OREGON STATE UNIVERSITY EXTENSION SERVICE

GROWING BERRIES on the OREGON COAST:

Raspberries and Blackberries

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Contents

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.

The raspberry and blackberry group (also called caneberries in the western United States) includes raspberries, blackberries, and their hybrids. Raspberries include red-, yellow-, black- (also called blackcaps), and purple-fruiting cultivars. Blackberries include types with a trailing, erect, and semierect growth habit. The raspberry-blackberry hybrids (e.g., 'Boysen' and 'Logan', also known as "boysenberry" and "loganberry") are trailing blackberries.

Raspberries and blackberries have a unique growth habit. The plants have a perennial crown (plant base) and root system, and biennial aboveground canes. There are two types of fruiting habits:

- **Floricane-fruiting** (also call summer-bearing) raspberries and blackberries produce vegetative canes, called primocanes, in the spring. These grow throughout the first year and then go dormant in the fall. They overwinter and then produce flowers and fruit in their second year, at which point the canes are called floricanes. The floricanes die after fruiting. After the planting year, raspberry and blackberry plants will have both primocanes and floricanes at the same time.
- **Primocane-fruiting** raspberries and blackberries (also called fall-fruiting or everbearing) have a

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similar cane development and lifecycle, except the tips of the primocanes flower and fruit in the late summer or fall of their first year before they overwinter and become floricanes. The portion of the cane that fruited in the autumn dies back and the rest of the cane will fruit as a floricane in its second year. Primocane-fruiting raspberry and blackberry plants can be pruned to produce one crop (primocane only) or two crops (early summer on floricanes, and late summer and autumn on new primocanes).

Raspberries and blackberries can be distinguished by their fruit. Both produce an aggregate fruit of many drupelets (the individual sections of the berry, each of which encloses a seed). However, when raspberries are picked, the fruit comes off the receptacle (white central core that stays on the plant) and the berry is hollow inside. In blackberries, the receptacle stays attached to the fruit when picked. It is part of the fruit that we eat; thus, blackberries are not hollow.

Raspberries

All raspberry types produce primocanes from the crown and the base of old canes each year. Red raspberries can also produce new primocanes from buds on the roots, and so the plants spread out from the place they are planted. Raspberries that are floricane-fruiting produce fruit in June and July, depending on the cultivar. The fruiting season of primocane-fruiting raspberries is from early August until the first frost on the new primocanes, and June and July on the floricanes, depending on the cultivar.

Blackberries

There are three main blackberry types; they are differentiated by their cane growth habit—trailing, erect, and semierect.

- **Trailing blackberry cultivars** include 'Marion' (also known as "marionberry"), 'Obsidian,' 'Black Diamond', 'Columbia Star', and the hybrids 'Boysen' ("boysenberry") and 'Logan' ("loganberry"). They have excellent fruit quality, good aroma, and small seeds. New primocanes are produced each year only from the crown and may be up to 15 feet long. They trail along the ground unless they are trellised. Depending on the cultivar, the fruiting season ranges from June through early August.
- **Erect blackberry cultivars** include 'Navaho' and 'Ouachita'. This type produces stiff, erect canes that need summer and winter pruning. The fruit have a milder aroma and flavor and larger seeds than the trailing types; they are glossy and firm. New primocanes are produced each year from the crown and roots, so these plants spread. Erect floricane-fruiting types produce fruit from early July through August. Primocane-fruiting erect blackberry cultivars, such as 'Prime-Ark® 45' and 'Prime-Ark® Freedom', produce fruit from September to the first fall frost.
- **Semierect blackberry cultivars** include 'Triple Crown', 'Loch Ness', and 'Chester Thornless'. Like erect types, they benefit from summer and winter pruning. The canes are vigorous, thick, and arching, and are only produced from the crown of the plant. These are late-fruiting types, generally producing fruit on the floricanes from August to frost in the autumn.

