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BLUEBERRIES

Highbush blueberries, *Vaccinium corymbosum*, are both ideal fruit producing and ornamental specimen plants for Pacific Northwest gardens, especially those west of the Cascades. Commercial interest in blueberries has increased as more and more consumers have been introduced to the fruit's tangy flavor in yogurt, ice cream, preserves, and fresh pack.

Plants can grow to a height and circumference of 5 to 6 feet. During the spring blooming period of late April to early May, plants usually produce abundant white to pinkish urn-shaped flower clusters, followed by a bountiful crop of tasty berries from early July through mid-September, depending on the cultivar. In autumn, some cultivars display striking yellow-to-scarlet foliage before the leaves fall.

As members of the plant family *Ericaceae*, blueberries share the same soil and climatic preferences as rhododendrons and azaleas. The plants thrive in areas of moderate summer temperatures and acidic soils. Cold hardiness is not a major factor. The plants can survive midwinter temperatures as low as -20°F and -25°F. An open site with air drainage reduces spring frost injury to flower blossoms. While blueberries survive

the warmer summers of eastern Washington, yields there rarely match those from west of the Cascades. A growing season of at least 140 days produces the best fruit.

Young plants generally do not begin to bear fruit until they are between 4 and 5 years old. Once a bush is established, life expectancy can be unlimited. Young plants, between 5 and 7 years, may bear 4 to 5 pounds of fruit per plant; mature plants can yield as many as 20 to 25 pounds.

Blueberries are self-fertile, but plant at least two different cultivars near one another to ensure optimum fruit set and size. When honey bees visit the blossoms in their search for nectar, the plants yield the most fruit.

Cultivars

All commercial blueberry cultivars ([Table 1](#)) released by the U.S. Department of Agriculture and state universities over the past 60 years have resulted from crosses with wild blueberry species indigenous to the eastern United States. These cultivars have performed very well in the Pacific Northwest. Season of ripening (early July through mid-September), yield, plant-growth habit, fruit size, color, flavor (sugar/acid ratio, aromatic components), and susceptibility to pathogens distinguish one cultivar from another. Home gardeners may wish to plant three to four different cultivars having varying ripening periods to extend the harvest season.

Site Selection and Preparation

An acid soil with a pH of 4.0 to 5.0 is the most important condition for growing blueberries successfully. Plants often become yellow and stunted due to iron deficiency where the soil pH is greater than 6.0. If you plant blueberries where lime has been used during the previous 3 years, or in areas east of the Cascades, send a soil sample to a soil testing laboratory to determine its pH. Use soil amendments such as garden sulfur, dusting sulfur, or flowers of sulfur to lower the soil pH. Rototill sulfur, at the rate of 1 to 1.5 pounds per 100 square feet into the top 8 inches of the soil profile 12 months before planting. During the life of the plant, make yearly spring applications of ammonium sulfate fertilizer to lower the soil pH. If the pH falls below 4.0, use lime to raise the pH back to the recommended range.

Heavily compacted soils, or those low in organic matter, greatly benefit from the addition of rotted manure, compost, sawdust, or peat moss. Amendments improve the soil texture and increase the water holding capacity. Blueberry plant roots are relatively fine and shallow (14 to 18 inches), and prefer an open, porous soil. Add 4 to 6 inches of sawdust initially, and 1 inch each year to maintain depth, or mix half a gallon of peat moss with the soil in the planting hole.

Blueberries do not demand as much soil depth for rooting as caneberries and strawberries, but try to select a site with at least 18 inches of free-draining soil. Install drain tile in areas that may flood during winter months.

Grow blueberries in full sun for optimum fruit production and quality. They will perform adequately, however, in a location that receives partial sun, although yield will be less. In areas of high summer temperatures, partial shade prevents soil moisture loss and keeps fruit from shriveling. Prepare the planting site in the fall before planting in the spring. Eliminate all weed growth through cultivation. In areas west of the Cascades, use of a fall cover crop of rye or barley (2 to 2.5 pounds of seed per 1,000 square feet) reduces fall germination of weed seeds, protects the prepared site from erosion, and helps build up organic matter.

Table 1. Blueberry cultivars

Cultivar	Harvest period	Fruit characteristics	Plant characteristics
Earliblue	Early	First to ripen, excellent dessert quality, large fruit size.	Upright bush, avoid frost pockets and poorly drained soils.
Spartan	Early	Very large, light blue, excellent dessert quality.	Upright bush, productive, prefers light, well-drained sites.
Patriot	Early	Large fruit, firm, very good flavor, high yield.	Vigorous, upright, winter-hardy, performs well on sites with less than perfect soil drainage.
Bluejay	Early to mid-season	Medium size, light blue, mild, tart flavor, fruit will drop from bush.	Bush vigorous, moderate yield, winter-hardy, some resistance to mummyberry fungus.
Bluecrop	Mid-season	Most widely planted cultivar in world. Large, light blue fruit, medium fresh quality, firm.	Very productive, vigorous bushes bear fruit over a 1-month harvest season.
Berkeley	Mid-season	Large fruit, mild flavor (sweet), medium blue color.	Bush is open and spreading. High yields in the Northwest. More susceptible to spring frosts.
Darrow	Late	Largest of fruit size, tart flavor.	Vigorous, upright bush.
Elliott	Very Late	Medium yields, mild flavor.	Suitable to areas south of Puget Sound.

Establishment and Cultivation

Planting

Most blueberry bushes are set out during the dormant season from January to March (March to April in eastern Washington) as either 2-year-old bareroot stock, or as 3-year and older container stock. While the smaller stock is less expensive, do not allow it to bear fruit for 2 years to assure strong plant development. More expensive container stock often bears fruit the year it is planted. In a landscape setting, allow at least 4 to 5 feet between the plants and 5 to 6 feet between the rows, since plants become quite large at maturity.

Dig a hole large enough to spread out the roots carefully.

Fertilization

Fertilizing blueberries during the first 3 to 4 years encourages development of a number of well-spaced, stocky canes with many branches. Give live plants without shoot growth the maximum recommended amount of fertilizer. Give plants that grow more than 1 foot little or no fertilizer. On mineral soils, apply fertilizer at leaf bud break and again during late spring. Use a balanced fertilizer such as 5-10-10 in early spring. Follow up with ammonium sulfate in May, and again in June if needed. Home gardeners often use commercially packaged evergreen and azalea fertilizer for blueberries. [Table 2](#) gives recommended rates.

Delay fertilizing young, newly transplanted blueberries for at least a year to avoid burning root systems. Keep inorganic fertilizer away from the crown of the plants, but spread in thoroughly within the dripline of the bushes. Apply extra nitrogen when you use sawdust mulches to prevent leaf yellowing and plant stunting.

Watering

Lack of supplemental watering from June to August severely limits successful production of blueberries in the Pacific Northwest. Shallow-rooted plants require close attention to maintain a uniformly moist environment around their base. They require 1, or possibly 2 inches of water each week, in the absence of any rainfall. Be sure the entire root zone is wet after an irrigation. Drought symptoms include reddened foliage, weak, thin shoots, and reduced fruit set. Maintain a 2-inch mulch layer to preserve soil moisture. A drip system, set on a timer, works especially well in keeping soil moist on a daily basis. Keep watering the plants through August to ensure good fruit bud development for the following season's crop.

Weed Control

If you have controlled perennial weeds prior to planting, add 2 inches of mulch each year to control the germination of annual and broadleaf weeds. Hand cultivate carefully within the dripline of the bushes to avoid severing shallow roots. Home gardeners can sprinkle a granular herbicide on the soil surface surrounding the bushes during November and December. This application will give 6 months' residual control of annual, broadleaf, and perennial weeds. Check with your local Cooperative Extension agent for further details.

Bird Control

Robins, starlings, and finches can strip ripening blueberry plants totally clean of fruit if plants are left unprotected. Drape plastic bird netting over the bushes as the berries begin to turn blue, or string plastic streamer tape between the bushes to frighten the birds away.

