

GROWING BERRIES on the OREGON COAST: Blueberries

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Blueberries are a fantastic crop to grow on the Oregon Coast. There are different types of blueberries, including northern highbush, southern highbush, rabbiteye, lowbush, and half-high. Northern highbush cultivars are most commonly grown in Oregon for commercial fruit production and high volumes of fruit on small farms and in the home garden. In general, southern highbush cultivars are not recommended because they have such a low winter chilling requirement; they flower very early and are typically injured by frost at bloom. The other types of blueberries are also suited for home fruit production or the edible landscape, but generally are not recommended for commercial, small farm production on the coast. The blueberry fruiting season is long in Oregon, extending from late June through early October, depending on the type grown and the cultivar.

Blueberry plants are woody shrubs and most types are deciduous. Some, such as the northern highbush types, can be long-lived, bearing fruit for more than 50 years. Bush height can range from 1.5 feet (half-high cultivars) to 9 feet (rabbiteye). Most northern highbush cultivars grow to a height of 6 to 7 feet at maturity. Plants should be pruned to produce fruit for the first time 1 or 2 years after planting and are mature in

If you are reading this publication for the first time, we recommend you first read *Growing Berries on the Oregon Coast: An Overview* (EM 9177). It includes general information on site selection, soils, irrigation, mulching, nutrient management, and considerations specific to the coastal environment.

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Photo: Bernadine Strik, © Oregon State University



Figure 1. Buds on 1-year-old (last season's growth) blueberry wood. The fat buds at the tip are flower buds, the lower ones below the pruners are leaf buds

the seventh to eighth year. In all blueberry types, fruit are produced on 1-year-old wood. Fruit buds are produced at the tip of last year's growth and appear as fat buds at the shoot tip. These enlarged buds only produce a flower cluster. Leaf buds (small and scale-like) are found lower on the shoot and only produce a leafy shoot (Figure 1).

Site Selection

Because blueberries, especially northern highbush types, can be so long-lived, you should carefully select an ideal location for planting. Direct, full sun is best for good fruit production. Blueberry plants are sensitive to wet or heavy soils and may be susceptible to root rot, depending on the cultivar. To minimize the risk of frost damage and disease, sites should also have good air drainage, so avoid planting in low-lying basins that may be frost pockets.

Birds are a major pest of blueberries. If possible, it is best to avoid areas surrounded by trees or plan to use bird-depredation techniques (see *Bird Management in Blueberries* <http://www.nwberryyfoundation.org/falconry.html>). In addition to providing bird habitat, trees can shade plants and compete with them for water and nutrients. Trees also interfere with cold air drainage and air circulation, which can increase frost damage and disease problems.

Coastal wind can be problematic for blueberry plantings because it can knock fruit off the plants. Windbreaks (such as a row of trees or shrubs) can provide protection, but be careful where you establish them to avoid competition with the berry crop. See *Windbreaks for Fruit and Vegetable Crops* listed in "For more information," page 13.

Drainage

Blueberry plants prefer well-drained soil and benefit from the improved drainage provided by raised beds; poor drainage can lead to root death and root diseases. The soil water table should be at least 14 inches below the soil surface. Roots will suffocate in soils that are water-logged for more than a few days in a row during the growing season, and the likelihood of root rot will increase. Almost any soil type is suitable or can be amended, although plants will be more vigorous and produce more fruit when grown on a well-drained, fertile, loam soil with some water-holding capacity.

Raised beds should be about 1 to 1.5 feet high. You can either hill soil and organic matter or fill wood walls (constructed raised bed) with a properly amended soil. Drainage tiles can also be beneficial if your soil is slow to drain or if you have a high water table. In the case of a row with poor drainage, install the drain tile near the row (at least 25 inches deep). More detailed information on drainage tiles is available in *Growing Berries on the Oregon Coast: An Overview* (EM 9177).

Organic matter aids in soil aeration, drainage, and water- and nutrient-holding capacity. Blueberries have specific organic matter requirements (see "Organic matter for blueberries," page 3). Incorporate suitable organic matter into the soil before planting.

Soil

Blueberry plants require relatively acidic soil and prefer soil pH in the range of 4.5 to 5.5. Coastal soils will naturally be within the required range. If, however, the soil test indicates the pH is above that recommended for blueberries, add enough elemental sulfur (S) to lower the pH to 5.5. See *Acidifying Soil for Blueberries and Ornamental Plants in the Yard and Garden* (EC 1560). If the soil is too acidic (the pH is below 4.5), add lime to the soil, as recommended by the soil analysis, to raise the soil pH to 5.5. For more information, see *Applying Lime to Raise Soil pH for Crop Production (Western Oregon)* (EM 9057). These amendments should be done about a year prior to planting as it takes time for the soil pH to adjust after the addition of lime or S. See Table 1 (page 3) for soil nutrient ranges for blueberries.

Table 1. Recommended soil nutrient ranges for blueberries

Soil nutrient	Deficient at less than (ppm)
Phosphorus (P) (Bray)	25–45
Potassium (K)	100–150
Calcium (Ca)	1000
Magnesium (Mg)	60
Manganese (Mn)	20–60
Boron (B)	0.5–1.0



Photo: Bernadine Strik, © Oregon State University

Figure 2. High pH symptoms in blueberry

Acidifying soil for blueberries

To acidify a clay loam soil with a pH between 5.7 and 6.5, add finely ground elemental sulfur (S). Apply 3.5 to 4.5 pounds per 100 ft² (0.8 to 1 ton per acre) to lower the pH from 6.5 to 5.4; 2 to 2.75 pounds per 100 ft² (0.4 to 0.6 ton per acre) to lower the pH from 6.1 to 5.4. Note that more S may be needed to acidify heavier soils. Begin by applying the lower rate of S and then check the soil pH again in 6 to 12 months. Over-acidification is much harder to correct than under-acidification, so do not apply more than 7 pounds per 100 ft² (1.5 ton per acre) at one time. If the soil pH is only slightly too high, or if it is between 5.5 and 5.7, S is not needed. Instead, incorporate Douglas-fir sawdust and ammonium sulfate fertilizer before planting.