Site selection

Some raspberry and blackberry plantings can produce for over a decade, so you should carefully select an ideal location for planting. Even black raspberries, which tend to succumb to disease after 4 to 8 years, benefit from good site selection. Direct, full sun is best for good fruit production. Raspberry and blackberry plants can tolerate partial shade, but yield and fruit quality may be lower. Raspberries and blackberries prefer well-drained, fertile, loam soil with moderate water-holding capacity. Blackberry plants are tolerant of wet, heavy soils, while raspberry plants are sensitive. This sensitivity increases their vulnerability to root rot. In addition, raspberries are also susceptible to verticillium wilt, a soil-dwelling fungal disease. Avoid planting raspberries in sites where other verticillium-susceptible crops (such as strawberries, kiwifruit, potatoes, tomatoes, peppers, or eggplant) have been planted in the past 5 years. Crop rotation will also disrupt other pest and disease cycles in the field.

Coastal wind can damage raspberries and blackberries. 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 14.

Soil

Soil nutrients and pH

Raspberries and blackberry plants require soils with a pH range of 5.6 to 6.5, which is often higher than the pH of native coastal soils. Test the soil 6 months to a year before you plant to give yourself enough time to modify the soil pH or add nutrients, if required. For more information about soil testing, see *Laboratories*

Serving Oregon: Soil, Water, Plant Tissue, and Feed Analysis (EM 8677), *Soil Sampling for Home Gardens and Small Acreages* (EC 628), and *Soil Test Interpretation Guide* (EM8713). If the soil is too acidic (the pH is too low), add lime to the soil as recommended by the soil analysis to raise the soil pH to the upper end of the ideal range for the berry crop. See *Applying Lime to Raise Soil pH for Crop Production—Western Oregon* (EM 9057) for more information. In general, if your soil pH is too low for berry production, incorporate finely ground dolomitic limestone at a rate of approximately 5 to 10 pounds per 100 ft^2 (1.1 to 2.1 ton per acre). You may also use high pH composts to add organic matter and increase soil pH (see *Growing Berries on the Oregon Coast: An Overview* (EM 9177). These amendments should be incorporated about a year prior to planting as it takes time for the soil pH to adjust after the addition of lime. See Table 1 for soil nutrient ranges for raspberries and blackberries.

Drainage

Raspberries are very sensitive to poor drainage. Because of their large root system, raspberries benefit when planted in well-drained soil that is at least 2 (and ideally 3) feet above the water table. Usually, raised beds are required to grow raspberries to ensure adequate drainage. Blackberries, on the other hand, are more tolerant of heavier soils and usually don't need to be planted in raised beds. Ideally, provide a well-drained, fertile, loam soil with some water-holding capacity. This will ensure your raspberry and blackberry plants will be more vigorous and produce more fruit, regardless of type or cultivar. More detailed information on drainage and options for improvement is available in *Growing Berries on the Oregon Coast: An Overview* (EM 9177).

Raspberry and blackberry cultivars for the coast

Raspberry

All types of raspberries are self-fruitful, so only one cultivar is needed for pollination and fruit production. See Table 2 (page 4) for recommended cultivars for each type of raspberry. Primocane-fruiting ("fall-bearing") cultivars fruit quite late, so they may need to be grown under tunnels for consistent fruit production during the late summer and autumn rains. Purple raspberries are not commonly grown in Oregon but may be a good addition to the home garden or a U-pick farm because they are excellent for processing into jams or pies. For detailed information on cultivars within each type, refer to *Raspberry Cultivars for the Pacific Northwest* (PNW 655).

Table 1. Recommended soil nutrient ranges for all raspberry and blackberry crops

Soil nutrient	Deficient at less than (ppm)
Phosphorus (P) (Bray)	20–40
Potassium (K)	150–350
Calcium (Ca)	1000
Magnesium (Mg)	120
Manganese (Mn)	20–60
Boron (B)	0.5–1.0

Blackberry

All blackberry cultivars are self-fruitful, so only one cultivar is necessary for pollination and fruit production. Trailing types have berries that are oblong with small seeds and intense, aromatic flavor. Erect types produce firmer fruit with larger seeds and less flavor and aroma. Semierect types produce high yields of late-season fruit with similar qualities to the erect types. Blackberry-raspberry hybrids are managed like trailing types. Many of these cultivars, however, need a warmer or more protected site for consistent fruit production. See Table 3 (page 4) for recommended cultivars for each type of blackberry. For cultivar descriptions, see *Blackberry Cultivars for Oregon* (EC 1617).