Table 2. Blueberry fertilization: quantity of fertilizer per plant in ounces and approximate equivalents

	5-10-10 ounce	Ammonium sulfate	Ammonium sulfate
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Age of plants from transplants	(cup) March 15 to April 15	ounce (Tbsp) May 20	ounce (Tbsp) June 15
Newly set	0	0	0
1 year	2 (1/4 cup)	1 (2 Tbsp.)	1 (2 Tbsp.)
2 years	4 (1/2 cup)	1-2 (2-4 Tbsp.)	1-2 (2-4 Tbsp.)
3 years	6 (3/4 cup)	1-2 (2-4 Tbsp.)	1-2 (2-4 Tbsp.)
4 years	8 (1 cup)	2-3 (1/4 cup + 1 Tbsp.)	1-2 (2-4 Tbsp.)
5 years	10 (1 1/4 cup)	2-3 (1/4 cup + 2 Tbsp.)	1-2 (2-4 Tbsp.)
6 years and older	12 (1 1/2 cup)	2-3 (1/4 cup + 2 Tbsp.)	1-2 (2-4 Tbsp.)

Pruning

Young plants need little if any pruning during their first 3 years in the ground. Flower buds form from late summer to early fall, overwinter, bloom, and set fruit the following spring. On 2- and 3-year-old plants, strip the blossoms off in spring to promote plant vigor.

As the plants mature, prune out low, spreading branches near the ground, and head back branches that lack vigor to a strong upright lateral. When the branch tips become twiggy, carefully thin them out with hand shears. Flower buds form nearer the tips of the branches and are fatter and less pointed than leaf buds. Remove any broken or diseased branches. On older bushes, production often declines as canes age and produce fewer fruit buds. To renovate the planting, remove canes with a basal diameter of more than 1 inch at the ground line using loppers. This practice does not affect subsequent yield but ensures strong return bloom and larger fruit size. Prune in the dormant season. Pruning during the fall, as opposed to the winter and spring, tends to delay spring bloom and reduces possible spring frost damage.

Harvesting and Storage

Harvest fruit approximately 4 or 5 days after the first berries turn blue so fruit size and sugar levels are the greatest. From then on, continue harvesting at 3- to 5-day intervals since all the berries in a cluster do not ripen at the same time. Use your thumb to gently roll berries from the fruiting cluster into the palm of your hand, then transfer them to a picking container. Fresh berries have a 2-week shelf life if they are kept in a refrigerator. To freeze blueberries, simply rinse them in water, then place in freezer.

Insect and Disease Problems

Insects

Blueberries have relatively few insect pests. Too many aphids reduce plant vigor, and leave a buildup of sticky honeydew on the leaves and fruit. Ladybird beetles are effective against aphids in commercial

settings. On small plots of land, however, they are not as effective because they disperse before feeding on very many aphids. Cherry fruitworm larvae destroy blueberries by feeding on the inside of the fruit. The 1/2-inch conspicuous pink worms are the progeny of small, dark gray moths. The larvae feed within berries, leaving frass and webbing; often the damage is noted shortly before harvest. Apply insecticides at blossom drop, and 2 weeks later, if cherry fruitworm is a perennial problem.

A heavy infestation of lecanium scale stunts the bushes and leaves them sticky and sooty with honeydew and mold. Prune out stems encrusted with high scale populations and apply dormant oil spray to the plants when the temperature is above freezing.

Root weevil larvae can damage blueberries as well as other small fruits. The c-shaped larvae, from 1/5 to 1/3 inch long, are legless, having white bodies and brown heads. They feed on the root systems and on the lower portion of the bush crown. Adult root weevils are rarely seen during the day. They feed on leaves in the evening, leaving the bush with characteristic leaf notching. While not harmful to the plant, the presence of notching is a good indication that larvae are present in the soil. No pesticides are available to home gardeners for use on larvae; however, a liquid product is available for evening use on adults early in the summer. Apply this material after the sun sets to kill the most adults.

Diseases

Mummyberry is the most serious fungal disease of highbush blueberries. It leaves affected fruit hard, white, and inedible, or mummylike. During a prolonged, wet spring, the incidence of this disease can be quite high. In late March mummified fruit on the ground from the previous summer sprout minute, brown, mushroomlike cups that release fungal spores. The spores infect new flower clusters and leave them blackened and withered. Spores produced on these blighted tissues infect opening flower blossoms, which subsequently produce infected fruit. Infected berries appear normal until the onset of ripening. They then turn a tan to salmon color. Mature fruit turn white, drop to the ground, then restart the cycle. Control mummyberry by raking the soil or mulch layer beneath the plants as leaf buds swell in early March. Raking destroys spore cups. Pick off and remove infected berries from the patch before harvest. Pick up and throw away infected berries that fall to the ground. A fungicide that can be sprayed on developing blossoms to protect them from the fungal spores is available to home gardeners. An integrated program of spring raking, blighted shoot removal, mummy removal, and use of protective fungal sprays will contribute significantly to mummyberry control.

Botrytis blossom blight can also be a problem during a prolonged, wet spring. Gray fungal spores distinguish Botrytis infection from frost injury. If rains occur before harvest, Botrytis fruit rot can infect maturing berries. Reduce the incidence of gray mold by keeping the plants well pruned. This improves air circulation. Apply protective fungicide spray applications during bloom, and do not let the berries become overripe on the bushes.



RASPBERRIES

Red raspberries, *Rubus idaeus*, thrive in the relatively cool, marine climate of the Pacific Northwest west of

the Cascades. Commercial production extends from Salem, Oregon north through Washington into the Fraser Valley of British Columbia. Since the early 1980s, acreage has expanded, primarily because over-the-row mechanical harvesters have reduced the labor needed for harvesting. A raspberry planting may live and produce fruit for more than 30 years if it is planted in well-drained soil and cared for properly. East of the Cascades, high summer temperatures can result in smaller plants and reduced yield. Small commercial plantings have been successful near Yakima and Spokane in cooler sites. Mid-winter temperatures below -2°F can cause extensive injury. In all locations, shelter plantings from winds to prevent desiccation of the canes.

Since all raspberry flowers are considered self-fertile, no additional cultivar is needed for pollination. Pollen is transferred by bees that prefer raspberry flowers because of the high nectar level. Spring frost injury is generally not a problem in areas west of the Cascades because flowers appear relatively late in the spring.

Cultivars

Two types of raspberries are available to the home gardener. Summer bearing or June-bearing types initiate flowers on first-year canes, or primocanes, from late August to early September ([Table 3](#)). The canes overwinter, bloom, and fruit the following spring and summer, then die. While the fruiting canes, or floricanes, are bearing, new primocanes emerge for the next year's crop and continue the life of the planting. Root systems are perennial.

Fall fruiting types, also known as everbearing or primocane fruiting types, bear fruit on the top half of first-year-canecanes from early August through late September. They overwinter and produce a second crop on the lower half of the canes the following June through July ([Table 4](#)).

No one cultivar can be universally recommended. Junebearers have ample plant vigor, but they produce fruit with different flavors. The earliest ripening cultivars usually produce mature fruit by the second week in June in the southern districts, and 1 or 2 weeks later in the northern regions. The potential harvest season lasts 4 to 6 weeks. The earliest ripening fall-fruiting types usually have fruit by the first week in August in the southern districts and can produce fruit until the start of the fall rains. In fact, later ripening, fall-fruiting types have had limited acceptance in the past because they bear late in the season. Black raspberries, *Rubus occidentalis*, ripen around the beginning of August. The two most commonly recommended cultivars are Cumberland and Munger. Both of these cultivars suffer from virus diseases and anthracnose. Black raspberries, or blackcaps, are commonly used for jam.

Table 3. June bearing red raspberry cultivars

Cultivar	Harvest season	Fruit characteristics	Plant characteristics
Willamette	Early, short	Dark red fruit, low in sugar, tart flavor, leading commercial.	Vigorous plants with numerous spines. Adaptable to well-drained sites throughout western Washington and Oregon, avoid hot, dry climates east of the Cascades.
			Fruit softens in fresh

Meeker	Mid-season, long	Higher in sugar, excellent flavor, standard for fresh market production.	storage, not as winter-hardy, not suitable for wet, poorly drained sites.
Sumner	Later season, average	Fruit has bright color, lacks flavor and sugar, yields well.	Best performing cultivar for wetter sites, some winterhardiness for east of the Cascades.
Chilliwack	Later season, short	Newest cultivar, best fruit flavor, color, and size.	Suitable to all areas west of the Cascades, better winterhardiness than other cultivars, better root rot resistance than Willamette or Meeker.
Centennial	Mid-season, long	Higher yields and better fruit size than Meeker.	A new, fresh-fruit cultivar suited to the southern portions of the Pacific Northwest, better root rot resistance than Willamette or Meeker.