Blueberry soil pH can be more difficult to manage than the other berry crops because the recommended values are so different from other crops. High soil pH is a common source of poor plant growth in blueberries. Signs of high soil pH include plants with yellow leaves with green veins, especially on younger leaves (Figure 2). Be aware that some amendments, such as compost or manure, have the potential to increase soil pH.

Organic matter for blueberries

Blueberry plants grow best in soils that are relatively high in organic matter (greater than 4 to 5 percent) with good aeration and drainage. When incorporating organic matter, it is important to consider the pH of the material being used (Table 2), as blueberries will not thrive in high pH soil. Many available organic materials, while suitable for most berry crops, have a pH that is too high for blueberries. For example, yard or animal (manure) composts are not suitable for use as a soil amendment in blueberries. If you have an acidic soil, suitable for

blueberries either naturally or after amendment with sulfur (S), incorporating these high-pH organic materials will lead to a soil pH that is too high. The best materials to use are sawdust or bark. Peat moss can be used on a small scale as it is quite acidic, but it is too expensive to use on a large scale and has little impact on improving soil aeration. For commercial production, test the properties of any organic material you plan to incorporate prior to planting. This is a good investment to ensure good plant health. Before planting, organic matter such as Douglas-fir sawdust or bark should be incorporated. Be sure to check the pH of yard debris compost as it can often be high (above 7.0, compared to pH 4.0 to 4.5 for Douglas-fir sawdust), and it can be high in salts (electrical conductivity or EC). For this reason, incorporating yard debris or animal-based composts prior to planting blueberries is not recommended.

Table 2. An analysis of different compost materials

	% N	% P ₂ O ₅	% K ₂ O	pH
Douglas-fir sawdust	1.1	0.7	0.06	4.2
Yard-debris compost	11	5.5	6.7	7.3
Dairy manure	1.4	0.4	0.7	7-8
Chicken manure	3.7	4.6	4.8	6.5–7.5

Adapted from: Larco, H., B. Strik, D.M. Sullivan, and D. Bryla. 2014. "Mulch effects on highbush blueberry under organic management." *Acta Hort.* 1018: 375-382; Collins, D., Miles, C., Cogger, C. and Koenig, R. (2013) Soil fertility in organic systems (PNW 646)

Blueberry cultivars for the coast

While northern highbush blueberry cultivars do not need cross pollination to produce fruit, planting more than one cultivar increases berry size and yield. Rabbiteye and half-high blueberry cultivars require cross pollination, so plant more than one cultivar within each of these types of blueberry to ensure adequate fruit set. The blueberry harvest season can extend from June through September, depending on the cultivars grown; each cultivar ripens for a 3- to 6-week period. Recommended northern highbush blueberry cultivars, in approximate order of ripening, include:

- ‘Duke’ (early)
- ‘Spartan’ (early)
- ‘Reka’ (early midseason)
- ‘Bluecrop’ (early midseason)
- ‘Jersey’ (midseason)
- ‘Blueray’ (midseason)
- ‘Mini Blues’ (midseason)
- ‘Liberty’ (midseason)
- ‘Legacy’ (midseason; has some southern highbush in its parentage but is adapted to the coast, see Figure 3)
- ‘Chandler’ (mid- to late season)
- ‘Darrow’ (mid- to late season)

Recommended half-high cultivars in order of ripening are:

- ‘Polaris’ (early)
- ‘Northland’ (early midseason)
- ‘Northcountry’ (early midseason)
- ‘Northsky’ (early midseason)
- ‘Chippewa’ (midseason)
- ‘Northblue’ (midseason)

The ornamental rabbiteye blueberry, ‘Pink Lemonade’ (Figures 4 and 5), grows well in many coastal sites. Other recommended ornamental blueberry cultivars are ‘Peach Sorbet’ (midseason), ‘Jelly Bean’, ‘Sunshine Blue’ (mid-season to late), and ‘Perpetua’ (two crops per year: small, early crop; larger late-season crop); these typically do not have as good a fruit-eating quality as the commercial cultivars. See *Blueberry Cultivars for the Pacific Northwest* (PNW 656) for descriptions of these and other blueberry cultivars.



Figure 3. ‘Legacy’

Photo: Bernadine Strik, © Oregon State University



Figure 4. ‘Pink Lemonade’ blueberry in Newport, Oregon

Photo: Sally Reil, © Oregon State University



Figure 5. ‘Pink Lemonade’ mixed with other blueberries (unknown cultivar) in Newport, Oregon

Photo: Bernadine Strik, © Oregon State University

Planting systems

Container planting

You can grow most types of blueberries in containers. 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 6). Half-high cultivars perform best in a 10-gallon or larger container.

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 fir bark (50 to 80 percent); peat moss (10 to 40 percent); and perlite (10 percent). Pots containing the higher proportions of bark are more difficult to manage as they dry out faster and are more difficult to fertilize. Some yard centers sell potting media that have a similar composition to what is recommended for blueberries. Make sure that the mix they are selling does not contain lime, which would lead to a higher pH than recommended for blueberries. Prune young plants well to limit fruiting.

