension.oregonstate.edu/ec628>) EC 628
- [Soil Test Interpretation Guide](https://catalog.extension.oregonstate.edu/ec1478), (<https://catalog.extension.oregonstate.edu/ec1478>)EC 1478
- [Raised Bed Gardening](https://catalog.extension.oregonstate.edu/fs270), (<https://catalog.extension.oregonstate.edu/fs270>)FS 270
- [Selecting Berry Crop Varieties for Central Oregon](https://catalog.extension.oregonstate.edu/ec1621), (<https://catalog.extension.oregonstate.edu/ec1621>) EC 1621

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Use pesticides safely!

- *Wear protective clothing and safety devices as recommended on the label. Bathe or shower after each use.*
- *Read the pesticide label—even if you've used the pesticide before. Follow closely the instructions on the label (and any other directions you have).*
- *Be cautious when you apply pesticides. Know your legal responsibility as a pesticide applicator. You may be liable for injury or damage resulting from pesticide use.*

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