Table 4. Fall fruiting red raspberry cultivars

Cultivar	Harvest season	Fruit characteristics	Plant characteristics
Autumn Bliss	Very early	Larger and firmer than Heritage. Very nice flavor.	Canes short and sturdy needing minimal support.
Summit	Early	Equal in size and firmness to Heritage. Difficult to pick under hot conditions.	Plants not as vigorous as Heritage, has resistance to root rot.
Fall Gold	Early	Yellow fruited cultivar with mild, sweet flavored fruit.	Bushes are only moderately vigorous, average yield.
Heritage	Late	Large, dark fruit, mild flavored.	Vigorous canes need support. Winter-hardy for sheltered areas east of the Cascades.

Site Selection and Preparation

Site Selection

Raspberries are the most demanding of all small fruits in their preference for well-drained, sandy loam soil at least 24 inches deep. Check the future planting site after a heavy rain in the winter for the presence of standing water. On sites slow to drain, install drain tile 24 inches deep, or plant the raspberries on mounds of soil 1 foot high. Excessive soil moisture during late winter when new roots are growing leads to root rot development (see disease section).

Select a site that receives full sun all day long. Plants grown in the shade often remain small and produce tart fruit. Provide for cultivation on either side of the rows to allow for primocane growth.

Soil Preparation

Plan to control weeds and build up the soil tilth a year before planting. Use a contact, foliar-applied herbicide to kill the sod or native vegetation. Consider seeding a fall crop of cereal rye or barley to the planting site to build up organic matter. Use between 2 and 2.5 pounds of seed for each 1,000 square feet. Do not allow the rye to head out the following spring before planting. Amend the soil pH with lime when the pH is less than 5.5. The ideal pH range is between 6.0 and 6.5. If the soil needs lime, apply the fall before planting.

Establishment and Cultivation

Planting

Dormant plants are usually available in nurseries from mid-January to March in western Washington. From March to early April stock is available for immediate planting. Do not use any planting stock that already has started to bud out appreciably; it generally does not perform well. Purchase virus-free, certified nursery stock, because it lives longer. Sucker plants dug from an established planting during the winter when the plants are dormant often have virus diseases that can survive during transplanting.

The generally accepted planting distance for red raspberries in the Pacific Northwest is 30 inches between plants within the row, in rows spaced 8 to 10 feet apart. This stool method of planting, which maintains canes as discrete bushes, permits more ease in controlling weeds and excess primocane growth. Hand plant the row, then cut down the canes to a handle of three to four buds above ground level. This practice encourages early development of basal shoots without promoting production of fruiting laterals during planting. In subsequent years, allow 10 to 12 primocanes to grow from each original stool. Maintain the row at a width of 12 inches; remove excess primocanes using a hoe or rototiller. In the English hedgerow planting system, growers set out plants at 30-inch intervals, but allow new primocanes to fill in the row to a width of 8 inches.

Fertilization

Raspberry primocanes normally grow an average of 8 to 9 feet during the spring and summer. Adjust

fertilizer rates annually to achieve this amount of growth. Apply fertilizer in the late winter (March) as bud swell begins. Either broadcast fertilizer over the entire row, or band it 1 foot on either side of the row. West of the Cascades, apply 2 to 3 pounds of a 5-10-10 fertilizer to each 100 feet of row. East of the Cascades, in areas of relatively high phosphorous and potassium, use only nitrogen. Consider an application of 3/4 to 1 pound of ammonium sulfate per 100 feet of row.

Watering

The raspberry plant is fairly deep rooted but can still suffer from a shortage of summer rainfall. Moisture is critical during the fruit ripening stage in early June, and the late August to September period, when flower buds form for the following year's crop. Apply an inch of water per week when rain does not fall. Overhead irrigation during the ripening stage can encourage fruit rot if the weather is cool and cloudy; consider using a trickle or soaker hose irrigation system.

Weed Control

Home gardeners can purchase a granular herbicide to sprinkle on the soil surface surrounding canes in the late fall to provide 6 months residual weed control. Do not use this product when new shoots are beginning to emerge since it can harm them.

Trellising and Training

Raspberry canes lack sufficient strength to remain erect. Install a post and wire trellis support. Erect the trellis the first summer the new plants are in the ground. If the newly planted canes grow vigorously the first summer, tie them to a wire support to ensure a crop the second year.

The first step in building a trellis involves placing secure, 6-inch-diameter end posts, preferably ones that have been treated with an environmentally safe wood preservative. Within the row, space 3-inch-diameter wooden posts at 25 to 30 feet, or place metal posts every 20 feet. Use 12-gauge or stronger wire to support a heavy fruit-laden canopy ([Figure 1](#)). A three-wire trellis is the universally accepted design. Place the top wire 54 inches above the soil line, and fix two detachable training wires 30 inches above the soil line. During the late summer renovation process, tie primocanes to the top wire, leaving the lower two wires on the ground. In the Scottish stool system canes are gathered together in upright bundles and tied to the top wire with binder twine. For the English hedgerow system, space the canes along the top wire and tie each cane individually. Leave primocanes long during the fall and early winter; topping canes in early fall makes them more susceptible to cold injury.

In May of the following spring, when new primocanes attain a height of 3 to 4 feet, bring up the training wires to collect the primocanes. Fasten the training wires to bent nails on the sides of the intermediary posts, or hook them together with wire loops. A four-wire trellis has two wires at 54 inches, and two training wires below. Secure primocanes between the top pairs of wires with twine or metal loops of wire every 3 to 10 feet. A four-wire crossarm trellis incorporates an 18- to 36-inch-wide wooden crossarm attached at the top of each post within the row. During August, secure primocanes to these wires with twine. During the following spring, allow new primocanes to grow up through the center of the canopies to prevent them from interfering with picking of fruit from the floricanes.

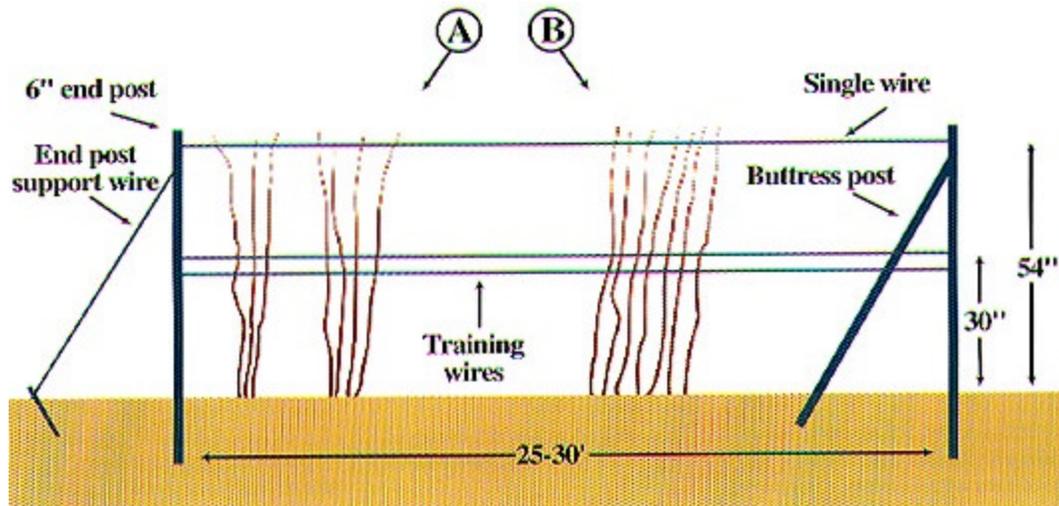


Figure 1. Three-wire raspberry training system: A.) Scottish stool system with stools spaced 30 inches apart, and B.) English hedgerow system with canes allowed to grow continuously within the row.