Row planting

Blueberry plantings can be established either in the fall (October) or in the spring (March and April). Purchase healthy, container-grown, 2-year-old plants from a reputable nursery; these are generally in one-gallon containers.

While blueberry plants can be placed throughout the landscape in a home garden, they are easier to manage if they are planted in rows. For hand-harvest, rows should be spaced 8 to 10 feet apart. Plant spacing in the row often varies with the cultivar, depending on plant vigor. Northern highbush blueberry cultivars should be spaced from 3 (many cultivars) to 4 feet ('Legacy') in the row. Rabbiteye cultivars are more vigorous and should be spaced 4 to 5 feet apart in the row with 10 feet between rows. Half-high types that are grown in rows should be spaced at 3 feet, with 8 feet between rows.

Work the soil throughout the entire planting area rather than just the planting hole to ensure proper soil requirements for blueberries. Set plants into the ground at the same depth that they were growing in the nursery (no more than ½ inch deeper), as planting too deep can smother or kill the roots. Gently press down the soil to remove air pockets and water the plants thoroughly. If you are using an organic mulch, such as sawdust or bark, add this to the entire in-row area (not just mounded around the plants); ensure that the mulch is no more than 2 to 3 inches deep at planting. You can also use perforated, black plastic ground cover ("weed mat") as an in-row mulch. When using black plastic or weed mat as a ground cover, you will need to place drip irrigation underneath it to ensure plants get adequate water.



Figure 6. 'Legacy' blueberry growing in a container

Photo: Bernadine Strik, © Oregon State University

Prune newly established plants by removing about 30 to 40 percent of the bush (Figure 7, page 6). To prune, remove any older wood and weak, low growth and keep the upright whips. Prune the whips by removing the tip portion or any branches that contain flower buds or flowers (Figure 8, page 6). New plants should not produce fruit their first season. 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. For the first 2 to 3 years, pruning demands are minimal compared to mature plants, but fruit production must be balanced with past and expected growth, and weak portions of the plant should be removed. See *A Grower's Guide to Pruning Highbush Blueberries* (DVD2).

Trellising

Blueberries can benefit from a simple trellis to keep the bush more upright. Trellising increases machine-harvest efficiency by making the canes fit into the 'throat' of the machine harvester better, particularly in less-upright cultivars. If the fruit are going to be hand-picked, a trellis is not necessary but may increase picker efficiency. In the row, set treated wooden or metal posts (3 to 4 inches in diameter) at the end of each row and metal T-style fence posts every 15 to 20 feet. Attach a 12- to 18-inch-long cross arm to each T-style post and run high-tensile, 12-gauge wire down each side of the cross arm. Use anchors to support the posts at the end

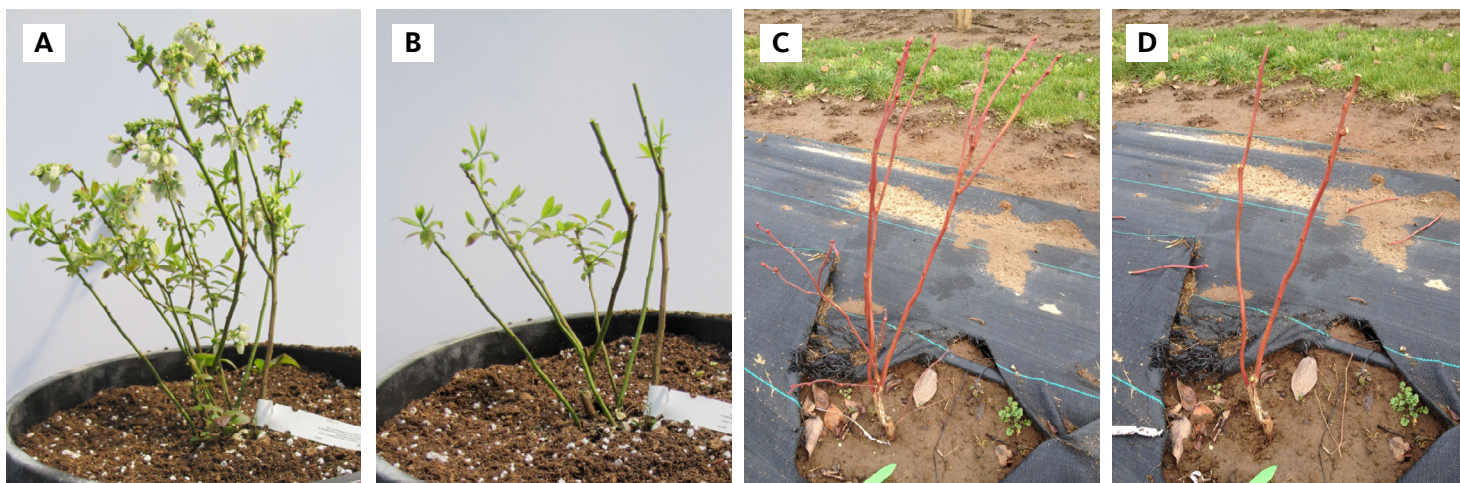


Figure 7. 'Chandler' blueberry plant before (A) and after (B) pruning when planted in the spring (in a container); blueberry plant just after planting in October (C) before pruning (note large fruit buds at the tip of the wood) and after pruning (D)

Photos: Bernadine Strik, © Oregon State University

of the rows and wire tighteners to help maintain tension. The cross arms should be moved from a position of about 2 feet from the ground when plants are young (second to third year after planting) to as high as 4 feet from the ground for mature plants, depending on the cultivar. This will place the wires in the correct position to support the fruit-laden canes during harvest.