Raspberry planting systems

Purchase certified disease-free plants from a reputable nursery. Do not propagate or move "suckers" from an older, established planting. Raspberry plants are susceptible to root rot and viruses that can be introduced to your planting by noncertified plants. Raspberry plants are sold as either bare-root plants (short cane section with roots attached) or as potted plants, typically propagated using tissue culture. If they can't be planted immediately, bare roots should be heeled in by covering the roots with moist soil or sawdust. Begin planting as soon as you can work the soil in the spring. Dig a shallow hole that is large enough to accommodate the roots. Roots from bare-root plants should be spread out and the highest point of attachment of roots to cane should be 1 to 2 inches below the soil. Cover the planting hole with soil and firm the soil to remove air pockets. Water thoroughly and cut the canes of newly planted bare-root plants to 6 inches, if they are longer. Small, tissue-cultured plants need to be cared for in the same way as a tender vegetable transplant. Water them frequently until the plants are established. Larger, potted plants are a little less tender, but good water management is still important.

Table 2. Recommended cultivars for different types of blackberries			
Trailing types	**Semierect types**	**Erect types**	**Primocane-fruiting**
'Obsidian'	'Triple Crown'	'Ouachita'	'Prime-Ark® 45'
'Metolius'	'Loch Ness'	'Navaho'	'Prime-Ark® Freedom'
'Black Diamond'			
'Columbia Star' (Figure 1)			
'Marion'	(See Figure 4, page 5)		
'Wild Treasure'			
'Columbia Giant'			
'Halls Beauty'			
Blackberry/raspberry hybrids (managed like trailing types):			
'Logan' (Figure 2)			
'Tayberry'			
'Newberry'			
'Boysen'			

Table 3. Recommended cultivars for different types of raspberries			
Summer-bearing	**Primocane-fruiting**	**Black raspberries**	**Purple raspberries**
'Prelude'	'Heritage'	'Jewel'	'Brandywine'
'Cascade Dawn'	'Vintage'	'Munger'	'Royalty'
'Willamette'	'Kokanee'		
'Cascade Bounty'	'Autumn Bliss'		
'Chemainus'	'Joan J'		
'Meeker'	'Polka'		
'Tulameen'	'Himbo Top'		
'Cascade Delight' (Figure 3)	'Anne' (yellow)		
'Cascade Gold' (yellow)			

Photo: Bernadine Strik, © Oregon State University

Figure 1. 'Columbia Star'

Photo: Sally Reill, © Oregon State University

Figure 2. 'Logan' blackberries in Newport, Oregon

Photo: Bernadine Strik, © Oregon State University

Figure 3. 'Cascade Delight'

Photos: Bernadine Strik, © Oregon State University

Figure 4. Primocane-fruiting blackberry in mid-September in Willamette Valley, Oregon; primocanes were tipped to 3 feet tall.

Figure 5. 'Meeker' red raspberry grown in a hill system in spring. Note the new primocane growth from the crown and the roots.

Figure 6. 'Vintage' red raspberry being grown for a primocane-only crop in a hedgerow. Plastic will be placed on the tunnels to protect autumn fruit from rain.

Only primocane-fruiting types will produce a small crop in the planting year. All types will produce a "baby" crop the next year, and the third year they will be in mature production.

You can grow floricane-fruiting raspberry plants in a hedgerow (solid row of canes) or a hill-system (as individual plants) (Figure 5). Primocane-fruiting raspberry plants should be grown in a hedgerow (Figure 6).

Hedgerow system

Rows of raspberries should be spaced 8 to 10 feet apart and plants 2 (primocane-fruiting types) to 2.5 feet (floricane-fruiting types) apart. Keep any primocanes that emerge in the row area between plants. Maintain the row width to about 6 to 12 inches by removing any primocanes that emerge outside this area by pruning or rototilling. If you allow wider hedgerows, management tasks such as weeding, pruning, and harvest can be difficult and disease can become more of a problem due to the dense canopy.