Pruning and Cane Vigor Control

On summer-bearing cultivars, prune out spent fruiting canes any time after harvest. Retain 10 to 12 of the healthiest primocanes and secure these to the top trellis. In late January or February of the following winter, tie top canes trained to either the Scottish stool or English hedgerow system at 6 inches above the uppermost trellis wire. You also can leave canes long and bow them over the top wire in a semi-circle. Either method of pruning forces lateral branches to grow in the spring at a convenient picking height.

Remove the first flush of primocane growth by hoeing in late April when growth is 7 to 8 inches high on vigorous plantings where cane growth is greater than 9 feet. New primocane growth follows shortly. This practice substantially increases yields, reduces fruit rot, and makes picking easier. Remove the top half of the cane from fall-bearing cultivars after fruiting is over, or remove the entire cane at the ground line. Leave the lower half of the cane for a summer crop the following June; remove canes entirely for only a fall crop each year. Because the fall crop on fall-fruiting cultivars is superior to the summer crop, most growers advise cutting all canes to the ground line in mid-October.

Harvesting and Storage

Collect dry, firm fruit as it reaches the peak of color and sugar development. Avoid picking wet fruit, as it deteriorates soon after harvest. Berries will not ripen further in storage. Frequent harvesting greatly reduces the incidence of fruit rot. Fresh berries have a shelf life of only 2 to 3 days in the refrigerator. You can easily freeze raspberries, or make them into tasty preserves.

Disease and Insect Problems

Diseases

The most limiting disease problem of red raspberries is a fungal disorder known as *Phytophthora* root rot.

This soil pathogen is the primary agent that causes the planting to decline when the soil is imperfectly drained or exhibits a high water table. Symptoms include wilting of primocanes in the spring and yellowing, drying, and premature death of fruiting canes during harvest. Affected plants also have deteriorated root systems. Unhealthy root tissue is brick red in color, while healthy tissue is creamy white. Little can be done to control root rot in an established planting. Relocate the planting to better soil, consider planting the raspberries on raised beds, or select a cultivar that has greater genetic resistance to this pathogen.

Berries with fruit rot (*Botrytis* gray mold) appear water-soaked; in the latter stages of rot, tufts of gray fungal strands grow on the surface, covering the fruit. Reduce the incidence of fruit rot by applying protective fungicides during early bloom and harvest ripe fruit daily. Promptly remove spent fruiting canes in August, and control excessive primocane growth as outlined under the cane vigor control section.

A number of virus diseases attack raspberries. Plants can be stunted, leaves may display bright veins and berries can become crumbly. Be sure of the cause before taking action, as these conditions can result from many other factors, including poor pollination, drought, and soil boron deficiency. Dig out virus infected plants and replace them with certified stock. The virus responsible for the decline generally does not live in the soil, so growers can place new plants in the same area.

Cane diseases such as anthracnose, spur blight, and crown gall are occasional problems. Anthracnose appears as small purple spots with gray centers forming on new growth. Canes can become girdled and cracked. Spur blight results in brown or purple spots appearing at buds along infected canes; often these buds are killed, resulting in the absence of fruiting spurs the first 18 inches from the ground. Affected leaves display brown wedge-shaped lesions. Field sanitation and properly applied fungicides, added at the green-tip stage of bud breaking in late winter, control these two diseases. The bacterial disease crown gall causes rough outgrowths to appear on canes, crowns, and roots. Exercise care when pruning affected plantings. Accidentally wounding healthy plants encourages entrance of the pathogen. Dig out galled canes from the planting.

Insects

The crown borer is the chief insect problem for red raspberries. Larvae tunnel to the basal portions of the canes and crowns, resulting in a gradual decline of the stand. A moth that looks like a black and yellow wasp produces the larvae. Roguing infested canes, and drenching the canes with an insecticide helps control this pest. Other minor insect pests are root weevil larvae that feed on the roots, leafrollers that roll leaves and feed on the fruit, and spider mites that cause speckled, bronzed leaves.



STRAWBERRIES

All Northwest edible fruit gardens should include a healthy bed of strawberries producing large, sweet, brightly colored berries for fresh eating, freezing, or preserves. Strawberries, *Fragaria ananassa*, adapt better than any other small fruit crop to Washington climates. Cultivars released from regional breeding projects of Oregon, Washington, and British Columbia are noted throughout the United States for their excellent flavor, and for their superior red internal color for processing in the jam, preserves, and yogurt

industries. Northwest berries may lack the size and appearance of California strawberries, but they more than make up for those characteristics in their flavor.

The strawberry is considered a herbaceous perennial. It sends up new shoots, leaves, and runners each year from a crown and root structure that generally lives for 4 to 5 years. Home gardeners often try to extend the life of the planting for more than 5 years. It is generally best to start anew with dormant, certified virus-free nursery stock when the original planting has declined in vigor, or become choked with runners or perennial weeds.

The strawberry fruit itself is the swollen receptacle of the flower. The individual achenes or seeds on the berry's surface result from bee pollination and fertilization. A strong, vigorous plant that has escaped spring frost injury during bloom will produce a bountiful crop of large berries.

Two types of strawberries are available for planting in the Pacific Northwest. June-bearing cultivars, often referred to as single cropping, initiate flower buds when the days become shorter in late August and September ([Table 5](#)). During the following May, blossoms appear and ripe fruit follow about 30 days later. June-bearing cultivars from other regions of the United States generally perform poorly in the Northwest. Flower bud initiation of day-neutral cultivars, often referred to as everbearing, or double cropping is not governed by day length ([Table 6](#)). Flowers and fruit occur simultaneously from June through October, although production normally declines during the hotter days of late July and August.

Table 5. June-bearing strawberry cultivars for the Pacific Northwest

Cultivar	Harvest season	Fruit characteristics	Plant characteristics
Hood	Early	Moderate yield of attractive, bright fruit of average size, excellent for preserves.	Good runner capacity, average winterhardiness, plants very susceptible to virus diseases and fruit rot.
Benton	Mid-season	Bright glossy fruit of good size, excellent for fresh eating and preserves, poor texture frozen.	Vigorous plants produce high yields, good winterhardiness, good virus resistance.
Shuksan	Mid-season	Large fruit size, bright, attractive, difficult to cap, best cultivar for frozen pack.	Most winter-hardy of all cultivars. Plants vigorous, good yield, good winterhardiness, good virus resistance.
Rainier	Late	Very attractive fruit, difficult to cap, excellent for fresh, frozen, and preserve use.	Vigorous plants but poor runner capacity, good virus resistance, average winterhardiness, moderate fruit rot

resistance.

Table 6. Day-neutral strawberry cultivars

Cultivar	Harvest season	Fruit characteristics	Plant characteristics
Tillikum	June-October	Excellent flavor, but poor fruit size and firmness.	Plants do not runner well, although may offer virus resistance.
Selva	June-October	Best day-neutral for large fruit size, and firmness, lacks flavor.	Vigorous plants, but low yields. May lack winterhardiness.
Tristar	June-October	Good flavor, firmness, and color, average size fruit.	Average vigor and yield, probably winter-hardy enough for east of Cascades.

Site Selection and Preparation

Strawberries share the same soil requirements as raspberries: they like well-drained ground that receives full sun all day long. Avoid frost-prone areas where a freeze can occur during early May.

Carefully remove all perennial weeds from the planting site. Only hand hoeing or cultivation controls them once the plants are established. Raising a cover crop the fall prior to planting will help control weeds during the establishment year. Incorporate compost or aged animal manures the fall prior to planting to improve soil texture. The optimum soil pH for strawberries is 6.0 to 6.5.

Establishment and Cultivation

Planting

Certified, virus-free planting stock is available from nurseries after the first of the year. Plants are sold bareroot, so keep them cool until planting. Trim roots back to 4 or 5 inches before planting. Plant so the crown, the swollen growing region that gives rise to leaves and roots, is at soil level.

June-bearers are normally grown in a matted row system where plants are set 15 to 24 inches apart within the row, and rows are 36 to 42 inches apart. Allow runner plants to fill in the spaces until the row is 14 to 18 inches wide.