Irrigation

Blueberries need adequate water to thrive, whether that comes from irrigation or rainfall. Fruit are made up of mostly water, so sufficient irrigation during fruit production is essential for the best yields and fruit quality. 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 your irrigation carefully, whether done by hand, sprinklers, or

drip systems to ensure the root zone of the plants is being adequately watered. If you are drip irrigating your blueberries, use a double line of drip irrigation per row with ½ gallon emitters spaced 18 inches apart. For more information on irrigation, see *Growing Berries on the Oregon Coast: An Overview* (EM 9177).

Mulching

A mulch can help control annual weeds, conserve soil moisture, and depending on the type of mulch, provide a source of nutrients. Organic mulch is most commonly used in blueberries as this crop prefers soil with a high organic matter. Sawdust is commonly used, but other organic materials can be used as well, as long as the pH of the material will not negatively impact blueberry plant health (see "Organic matter for blueberries" page 3). Apply no more than a 2- to 3-inch-deep mulch after planting. Over the next several years, increase the depth of the mulch to 4 to 6 inches total (when plants are mature). Mulch generally decomposes at a rate of about an inch per year, so replenish the mulch every few years to maintain the desired depth. If you use fresh organic material, such as fresh sawdust, you may need to increase the amount of nitrogen (N) fertilizer to compensate for the N immobilized by the bacteria that break down the organic matter. If you wish to add a yard- or animal-based compost to the mulch system, only add about ½- to 1-inch-deep mulch to avoid any possible negative effects from the high-pH material or possible salt injury. It is best to top this with a sawdust or weed mat (see "Weed management," page 11) to reduce the incidence of weeds; weed seeds germinate readily in this nutrient-rich material.

Photo: Drew Olson, © Oregon State University



Figure 8. Pruning to remove fruit buds in blueberry

Fertilization

For general information on fertilization, including how to fertilize, calculate the nutrient content in fertilizers and decide between common organic and conventional (inorganic) fertilizer sources. See *Growing Berries on the Oregon Coast: An Overview* (EM 9177).

New Plantings

Blueberries only take up the ammonium form of nitrogen (N), not the nitrate form. If you plant in October, do not fertilize until spring of the following year (year 1). In year 1, apply 0.4 to 0.6 ounces N per plant (equivalent to 2 to 3 ounces of ammonium sulfate fertilizer, 21-0-0 or 0.9 to 1.3 ounces of urea, 46-0-0; 25 to 40 pounds N per acre). Use higher rates 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 Table 3 for fertigation rates.

The total amount of N required should be divided into several applications to ensure the plant has time to take up the fertilizer. If you are using granular inorganic fertilizer, divide the total N into thirds, applying one-third in each of late April, late May, and late June. If using liquid fertilizers by hand or fertigation, divide the total fertilizer into many applications during a similar time period. Many organic fertilizers, such as feather, soy, or cotton seed meals, take longer to release N and should be applied earlier in the season. For this reason, they may not be the best choice in the planting year. Spread granular fertilizer products evenly in a circle encompassing the drip line (canopy area) of the bush. To avoid burning the plants, do not pile fertilizer in one spot or against the crown (plant base). If you are fertigating, place the drip lines along each side of the plant; move them out or wider apart as the plants mature. Two drip lines per row will increase plant root growth and increase plant access to nutrients. Make weekly applications from late April through late July.

Most garden soils have sufficient phosphorus (P) and potassium (K) for blueberry growth, but some soils found along the coast can have low levels of P. It is always good to take a soil sample and send it in for testing so that you can make informed decisions. If soil or plant tissue analyses show deficiency, a more complete fertilizer is needed. Since ammonium sulfate and urea fertilizers do not contain P or K, use mixtures that contain potassium sulfate. See *Nutrient Management for Blueberries in Oregon* (EM 8918) for more information.

Established plantings

Blueberry plants must be fertilized with products containing predominantly the ammonium form of N,

Table 3. Fertilization of established plantings

	Recommended N rate*		
	Fertigation	Granular fertilizer	
Year	lb/a	lb/a	oz/plant
1	90	25–40	0.4–0.6
2	90	40–50	0.6–0.7
3	60	50–60	0.7–0.9
4	70	55–65	0.8–1.0
5	75	65–75	1.0–1.1
6	85	80–100	1.2–1.5
7	95	90–120	1.3–1.8
8+	100–150	100–140	1.5–2.1

*Assumes between-row spacing of 10 feet for the per-acre rates. Rates for years 1 and 2 assume application to the root zone area by hand. Assume plant canopies will be touching by year 3.

such as ammonium sulfate, urea, or organic products. Gradually increase fertilizer rates through the establishment years to maturity in year 7 or 8 (Table 3). If you are using granular inorganic fertilizers, apply a third of the required N per plant in each of late April (around bloom), late May, and late June. Spread the fertilizer evenly over an area about the size of the spread of the bush without touching the base of the canes or crown. Generally, it is best not to fertilize with granular products after July 1 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—half in mid- to late March and the other in mid-May. If you are fertigating, apply weekly doses from late April through July, depending on plant vigor and soil type.

Recommended rates of N to apply to blueberry plants are based on planting age and application method (granular or fertigation). Apply the higher end of the range if fresh sawdust mulch has been applied to the in-row area. Recommended rates are higher for fertigation when plantings are young because the fertilizer is applied where there are no plant roots and is thus not available.

Healthy 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. Their leaves will look green, and yield will be in the expected range. If your plants seem healthy, your 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 soil-borne disease (such as root rot), competition from weeds, or disease or insect issues.