Hill system

The "hill" in a raspberry planting is the cluster of canes that develops around a plant. Rows should be 8 to 10 feet apart and in-row plant spacing should be 2.5 feet. Individual hills should be restricted to a diameter of 1 to 1.5 feet. Remove all newly emerging primocanes that develop between the hills or in the aisles. In vigorous plantings, the primocanes may be thinned in winter to 6 to 8 canes per hill.

Black and purple raspberries are vigorous and should be planted with 8 to 10 feet between rows and 3 to 4 feet between plants within the row. These types only produce new primocanes from the crown and remain as individual plants.

Trellising

Most raspberries require trellising. Summer-bearing raspberry plants need a permanent trellis for support. Set treated wooden or metal posts at each end of the row (3 to 4 inches in diameter and 6 feet above ground) (Figure 7A, page 6). Set metal T-style posts every 15 to 20 feet in the row. Training is easiest with two sets of two high-tensile wires (generally 12-gauge)—one set near the top of the trellis (about 5.5 to 6 feet from the ground), attached directly to the posts, and one at about knee height, attached so you can remove them (for example, by using hooks, as shown in Figures 7B and C, page 6). This design will allow you to lift the lower wires out over the growing primocanes to pull them into the row and prevent damage. Use a wire-tightener in each of the top wires. You can also use a single, high-tensile wire at the top of the post and install a cross arm on each post to support the lower wires. The cross arm should be about 12 to 18 inches long, and nailed or bolted (Figure 7D, page 6).

If primocane-fruiting raspberries are grown for only a primocane crop (late summer to autumn fruit harvest), you can use a temporary support structure, such as a simple "T" trellis with a 1.5-foot-wide cross arm attached at about knee height. The T can be made using rebar with twine or wire strung down each side of the row to support the canes. This type of trellis is also commonly used for black raspberries (Figure 8).

Photos: Bernadine Strik, © Oregon State University

Figure 7. Trellis design options for moveable wire attachment to end posts (A), metal posts (B), wooden posts (C), and metal T-bars (D)

Container plantings

When soil in the garden is not well suited for berry production (even after you make all possible amendments) or space in the yard is limited, you can grow berry plants in containers on a deck or balcony. Choose a site that has good sun exposure. Because containers have a relatively low volume of soil, these plantings require careful monitoring and care, especially when watering and fertilizing. Choose a container and a potting mix that are well suited for the plant. Follow the planting, fertilizing, and pruning recommendations described in this publication.

The best types of raspberries for container production are primocane-fruiting cultivars, which produce two crops per season. Since raspberry plants are relatively deep rooted, they require a deep pot (2 feet deep or a 20- to 30-gallon size) and careful pruning to ensure the plant doesn't get too large for the container. Thin the plant to no more than 4 primocanes (and 4 floricanes when over-wintering) per pot (see "Pruning and training," page 9). It's very important that the potting mix and the container drain well if you want to be successful with container-grown raspberries. A recommended soil mixture is one part perlite, one part finely ground fir bark, and two parts garden or potting soil; yard centers may sell a similar mix in bulk. If desired, slow-release (sulfur-coated) fertilizer can be mixed into the potting mix at a rate of 8 cups per cubic yard of medium.


Photo: Bernadine Srik, © Oregon State University

Figure 8. Simple trellis for black raspberry (shown) or primocane-fruiting raspberry

Blackberry planting systems

Purchase certified disease-free plants from a reputable nursery. Blackberry plants are most commonly sold as potted plants propagated using tissue culture. Begin planting as soon as you can work the soil in the spring. Plant to a similar depth as the potting medium. Cover the planting hole with soil and firm the soil to remove air pockets. Small, tissue-cultured plants need to be cared for in the same way as a tender vegetable transplant (Figure 9, page 7). Water them frequently until the plants are established. Larger, potted plants are a little less tender, but good water management is still important.