Day-neutral cultivars often are grown in a hill system. They seldom form runners. Space plants 10 to 18 inches apart: at 10 inches remove all runners through the season; while at 18 inches, hand set one runner between mother plants. Best results occur when no two plants are closer than 7 to 8 inches apart. After

planting, remove the first blossoms appearing on day-neutrals to encourage strong leaf and root development. Retain flowers appearing after the middle of June for later fruit.

Fertilization

Strawberries are not heavy nutrient feeders. Apply 2 pounds of a 10-20-20 fertilizer, or 4 pounds of 5-10-10 per 100 square feet prior to planting.

Watering

Supplemental watering during dry summer months results in a vigorous, productive strawberry bed. Most of the plant roots are in the top 18 inches of the soil. Irrigate the planting in the two most crucial times in its life: before and during harvest to ensure good fruit size, and in late summer as flower buds form. Do not use excessive amounts of overhead watering during the bloom period. This can encourage fruit rot later.

Weed Control

If perennial weeds are under control before planting, use a granular herbicide to partially control annual and broadleaf weeds during the life of the planting. Apply the herbicide to weed-free soil. Expect up to 4 months' residual weed control if you apply the product in early spring before seed germination.

Renovation

After June-bearers finish producing fruit for the season, cut or mow all leaves to stimulate vigorous new growth. Avoid damaging the crown of the plants in the process. Dig up and replant rooted runners in bare areas. Rototill the row width to 12 inches. Use rooted runners to replace weak areas of day-neutrals. Maintain the hill systems for June-bearers.

Next, apply fertilizer, control weeds, and irrigate adequately. Apply enough fertilizer to established June-bearing beds to stimulate late summer plant growth and flower bud initiation for the following season's crop. One-half of the pre-plant fertilizer amount is adequate.

Growers often replace day-neutral beds after 2 fruiting years, as plant vigor and fruit size become marginal.

Harvest and Storage

Fruit is ready for harvesting when its entire surface area becomes a bright red. The color indicates berries have reached the maximum in flavor, sweetness, and aroma. Keep fresh berries in the refrigerator for 24 to 48 hours. They last little more than overnight at room temperature. Pick strawberries with their green calyxes left on. Handle them carefully to reduce bruising. Cool fresh berries promptly (32°F to 15°F) to extend their shelf life. Clean and process fruit destined for the freezer or for use in preserves soon after harvest.

Disease and Insect Problems

Diseases

Infection of home garden strawberries by virus diseases is the most important factor limiting plant life span. The presence of virus leads to a gradual loss in vigor in plant height and spread, as well as a marked reduction in the yield. Leaves become cupped, yellow, or streaked, depending upon which virus has infected the plant. Aphids spread viruses when they feed on plant sap. Planting noncertified nursery stock also can spread viruses. The most common control measure is to dig out infested plants and replace them with certified nursery stock. Growers can use the same area of the garden, since the virus requires strawberry plants as a living host to survive.

Root rot can be a problem in poorly drained soils. Several different soil fungi, some of which can survive in the soil for many years, are responsible for the characteristic leaf reddening, and stunted and discolored root systems. No registered fungicides are available to home gardeners for the control of root rot. Remove infected plantings. Reestablish new beds on better drained ground to avoid root rot.

Verticillium wilt spreads by a soil-borne pathogen, similar to the one that causes wilt and decline in tomatoes and potatoes. Older, outer leaves wilt, and newer, inner leaves remain green and erect. Eventually, wilt can kill the entire plant. Generally, do not plant strawberries in an area where tomatoes or potatoes have been grown previously. Strawberries, like other small fruits, are highly susceptible to flower and fruit deterioration caused by Botrytis gray mold. Infected blossoms brown and wither without producing fruit while developing fruit rot and exhibit the characteristic gray, fungal growth. Control fruit rot with fungicidal spray applications during early bloom, restrict use of overhead irrigation from bloom through harvest, maintain good air circulation in the planting, and harvest fruit every day.

Insects

The root weevil is the most common insect pest of strawberries. Adult weevils notch leaves when they feed. The larvae or grubs, however, are the most damaging. They feed on plant roots and cause the plant to wilt and die. Home gardeners have no insecticide they can use to control the grubs. A liquid insecticide provides partial control for adults if it is sprayed on the foliage during the early evening when adults begin feeding. In addition, fall plowing the future planting site protects the newly established plants. Controlling root weevil adults on adjacent ornamentals is also beneficial.

Use insecticides to control aphids on a planting to reduce the incidence of viruses. Spider mite infestations, although infrequent, can result in leaf speckling and bronzing. Masses of foam that cover developing fruit and stunt its growth characterize spittlebug infestations. Apply insecticide shortly before bloom to control spittlebugs. Control is more difficult when masses of foam have appeared. Slugs feed on leaves and fruit, especially during cool, moist weather. Slime trails accompany slug feeding damage. Control slugs by smashing adults, or by setting out insecticidal baits between the rows, but do not apply bait to foliage or fruit.



BLACKBERRIES

Blackberries and raspberries are members of the same genus, *Rubus* sp. Unlike raspberries, however, picked blackberries retain the fruit receptacle, or core of the berry with the fruit. As is the case with raspberry, blackberry flowers are self-fertile, eliminating the need for an additional pollinizer cultivar.

Well-known blackberry cultivars, such as Marionberry or Boysenberry, do best in areas west of the Cascades, and south of Puget Sound. Even in mild areas, however, winter injury is a constant concern. Near 5°F, canes can suffer freeze injury that results in poor bud emergence in spring. Most commercial blackberries grow in the north Willamette Valley near Salem, Oregon. Commercial blackberry acreage has not expanded in the last 5 years, partly because of cultivar susceptibility to freeze injury. East of the Cascades, growers can keep vines of the trailing types on the ground and mulch them during the winter. Nonetheless, high summer temperatures and low relative humidities often result in small yields and poor fruit.

Cultivars

Western trailing types, often called dewberries (*Rubus ursinus*), are the most widely planted commercial cultivars, exhibiting vigorous growth. You can train them by tying trailing canes to a post and wire trellis. These biennial plants form nonbearing primocanes the first year and fruiting floricanes the second year. Canes die shortly after fruiting, when it is time to cut and remove them. The earliest bearing cultivars generally produce fruit by the first week in July in southwest Washington; the latest cultivars bear fruit in late August.

Developed in the southern Midwest, the cold-hardy, erect thorny cultivars (e.g., Cherokee) are more suited to eastern Washington. The plants produce much stiffer canes that will stand erect with proper pruning techniques. Erect types are cold-hardy enough for most of Washington.

Semi-erect thornless (e.g., Chester Thornless) cultivars were developed in Illinois. The new thornless types are significantly sweeter than older cultivars, such as Smoothstem and Black Satin. Newer Pacific Northwest thornless blackberry cultivars are hardy to approximately 0°F.

A number of different raspberry-blackberry hybrids have recently been introduced. The Tayberry, from Scotland, has thorny trailing canes that bear large, narrow reddish black fruit with a sweet, fruity flavor ([Table 7](#)). The Tummelberry and Sunberry are also thorny; each has a distinctive flavor. Hybrids often are more suitable for processing than for eating fresh because of their unusual flavors.

Table 7. Pacific Northwest blackberry cultivars

Cultivar	Harvest season	Fruit characteristics	Plant characteristics
Loganberry	Early	Large, elongated, dusky red berries, juicy and acidic. Can be used for fresh-eating, frozen, or preserves.	Thorny canes of moderate vigor. Needs winter protection for eastern Washington.
Boysenberry	Mid-season	Very large reddish black fruit, which are soft and sweet-tart in flavor (suggestive of	Thorny, vigorous canes. Hardy to approximately 10°F

		raspberries). Excellent fresh or frozen.	without winter protection.
Marionberry	Mid-season	Black and shiny fruit of medium firmness, with a sweet flavor.	Very productive, vigorous canes with numerous large spines. Canes need winter protection in many parts of Washington.
Tayberry	Mid-season	Large, long, reddish black berries, less acidic than Loganberries.	Extremely thorny canes of moderate vigor. Canes need winter protection in eastern Washington.
Cherokee	Mid-season	Medium-large black fruit similar to Marionberries but firmer, excellent flavor.	Canes erect, thorny; hardy to -10°F. Bushes are very vigorous and productive in areas west of the Cascades.
Chester Thornless	Late	Similar in size and shape to Thornless Evergreen.	Canes erect, and winter-hardy for most of Washington.