Figure 9. “Zippered” weed mat to allow opening for fertilization. Weed mat closed (A) and open (B).

Photos: Bernadine Strik, © Oregon State University

Monitor the soil pH in the plant row by taking soil samples every few years. This is especially important if you observe poor growth. If soil pH is too high (5.8 or above) in established plantings (likely because the soil pH was not properly modified before planting), low rates of sulfur (S) may be applied to slowly lower the pH. Apply elemental S at a rate of no more than 300 pounds per acre (6.5 pounds S per 100 feet of row; 3 ounces per plant) in early autumn. Do not apply more than these recommended rates; higher rates will burn or kill blueberry plants. If the soil pH is slightly above the recommended range (e.g., 5.6 to 5.7), fertilization will lower the pH over time, and no S is needed.

Fertilizers and S should be applied on the surface of any mulch used with rates of N adjusted to account for any immobilization by bacteria that break down the mulch. If you have a black weed mat, the weed mat should be designed so that it can be opened when granular fertilizers (or S) need to be applied (Figure 9).

Pollination

Northern highbush blueberry cultivars are self-fruitful and do not require cross pollination, but planting more than one cultivar will allow for cross-pollination, improving berry size and yield. Other types of blueberry require cross pollination. In addition, if you plant multiple cultivars that ripen at different times, you will lengthen the harvest season. While the fruit production season may vary among cultivars, their bloom periods all overlap. In many home gardens and on small farms, there are sufficient native honey and bumble bees to ensure good pollination. However, for larger plantings, rent two to four hives per acre to ensure good fruit set, as blueberries are less attractive to bees when other flowers are blooming at the same time. Place hives in a location to ensure good bee activity, keeping in mind that pollination is affected by wind. Place hives in the field no

sooner than when 5 to 10 percent of the planting is in bloom. For more information, see *Nurturing Mason Bees in Your Backyard in Western Oregon* (EM9130) and *Evaluating Honey Bee Colonies for Pollination* (PNW 623).

Harvesting

Pick regularly. This not only helps ensure you collect berries at their optimal ripeness, but also reduces insect pests and diseases that are more prevalent on overripe fruit. During periods of hot or rainy weather, you may need to pick more frequently. Try to avoid picking when fruit are 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.

An individual cultivar will have a fruiting season that lasts from 2 to 5 weeks, depending on the cultivar and the weather. 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 percent in size if you leave them a few days longer before picking. Depending on the weather, pick berries once a week or every two weeks (Figure 10, page 9); protect the ripening fruit from predation (see “Pests and problems,” page 11). Fruit will store for as long as 2 to 3 weeks in the refrigerator and longer in cold storage (just above 32° F).

Expected yields for northern highbush blueberries range from 6 to 22 pounds per bush (5 to 12 tons per acre) for mature (7 years or older) plantings, depending on plant spacing and cultivar.

Pruning and training

The most important reason to prune is to promote strong, new growth and to maintain good fruit production from year to year. Blueberry plants should be

pruned annually in winter (December to early March), when the plants are dormant and before flower buds have broken. Plants that are pruned too little will produce many small berries and weak, twiggy shoot growth (Figure 11); yield will decline quickly and wood with little new growth will die when plants are not pruned for several years. Severe pruning produces fewer, larger berries (reduces yield) and more new wood. If you prune bushes correctly, you'll have a good balance between fruit production and growth of vigorous new shoots. Although you can follow guidelines on how to prune, experience is the best guide. A video on pruning blueberry plants (*A Grower's Guide to Pruning Highbush Blueberries*, DVD 002) is available through the OSU Extension Catalog.

Blueberry plants produce fruit on last year's growth (1-year-old wood), called "laterals." If you look at the shoots during the dormant season, the flower or fruit buds will be visible. They are fat buds at the tip of last year's growth (Figure 1, page 2); these will only produce a flower cluster (no leaves). Further down the lateral are smaller, scale-like buds that are vegetative buds, which will produce a new shoot with leaves next season. These vegetative shoots are important for good-quality fruit produced further up on the lateral; they will produce fruit buds in late summer for next year's crop.

Pruning young plants

In addition to pruning off the fruit buds or flowers at planting, remove any low growth, thin or weaker growth, and any branches at the top of the whips; this leads to a better bush shape and encourages growth of new whips at the base of the plant in the first growing season. In the first winter after the planting year, you can prune plants to remove all fruit buds and shape the bush in a similar way. Doing this will mean there will be no crop in the second year. For more vigorous plants, you can prune to produce a limited crop. Fruit production limits bush growth, so leave no more than 30 fruit buds per plant on only the more vigorous bushes (those that have several whips or canes that are 3 feet tall).

Pruning more mature plants

Your best fruit production will be on 6- to 12-inch- or longer laterals. This wood also tends to be larger in diameter than shorter laterals, 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, which leads to poor fruit quality. Canes or wood with a lot of short, unproductive laterals are called "twiggy" growth and should be removed at pruning.



Photo: Bernadine Strik, © Oregon State University

Figure 10. Blueberry hand-harvesting



Photo: Drew Olson, © Oregon State University

Figure 11. Twiggy growth in blueberries (to the left of the hand) will be cut back to the black line to promote more vigorous growth.

When pruning blueberries, keep in mind the following principles:

- Keep the bush fairly open. Open bushes increase whip growth from latent buds (buds on older wood that have been dormant for at least two years), promote better air circulation (less disease and better spray coverage), and result in good light penetration that improves fruit bud set for next year's crop.
- Cut out any wood that's dead, damaged, or diseased.
- Remove the low growth (Figure 12) that would touch the ground when loaded with fruit. Cut out short, soft, new whips that developed from the base of the plant late in the season.
- Remove whips smaller than pencil size in diameter, but leave larger whips to develop into good

fruiting wood next year. If needed, thin to the best 3 or 4 whips.