Trailing and semierect blackberry plants should be grown as individual plants because they do not produce new primocanes from the roots. Space trailing plants 3 to 5 feet apart in the row and semierect plants 5 feet apart. Rows should be 10 feet (trailing types) to 12 feet (semierect types) apart. Erect blackberry plants are most commonly grown in a hedgerow. Space plants 2.5 to 3 feet apart in the row with 10 feet between rows. Keep any primocanes that emerge in the row area between plants. Maintain the row width to about

Photo: Bernadine Strik, © Oregon State University

Figure 9. Trailing blackberry at planting

12 inches by pruning or rototilling to remove any primocanes that emerge outside this area. If you allow wider hedgerows, management tasks such as weeding, pruning, and harvest can be difficult, and disease can become more of a problem due to the dense canopy.

Only primocane-fruiting types of blackberries will produce a small crop in the planting year. All types will produce a "baby" crop the next year, and the third year they will be in mature production.

Trellising

Although you can grow erect blackberries without support, trellising is beneficial to all types because it helps prevent cane breakage from wind, keeps the planting neater, and simplifies cultivation and harvesting.

- **Trailing types:** Trailing types only need a simple two-wire trellis. Use a similar post design as described for raspberries (page 5) with metal posts every 20 feet in the row. Run one high-tensile wire at the top of the posts (almost 6 feet high) and a second wire 4.5 feet above the ground. Install wire-tighteners at one end of each row.
- **Erect types:** Erect types will form a hedgerow as they produce short, stiff primocanes from the crown and the roots. A trellis similar to the one described above for primocane-fruiting raspberries (page 5) can be used, or you can install a more permanent trellis, such as the one described below for semierect blackberries.
- **Semierect types:** Use a "double T" trellis for these cultivars. Install wooden posts as described above for raspberries, but use them for all posts. Attach wooden 2x4s or metal to form the cross arms. Install one 4-foot-wide cross arm at the top of the post and one 3-foot-wide cross arm 2 feet below it. Use high-tensile wire along the row on the cross arms so that you have four wires extending between the posts. If you only have a few plants, you can grow these on simpler trellises, wrapping canes more like what is described for trellising and training trailing types (above and on page 11).

Container planting

Blackberries are extremely vigorous and most cultivars are floricane-fruiting. For these reasons, blackberries are less easily grown in containers.

Irrigation

Raspberry and blackberry plants, like all berry crops, need adequate water to thrive. You can irrigate your crop by hand, or with sprinklers or drip systems—whatever works best for you. The important thing is to make sure that adequate moisture is getting to the root zone. For more information on irrigation, see *Growing Berries on the Oregon Coast: An Overview* (EM 9177).

In all berry cropping systems, drip irrigation is ideal. Raspberries and blackberries can be irrigated with a single line of drip irrigation per row with ½ gallon emitters placed every 18 inches. Established raspberry and blackberry plants typically need from 1 to 1.5 inches of water per week during the growing season.

Mulching

A mulch can help control annual weeds, conserve soil moisture, and depending on the type of mulch, provide a source of nutrients. Be careful to not bury the raspberry or blackberry crowns as this can lead to crown rot or plant death. Deep straw is not recommended as it can bury the crown and lead to increased vole or rodent activity, which can damage the plants. For more detailed information on mulches, refer to *Growing Berries on the Oregon Coast: An Overview* (EM 9177).

Fertilization

New plantings

When fertilizing new plantings, plan to divide the total required nitrogen (N) into three equal portions, the first starting 2 weeks after planting, the next one a month later, and the last a month after that. Spread the fertilizer evenly down the row area. Fertigation can also be used in raspberries and blackberries. See the *Caneberry Nutrient Management Guide* (EM 8903) for more information.

- **Raspberry**—In the planting year, fertilize floricane-fruiting raspberries with a total of 2 ounces N per 10 feet of row (50 pounds N per acre), primocane-fruiting raspberries with 2.5 ounces N per 10 feet of row (70 pounds N per acre), and black raspberries with 0.5 ounces N per plant (45 pounds N per acre).
- **Blackberry**—In erect blackberries, fertilize with 2 ounces N per 10 feet of row (60 pounds N per acre). For semierect and trailing blackberries, apply 1 to 1.4 ounces N per plant, depending on soil type and plant vigor.