Site Selection and Preparation

Blackberries generally are more tolerant of varying soil conditions than are red raspberries. They can tolerate heavier soil textures. Even so, avoid sites or tile drain sites that have standing water in the winter. Provide a shelterbelt around sites that receive considerable wind during the winter months to avoid cane damage. Prepare the planting site as you would prior to planting red raspberries. Ensure that the planting site receives full sun exposure.

Establishment and Cultivation

Planting

Dormant blackberry planting stock is available for immediate planting in nurseries from mid-January to March in western Washington. You also may obtain rooted cuttings from established plantings through a propagation method known as tip layering. Bury the last 6 inches of primocanes during late summer. A root system and a new shoot then develop in the fall for mid-January transplanting. Perform this operation only with healthy, disease-free propagating stock.

Planting distances vary according to the vigor of the cultivar. Set Boysenberries 4 feet apart within the row. Set more vigorous cultivars such as Marion, 5 to 6 feet apart. Space rows 8 to 10 feet apart. Maintain plants in this stool system for the life of the planting. Since relatively few sucker canes arise from each of the stools, retain all primocanes for later training. Plant erect types 3 to 4 feet apart within rows, keeping rows 8 to 10 feet apart.

Fertilization

Base fertilizer application rates on the length of primocane growth made each year. Apply fertilizer in the late winter as the plants begin to break dormancy. Use the same fertilizer rates that are recommended for raspberries.

Trellising and Training

A trailing-type blackberry trellis consists of stout end posts, either wooden or metal intermediary posts, and two 12-gauge wires set 18 inches apart. Place the top wire 5 feet above the ground ([Figure 2](#)). Leave 3.5 feet below the bottom wire for training new canes along the ground within the row as they elongate during the summer.

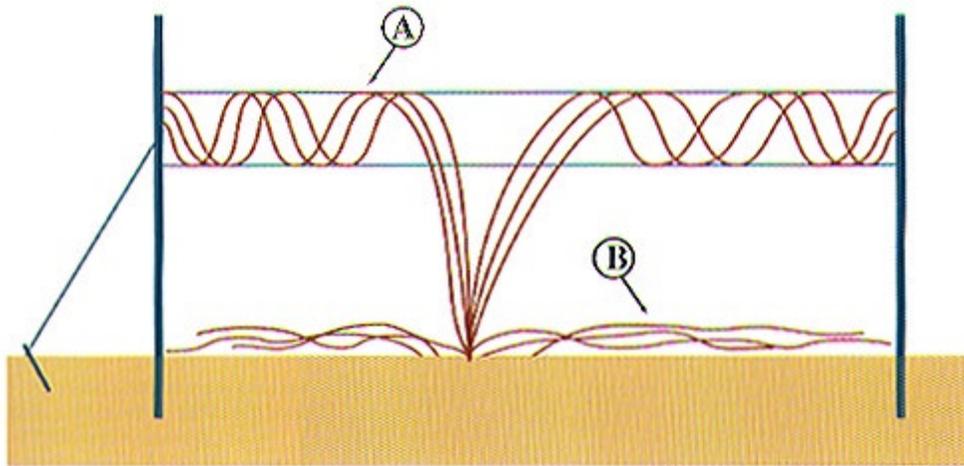


Figure 2. Training system for trailing blackberries where fruiting canes A.) are woven upon the trellis wires and primocanes B.) are allowed to run freely upon the ground.

Blackberry primocanes (new canes) grow for one year, overwinter, set fruit the following summer, and then die. Cut out floricanes (canes that bore fruit during the summer) at ground level and either till into the alleyway or remove from the planting. Then train primocanes singly in a spiral, fan-shaped wrap on the two wires. Put the longer canes on first. Train each cane over the top wire, then under the bottom wire in succession. Separate canes along the wires to ensure good air circulation.

Train trailing types during August in the warmer regions of western Washington. If canes suffer from winter desiccation, delay training them until the following spring. However, disease and insect problems are usually worse when you train canes in the spring.

Tip primocanes of erect blackberry cultivars to 36 inches as they develop during the summer to promote lateral branching. After harvest, retain only three to four of the strongest primocanes. During the following spring, cut back lateral branches on floricanes from 12 to 18 inches ([Figure 3](#)); this practice improves fruit quality.

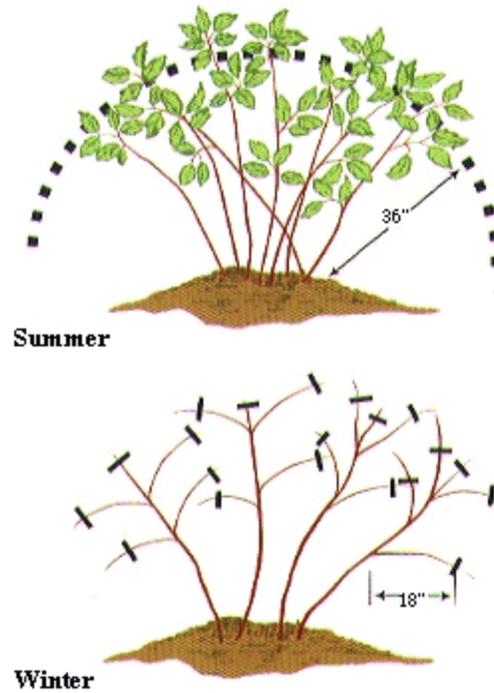


Figure 3. When pruning erect blackberries, tip back primocane growth in the summer to 36 inches. During the following winter cut laterals back to 12 to 18 inches.

Disease and Insect Problems

Blackberries suffer from many of the same pathogens that attack red raspberries. Root rot is often a lesser problem on blackberries because the fruit is more tolerant of heavier soil types. Fruit rot (refer to discussion on raspberries) often is less severe, since berries mature during the drier portion of the summer. Minimize fruit rot by keeping the primocanes well separated during training to ensure good air movement through the canopy, and by picking regularly.

The most notable disease on trailing blackberries is leaf and cane spot. The disease causes 1/8-inch leaf spots that vary from light to dark brown and take on whitish centers with brown to red borders. In the spring, canes of Marion and Evergreen blackberry also display irregular elongated purple blotches that can develop into cankers and girdle the canes. Promptly remove spent fruiting canes, train primocanes in August, and apply fungicide in the spring and fall to control the disease. Other cane diseases of blackberries are anthracnose and crown gall. Refer to the raspberry section for further details.

Redberry mite infestation results in fruit that do not ripen uniformly. Infected fruit form bright red or hard green drupelets that spoil fruit flavor. Microscopic mites overwinter in cane bud scales. Train canes in August, and apply miticides thoroughly in the fall and prior to spring budbreak to control red mite damage.

**KIWI**

Kiwi, *Actinidia deliciosa*, a relative newcomer to the Pacific Northwest, originated in the Yangtze River Valley of China. New Zealand, and more recently California are large commercial producers. The popular kiwi is a subtropical vine that grows up to 30 feet long and produces numerous, fuzzy brown, berrylike fruit the size of large eggs. The fruit have a tough skin that must be peeled off before eating. The flavor resembles a combination of strawberry and melon.

Kiwi vines are normally winter-hardy to somewhere between 0°F and 10°F, depending upon degree of plant dormancy. Avoid sites prone to early fall freezes or late spring frosts. Expect fairly consistent crops in western Washington if the crop is in a sheltered field. The kiwi's lower trunk is the most sensitive to cold. Growers have used kraft paper or plastic coated foam insulation to protect the vines.

Kiwi is a dioecious plant: male and female flowers are produced on separate plants. To cross-pollinate, intersperse male vines with the female fruit-producing vines. Pollen from one male vine can pollinate up to eight surrounding female vines. Male vines flower profusely, but do not produce fruit. Numerous stamens-the pollen producing structures-and lack of styles-the pollen receptors-characterize male flowers. Female flowers have just the opposite characteristics. Honey bees pollinate kiwis. Open flower clusters are not very attractive to bees; a shortage of bee activity results in small, misshapen fruit.

Vines do not begin to bear fruit until they have grown for 4 years. Maximum production is not attained until 8 years. Growers in the north Willamette Valley report vine yields of up to 200 pounds of fruit per plant.