- Cut out unproductive canes or twiggy wood by cutting back to the crown or to a strong new whip growing lower down on the cane. Do not be afraid to cut out a large older cane, if it's warranted.
- Selectively prune to keep the most productive laterals (generally 6 to 12 inches long). However, vigorous plants may still produce too much fruit if these are all left on the bush.
- Remove excessive branches at the tip of vigorous whips (Figure 13).
- Thin the remaining wood to balance expected fruit crop with the vigor of the bush. This takes experience and depends on the cultivar. See suggestions below for thinning methods for specific cultivars.
- Prune a weak plant harder (more) than a normally growing plant.

Irregular pruning or variable pruning severity results in erratic yields from year to year, and in very large bushes with individual canes competing for light. Research has shown that annual, moderate pruning results in bushes with the fewest canes but with the greatest yields. Pruning severity may need to be adjusted to balance the production of a good, quality crop with adequate growth for subsequent years' crops. Experience is the best guide for proper pruning.

Some cultivars (e.g., 'Duke', 'Berkeley', and 'Bluejay') do not produce many whips from the base of the plant. Instead, they produce whips from the base of older canes between ground level to about knee height. When you prune these bushes, you will have fewer canes at

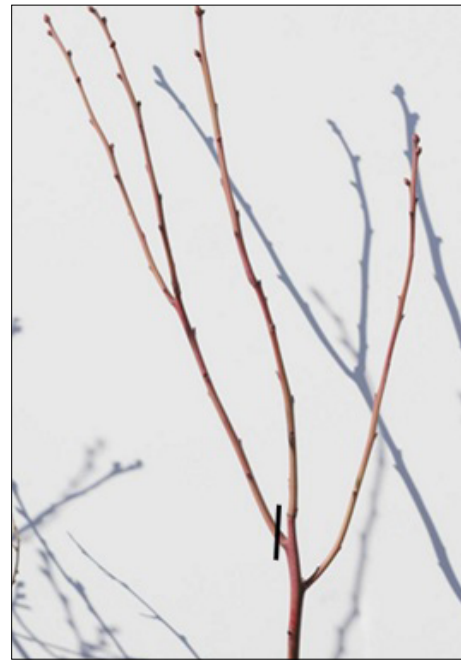


Photo: Drew Olson, © Oregon State University

Figure 13. Removing excessive branches at the tip of a vigorous whip in blueberry (cut at black line)

the base of the plant but more new growth or renewal wood higher up on the bush. Prune less-productive wood or sections of canes out of the bush by cutting back to these new whips. Some cultivars (e.g., 'Draper') produce many whips from the base and thinning or removing these adds considerable pruning time.

Some cultivars (e.g., 'Liberty' and 'Elliott') produce a lot of laterals on a 2-year-old cane. To avoid very small berries and poor growth, thin to the best 4 to 5 laterals (often the longest ones) on such a cane by removing the small ones (Figure 14, page 11) or by tipping the cane to remove the top laterals if the cane is too high and thus would be above picking height. With these cultivars, there are often small lateral shoots that you can strip off with your gloved hand instead of using clippers.

'Legacy' (a southern and northern highbush blueberry hybrid) grows quite differently than other northern highbush cultivars. If this cultivar is fertilized with high rates of N or is pruned too heavily, the plant grows vigorously and sets fewer fruit buds, reducing yield. 'Legacy' has a weeping habit that benefits from trellising. As the result of this habit, new renewal growth is high up on the bush. Watch for this growth and cut back to it when removing twiggy growth (Figure 11, page 9). Most other blueberry cultivars are most productive on 6- to 12-inch laterals. 'Legacy', however, is productive on shorter laterals as well, and thus, for high yield, should be pruned to

Photo: Drew Olson, © Oregon State University

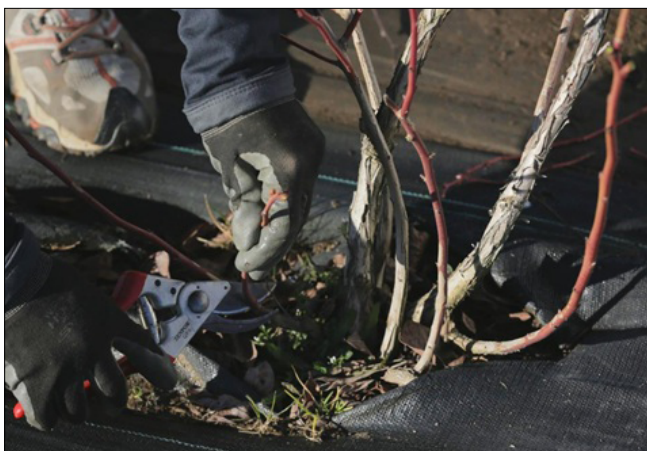


Figure 12. Removing low growth in a blueberry plant

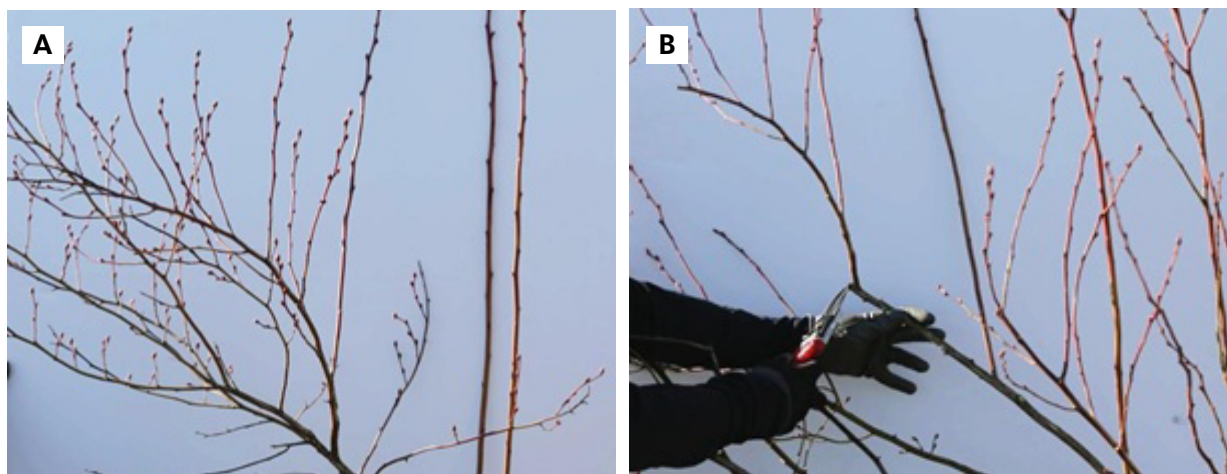


Figure 14. On a mature blueberry bush, thin to the most productive laterals to limit fruit production and promote new growth. Shows a mature bush before pruning (A), and after pruning to best laterals (B).

include a broader range of fruiting wood (more than 4 inches long).

Rabbiteye blueberry plants (e.g., ‘Pink Lemonade’) benefit from summer pruning. Tip new, vigorous upright growth shoots by removing about 1 inch of growth in early summer. This early tip removal is called “soft tipping.” Don’t tip any shoots after the end of June because late-growing branches produced by tipping do not set as many fruit buds.

Renovation/rejuvenation

Bushes that have been neglected or have not been pruned well for many years often have no good wood (laterals 6 to 12 inches long or new whips) to prune back to. These plants would benefit from renovation or rejuvenation. Cut the bush to a height of about 1 foot. Thin the old canes to the best 6 to 10, depending on cultivar. The following growing season, provided the soil and nutrient status are good and there are no pest issues, many new whips will be produced. These can be soft-tipped to encourage branching at different heights. The next winter, thin these to the best 12 or so. The plant will soon be back in production. This approach will work on all cultivars.

Pests and problems

Weed management

Weeds compete with berry plants for water, nutrients, and light, so it is important to keep weeds out of the row. Blueberries are shallow-rooted, so cultivation must also be very shallow. As a result, pulling weeds by hand, especially around the base of the plants, is often necessary. Cultivate no deeper than ½ to 1 inch to prevent root damage. The entire area under the drip line or

canopy must be maintained weed-free during the growing season. Hoe or hand-pull weeds before they become well established and to keep the soil loose, which will promote root and plant growth. A mulch layer of sawdust or bark may help control weeds, particularly annual weeds.

Black plastic can be used as a mulch in blueberries, but is not ideal because of the relatively short life span of plastic in comparison to the long-lived blueberry plants. Instead, use weed mat as a mulch for weed control in the row (Figure 9, page 8). Apply the weed mat just before planting, placing it over the row or raised bed and overlapping the edges. Stake down the edges or use soil to hold them down. Cut an “X” or a 6-inch-diameter circle in the plastic where each plant will be set and plant through the holes. You may also install a zippered system (Figure 9, page 8), but make sure the weed mat is well anchored in windy areas. Even though weed mat is perforated, use drip irrigation underneath it to ensure plants get enough irrigation water, particularly when grown on raised beds.

For chemical weed control, check with your county office of the OSU Extension Service or a garden or farm supply store for herbicides registered for use in blueberry plantings. Not all herbicides are registered for all crops.

You will also want to manage weeds between the rows (the aisles) so that they do not spread into the rows with your berry plants. The aisles can be cultivated and kept as bare soil or seeded with grass or another cover crop. If you are growing relatively few berry plants in your home garden, you may find it more practical to use other materials between your rows, such as bark mulch, wood chips, or straw. See *Commercial Red Raspberry*

Production in the Pacific Northwest (PNW 598) for more detailed information on using cover crops in berry production systems.

For detailed information on specific weeds and weed control, refer to the *PNW Weed Management Handbook*.

Insect Pests

The most important insect pest in berry production is the spotted wing drosophila (SWD; *Drosophila suzukii*). It was introduced to the mainland United States in 2008 and has rapidly become a major problem in all berry crop production areas. This vinegar fly looks like a commonly seen fruit fly. However, the female lays eggs in developing fruit (generally after it first develops some color). The resultant larvae feed inside the berry while the fruit are ripening. Populations of SWD build up during the season, so late-fruiting cultivars are more prone to this pest. For more information on how to control and manage this insect, refer to the SWD publications listed under “For More Information” (page 13). Other insects that can be problematic include root weevils, and lecanium and azalea bark scale.

Check with your local office of the OSU Extension Service for control recommendations if insects become a problem. Control methods are also outlined in the *PNW Insect Management Handbook*. Keep in mind that control options vary for commercial small-acreage farmers (with commercial pesticide applicator’s license) and home gardeners.