The hardy kiwi, *Actinidia arguta*, differs from the fuzzy kiwi in that the fruit are smaller (1 inch across), shiny green, and can be eaten without peeling. Nurseries report that hardy kiwi vines are cold-hardy to -25°F.

Neither home nor commercial growers of kiwi in the Pacific Northwest have reported any serious insect or disease problems.

Cultivars

Nurseries recommend Hayward, the popular commercial fuzzy kiwi cultivar available in supermarkets, for the Pacific Northwest. Other notable cultivars are Blake and Saanichton 12. Select either the cultivar Matua or Tomuri as the pollinator; nurseries often simply refer to them as the male plant.

The recommended hardy kiwi female is Ananasnaja. Once again the pollinator is simply referred to as the male vine. This male vine can be used to pollinate the fuzzy female kiwi. A self-fertile female cultivar, Issai, has recently been introduced.

Establishment and Cultivation

Select a sunny, wind protected, well-drained site for kiwi plantings. Kiwi plants are vigorous vines that produce a considerable weight of fruit. Erect a sturdy arbor or trellis to support the plants. The best trellis for

ease of harvest and pruning for the home gardener is a 6-foot T-bar trellis made of treated post set in concrete. Space three to five 12-gauge horizontal wires at 1- to 1.5-foot intervals and space plants 15 to 20 feet apart within the trellis. The New Zealand Renewal system ([Figure 4](#)) is the preferred training system for kiwis on a T-bar. After planting allow the vine to grow straight up to the middle wire. Pinch the terminal bud to stop its growth. Select two buds that will grow to become permanent leaders in opposite directions along the middle wire.

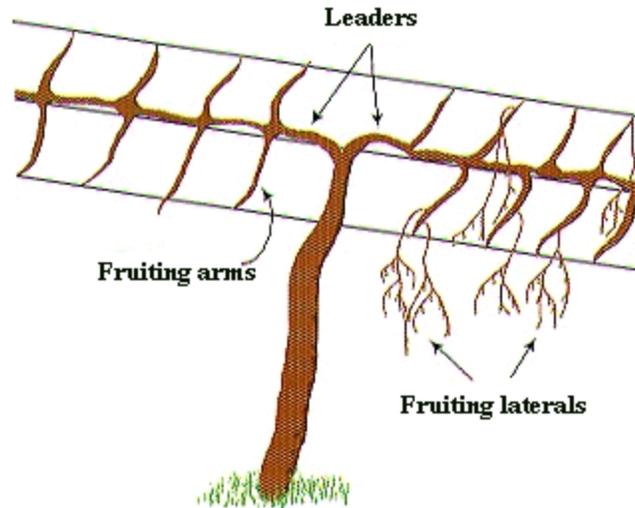


Figure 4. New Zealand Renewal System for training kiwi vines.

During the second growing season, select fruiting arms spaced at 2-foot intervals along the permanent leaders. These developing fruiting arms will grow at right angles to the permanent leaders and will bear for 2 to 3 years. Fruit will develop on shoots from these arms and hang down below the trellis wires. In the spring, pinch back the developing fruiting shoots to six leaves. Pinch off near the wire any erect water shoots on top of the trellis. During the summer, continue to pinch off the majority of developing arms. Leave only a number sufficient to serve as replacements for shoots that are no longer fruitful. During the winter, cut 2-year-old arms back severely ([Figure 5](#)); leave only two to three fruiting shoots that bore fruit the previous summer. These shoots will bear new shoots and fruit the next spring and summer.

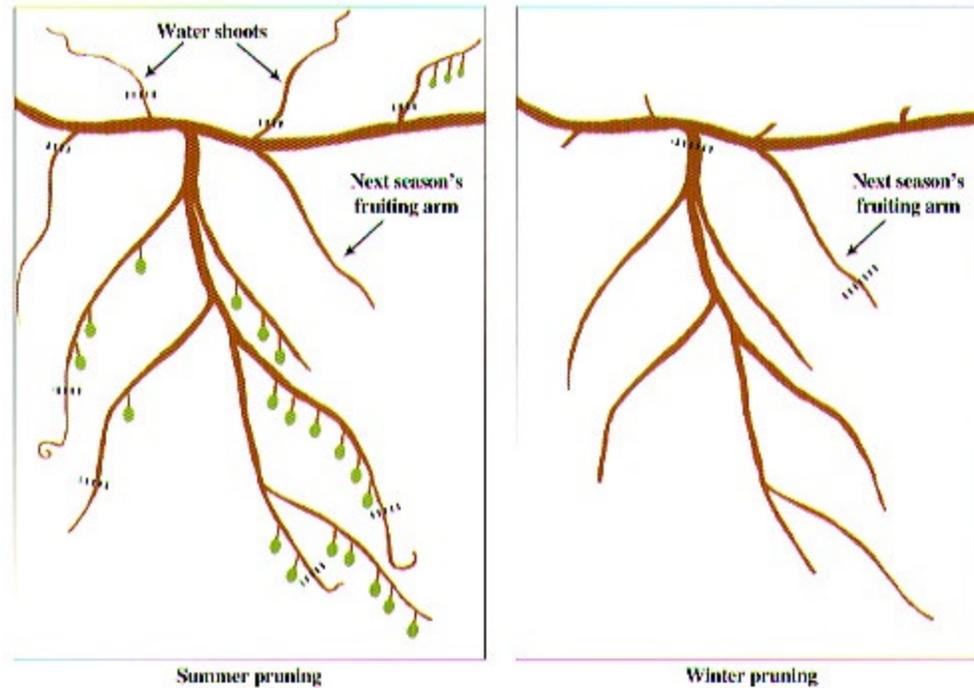


Figure 5. Winter and summer pruning cuts on kiwi vines.

Harvesting and Storage

In western Washington, harvest fuzzy kiwi in late October. Pick fruit while still hard; a slight depression on the surface of the fruit when pressed hard with the thumb serves as a good indicator. The surface color of the fruit will have turned from green to full brown. Pick vines three or four times; harvest the larger fruit and leave the smaller ones to swell. Fruit can be left on the vine through a light freeze and even after the leaves have fallen, but it will shrivel if exposed to a hard frost. Snap the fruit off the vines but leave the fruit stalks intact.

Store fruit for 1 to 2 months in cold storage (32°F) before setting it out at room temperature to ripen. Once ripe, the fruit should last 10 to 14 days. Refrigerated fruit may last up to 4 months. Do not store kiwi fruit with apples. Ethylene gas given off by the apples hastens kiwi ripening. Use a ripe apple to speed ripening of kiwi brought out of refrigeration.



CURRENTS AND GOOSEBERRIES

Currants, *Ribes sativum*, and gooseberries, *Ribes grossularia*, are considered shrubby bush fruits that bear colorful spring flowers and abundant berries that are tasty when processed. Unlike blueberries, they do well

on almost any Northwest soil of average fertility, whether it is slightly acidic or alkaline. In addition, they can grow on soil that does not drain adequately to support strawberries or raspberries. Both currants and gooseberries flourish in areas of partial shade where soil stays moist.

Currants and gooseberries are hardy in protected areas of eastern Washington. They bloom fairly early in the spring, so avoid frost prone sites. They are considered drought tolerant, but irrigate them well during the summer. Because the plants can suffer under high temperatures, consider planting in a field with a northern exposure, or under the shade of a deciduous tree.

Gooseberry plants can reach 5 to 7 feet at maturity. They generally have thorny, arching canes borne singly along the stems. The fruit is too tart to be eaten out of hand and must be cooked for use in pies, jams, jellies, and preserves.

Currants are more erect than gooseberries and are thornless. Fruit are borne in grapelike clusters. Red-colored currants, while not as tart as gooseberries, are best when used in pies and preserves.

Widespread adoption of both fruits has been slow because they serve as alternative hosts for white pine blister rust, *Cronartium ribicola*, a disease that attacks five-needle pines, including western white pine and eastern white pine, in addition to *Ribes* spp. In the past, planting currants and gooseberries was illegal because of the potential damage to pines. Restrictions in the United States were dropped in 1966 after researchers determined that many wild *Ribes* spp. also serve as alternate hosts. Nonetheless, if five-needle pines do occur in the landscape, consider planting other small fruits.