Birds

Birds are the other major pest for blueberries. Many species feed on the fruit and can completely eliminate your crop if not controlled. Birds are very adaptable and scare tactics will usually only have limited effectiveness. If using methods such as aluminum plates and flashing, eye spot balloons, kites, and alarm calls, it is best to use a combination of methods and change things as birds get used to them. Improving raptor habitat also can be effective as a deterrent to berry-eating birds. Raptors will either hunt berry-eating birds or deter them by simply being around. Light plastic, overhead netting is the best way to exclude birds. Construct wooden or PVC frames around your berry plantings and drape netting over them.

Diseases

The most important diseases in blueberries include botrytis (a gray mold that kills blossoms and sometimes leads to green fruit rot), *Pseudomonas* (a bacterial blight

that causes 1-year-old wood to die back in winter), mummy berry, and anthracnose and alternaria fruit rots.

If disease becomes an issue with your blueberries, check with your local OSU Extension Service office for control recommendations. Control methods are also outlined in the *PNW Plant Disease Management Handbook*. Keep in mind that options for controlling plant disease vary for commercial small-acreage farmers (with commercial pesticide applicator’s license) and home gardeners.

Cold and Frost

The growing parts of blueberry plants may be susceptible to frost (temperatures just below freezing) damage in spring or late autumn, or to cold damage during early, mid-, or late-dormancy from late autumn through winter. Susceptibility to injury depends on the type of blueberry and the cultivar, the temperature, and stage of plant growth. (The cultivars listed on page 4 should be hardy on the coast). Site location will have a large impact on whether frost has the potential to damage blueberry plants (e.g., frost injury may only be possible at high-elevation coastal sites). Mid-winter cold injury is likely not a problem for any type of blueberry at most sites along the coast.

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. Row cover (also called floating row cover) can be used to protect smaller areas if low temperatures during bloom are forecasted. On larger plantings, wind machines, smudge pots, or other heating devices can be used if there is a temperature inversion, with warm air locked above cold air closer to the ground. Well-designed irrigation systems can provide approximately 6°F to 8°F of frost protection in some situations. Berries grown in containers can be left outside for the winter; however, they should be brought inside if there is a frost event at bloom or during fruiting that may damage the plant.

Late-fruiting cultivars (e.g., ‘Darrow’ or rabbiteye blueberries) benefit from being grown in a tunnel covered with plastic in the later months of the season (late August through October) so that plants are protected from rain and more of the fruit can be harvested. Tunnels that are covered with plastic are very susceptible to wind damage. Since tunnels are expensive, small-acreage farmers need to evaluate the economic benefit of using them on the coast.

For more information

To learn more about growing individual berry crops on the Oregon Coast, see these other publications in the series:

- *Growing Berries on the Coast: An Overview* (EM 9177) <https://catalog.extension.oregonstate.edu/em9177>
- *Growing Berries on the Coast: Strawberries* (EM 9178) <https://catalog.extension.oregonstate.edu/em9178>
- *Growing Berries on the Coast: Raspberries and Blackberries* (EM 9180) <https://catalog.extension.oregonstate.edu/em9180>
- *Growing Berries on the Coast: Kiwifruit and Grapes* (EM 9181) <https://catalog.extension.oregonstate.edu/em9181>
- *Growing Berries on the Coast: Gooseberries, Currants, and Other Minor Berry Crops* (EM 9182) <https://catalog.extension.oregonstate.edu/em9182>

Other OSU Extension Publications

Production

- *A Grower's Guide to Pruning Highbush Blueberries* (DVD 002) <https://catalog.extension.oregonstate.edu/dvd2>
- *Blueberry Cultivars for the Pacific Northwest* (PNW 656) <https://catalog.extension.oregonstate.edu/pnw656>
- *Commercial Red Raspberry Production in the Pacific Northwest* (PNW 598) <https://catalog.extension.oregonstate.edu/pnw598>
- *Evaluating Honey Bee Colonies for Pollination* (PNW 623) <https://catalog.extension.oregonstate.edu/pnw623>
- *Growing Blueberries in Your Home Garden* (EC 1304) <https://catalog.extension.oregonstate.edu/ec1304>
- *Nurturing Mason Bees in Your Backyard in Western Oregon* (EM 9130) <https://catalog.extension.oregonstate.edu/em9130>

- *Nutrient Management for Blueberries in Oregon* (EM 8918) <https://catalog.extension.oregonstate.edu/em8918>

Soils and Irrigation

- *Acidifying Soil for Blueberries and Ornamental Plants in the Yard and Garden: West of the Cascades Mountain Range in Oregon and Washington* (EC 1560) <https://catalog.extension.oregonstate.edu/ec1560>
- *Applying Lime to Raise Soil pH for Crop Production (Western Oregon)* (EM 9057) <https://catalog.extension.oregonstate.edu/em9057>

Problems

- *A Detailed Guide for Testing Fruit for the Presence of Spotted Wing Drosophila (SWD)* (EM 9096) <https://catalog.extension.oregonstate.edu/>
- *Pacific Northwest (PNW) Insect Management Handbook, Pacific Northwest (PNW) Plant Disease Management Handbook, and Pacific Northwest (PNW) Weed Management Handbook*, Revised and reissued annually <https://pnwhandbooks.org>
- *Protecting Garden Fruits from Spotted Wing Drosophila* (EM 9026) <https://catalog.extension.oregonstate.edu/em9026> [em9096](https://catalog.extension.oregonstate.edu/em9096)

Additional resources

- *Bird Management in Blueberries* <http://www.berriesnw.com/falconryhome.htm>
- Oregon State University Spotted Wing Drosophila information page <http://spottedwing.org/>
- *Windbreaks for Fruit and Vegetable Crops* (EC 06-1779), University of Nebraska Extension <http://extensionpublications.unl.edu/assets/pdf/ec1779.pdf>

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