Cultivars

Recommended red currant cultivars are Red Lake, Perfection, and Wilder. A good white cultivar is White Imperial. Black currant cultivars include Consort and Crusader, both of which are considered rust resistant. Currants ripen in late July in western Washington.

Gooseberries ripen from mid-June through early July. Both currants and gooseberries ripen on 2-year-old wood, but generally do not bear heavily for 3 to 4 years. For gooseberries, consider Poorman (red), Pixwell (pink), Oregon Champion (green, thornless bushes), or Captivator (pink).

Establishment and Cultivation

Planting

Dormant stock is available for mid-winter planting in January and February in western Washington. Set plants 5 feet apart. A thick layer of mulch or well rotted manure keeps roots surrounding the plants evenly moist during the dry summer months. The root systems are as shallow as those of blueberries.

Training

Grow gooseberries and currants as free-standing bushes, in hedgerows, or as fan-shaped bushes up against the side of a wall. The last method allows for easier picking when thorns are present. Diseases usually cause fewer problems because air can circulate through the foliage.

The objective in pruning free-standing bushes is to develop an open vase-shaped bush with equally spaced branches. In general, use more thinning cuts (removal of an entire branch back to the base) than heading cuts (shortening a branch). Failure to keep a bush pruned usually results in a brushy, unthrifty bush. The 2-, 3-, and 4-year-old branches are the most productive; at maturity a healthy bush probably has no more than six to eight branches.

Harvesting and Storage

Harvesting currants and gooseberries is a slow process, especially when gooseberry cultivars have thorns. Currants ripen over a 2-week period. Once mature, however, they hold on the bushes for a week without spoiling. Do not remove red currants intended for juice or jelly from the stems, as the products are strained. Black currants are prized for their distinctive flavor in preserves and juices; in France, one cultivar is used for the manufacturing of brandy.

Gooseberries mature over a 4- to 6-week period. Pick them individually when the fruit attain full size. Juice, preserve, or freeze the fruit. All *Ribes* fruits are high in vitamins A, B, and C.

Disease and Insect Problems

The principal disease problem on both currants and gooseberries, beside blister rust, is powdery mildew. The disease is characterized by a whitish, powdery growth that occurs on leaves, shoots, and fruit. During fruit maturation, heavily infested fruit take on a brown, rough coating that makes them unusable. Humid conditions and crowded plantings that reduce airflow through the canopy favor powdery mildew. Begin fungicide applications at the delayed dormant stage of growth, and follow with additional applications at prebloom as buds begin to open. Apply again at full bloom.

Currant fruit flies, also known as gooseberry maggot, aphids, and imported currantworm larvae are the principal insect pests of currants and gooseberries. Aphids can devitalize the plants and leave the fruit with a sticky, undesirable coating. Currant fruit flies emerge as adults from the soil beneath the bushes in April, and soon lay eggs in developing berries. Resulting white maggot larvae feed within the berries, causing them to turn red and drop from the bushes. Apply foliar insecticides to the bushes in mid- to late April when adult flies are first noted. Imported currantworm larvae can defoliate *Ribes* bushes in a matter of days if left unchecked. Larvae, 1/2 inch long, are green with distinctive black spots.



Miscellaneous Small Fruits

A number of minor small fruit crops that have ornamental and food uses are suitable for the home garden .

Elderberry

The common or American elderberry, *Sambucus canadensis*, forms a moderately tall shrub (6 to 16 feet) that bears large, flat-topped flower clusters. These produce an abundant quantity of purplish black berries approximately 1/4 inch in diameter. Plants grow on soil types that range from very moist to fairly dry. It takes 2 to 3 years for full production (10 to 15 pounds of fruit per bush). To promote good growth of elderberry bushes, annually prune any canes older than 3 years of age and leave a total of seven to nine canes on each bush.

Fruit grow principally on 2-year-old canes, although smaller flower clusters occur on 1-year-old canes. Fruit usually mature from late August to mid-September. Remove entire fruit clusters for later cluster stripping before processing. Make berries into sauces or use for pies or tarts, juice and wine, either alone or in combination with other berries. In the past, tannin in the bark and roots was used for tanning and dyeing leather. A cousin of the common elderberry is the Pacific red elderberry, *Sambucus callicarpa*, a bush that bears bright red berries. The bushes are attractive as ornamentals, but fruit are edible by birds only.

Juneberries

In the genus *Amelanchier* (Rose family), the Juneberry, *Amelanchier alnifolia*, known as serviceberry, saskatoon, sarvisberry, and shadbush, is a widely distributed slender shrub that can grow from 6 to 15 feet in height at maturity. Plants prosper over a wide range of soil types and pH variations. Drooping white flowers give rise to dark purple blueberrylike berries that mature in midsummer. Flowers are borne on 2-year and older wood. Prune a mature bush so five to seven shoots remain.

In the past, North American Indians prized the fruit for making pemmican, a dry mixture of fruit, meat, and suet. Today, people eat the berries fresh, use them in preserves, and make them into wines. Fruit harvested at an early stage of maturity have a higher pectin content and are more suitable for preserves. More mature fruit, having higher sugar content, are better suited for wine. Juneberries have no serious insect or disease problems; birds feeding on ripe berries can quickly strip the bushes.

Highbush Cranberry

Highbush cranberry, *Viburnum trilobum*, also called the American cranberrybush, forms an open, spreading bush that grows from 6 to 13 feet; a dwarf type grows to half that height. Highbush cranberry shrubs display showy white flowers in the spring. Bright scarlet fruit mature during late July. You can use the berries as a substitute in cranberry sauce if you strain the large seeds out first. Particularly high in pectin, the fruit is suitable for preserves. While cooking, add lemon or orange peel shavings to eliminate the odor the berries give off. Highbush cranberries have no reported serious insect problems. Powdery mildew may occur in limited air movement. The plants are hardy enough to grow anywhere in Washington.

Evergreen Huckleberry

Evergreen huckleberry, *Vaccinium ovatum*, is an evergreen shrub that can grow to 2 to 3 feet in full sun (twice as tall in the shade). Its blackish berries covered by a white bloom make the evergreen huckleberry a strikingly attractive ornamental. The fruit are used in preserves, and cut branches often are used in flower arrangements. Like other *Vaccinium* species, this one thrives in acidic soil. A closely related species, the red huckleberry, *Vaccinium parvifolium*, produces small, clear red berries on a slow-growing, spreading bush that prefers partial shade and an acidic, humus-rich soil.

Dwarf Blueberries

In the last 5 years, researchers have developed dwarf, or so-called half-high blueberries, by crossing the standard highbush blueberry, noted for its large fruit size and productivity, with the lowbush blueberry, *Vaccinium angustifolium*, low in stature and cold-hardy. This cross produces a winter-hardy plant that can survive the extreme low winter temperatures of the upper Midwest. In the Pacific Northwest, these plants have become desirable landscape plants that require minimum care and produce edible fruit. Popular cultivars are Northcountry, Northblue, and Northsky. While the yield of these cultivars will never match that of standard highbush types, they have a place in the container garden or container situations.

Lingonberry

Lingonberry, also known as the mountain cranberry and foxberry, *Vaccinium vitis-idea*, is a low-growing, evergreen groundcover, producing red new growth that later turns a glossy green. It grows to a height of 6 to 12 inches and prefers partial shade and a large amount of water during the summer. Clusters of white, urn-shaped flowers produce bright red, tart berries that mature in August and September, but may persist on the bushes all winter. Berries are tart to bitter when first picked, but their flavor improves when picked after the first frost. Fruit are highly regarded for use in preserves and syrups; use them as substitutes for the true cranberry. The plants are hardy enough to grow anywhere in Washington State.

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Pesticide Recommendations: Due to Frequent changes in pesticide labels, no pesticide recommendations are made in this publication. Consult annual revisions of *EB1015 Insect and Disease Control for Home Gardens-Small Fruits and Berries*. Acknowledgments: The author thanks Art Antonelli, Ralph Byther, Tonie Fitzgerald, George Pinyuh, and Bernadine Strik for their helpful review of the manuscript.



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