Established plantings

Well-balanced fertilizers, such as 16–16–16, some similar types of inorganic fertilizer, and some organic products, work well for raspberries and blackberries. See *Growing Berries on the Oregon Coast: An Overview* (EM 9177) for more information on fertilizing berry plants.

Fertilize floricane-fruiting raspberries with a total of 2 to 3 ounces N per 10 feet of row (50 to 80 pounds N per acre) and floricane-fruiting blackberries with 1.5 ounces N per plant or 3 ounces per 10 feet of row (80 pounds N per acre) per year. Fertilize primocane-fruiting raspberries and blackberries with 3 ounces N per 10 feet of row (80 pounds N per acre).

Divide the fertilizer into two applications, applying the first in late March to early April, just as the new primocanes start to grow, and the other in late May to early June. Semierect blackberries and primocane-fruiting raspberries and blackberries may require an additional 0.5 ounce N per plant or about 1 ounce per 10 feet of row (25 pounds N per acre) in mid- to late July to ensure there is adequate nutrition to accommodate the late-fruiting period.

Broadcast the fertilizer over the soil surface in the row area (about 2 to 3 feet wide, centered on the row). Irrigate immediately after fertilization. If you use manure applications (generally in autumn or early winter to a depth of about 2 inches), try reducing the fertilizer N by half and monitor plant growth to see if additional fertilizer N is needed. Fresh manure is not recommended as it is high in salt content and can burn plants.

If N is fertigated, divide the total recommended rate into equal amounts and make weekly or bi-weekly applications from early April through July, depending on the type of raspberries and blackberries grown.

A well-managed plant should have healthy green leaves with good primocane growth (a good number per plant and a normal length for the cultivar being grown). Pale green or yellow primocane leaves could indicate N deficiency. Primocanes that are too tall (e.g., 10 feet for raspberry), thin (less than 0.37 inch), or with long internodes (distance between leaves) indicate an excess of N fertilizer.

Monitor soil pH every few years and add lime in autumn to maintain the soil pH within the desired range for raspberries and blackberries.

Pollination

Raspberries and blackberries are self-fruitful, so only one cultivar is necessary for fruit production. In many home gardens and on small farms, there are often sufficient native honey and bumble bees to ensure good pollination. However, for good fruit set in larger plantings, place two to four hives per acre in a location that will ensure good bee activity. Keep in mind that pollination is affected by wind. Place hives in the field no earlier than when, on average, 5 to 10 percent of each plant 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.

Raspberry

Ripe raspberry fruit will separate easily from the receptacle. Hand harvest with a gentle pull on ripe fruit (Figure 10, page 9), ensuring the fruit are not squeezed, which reduces firmness and shelf life. In general, pick raspberries every 3 to 4 days, depending on the cultivar and the weather. Pick into shallow containers so fruit does not crush.

Hand-picked, summer-bearing red raspberries can be expected to yield 18 to 27 pounds per 10 feet of row (4 to 6 tons per acre). Primocane-fruiting cultivars and black raspberries will yield slightly less.

Blackberry

Blackberries are easy to pick when they are fully ripe. Use a gentle breaking motion, by moving fruit up or down (Figure 11, page 9). Most cultivars change from a full shiny, black color to a dull, black color when fully

Photos: Bernadine Srik, © Oregon State University

Figure 10. Picking red raspberries. When ripe, fruit pulls easily off of the receptacle.

Figure 11. Picking a blackberry

ripe. Shiny black fruit are high in acid with comparatively less flavor and sweetness than dull black fruit. In general, harvest blackberries every 4 to 7 days, depending on the cultivar and weather. Pick into shallow containers so fruit does not crush.

Trailing cultivars will yield 10 to 13 pounds per plant (4.5 to 5.5 tons per acre), erect types will yield 18 to 28 pounds per 10 feet of row (4 to 6 tons per acre), and semierect types will yield 25 to 35 pounds per plant (10 to 15 tons per acre).

Pruning and training

Summer-bearing red raspberries

For summer-bearing red raspberries, do not prune or tip (remove the top 3 or 4 inches) the primocanes during the growing season. You may remove any primocanes that grow outside the in-row area by cutting them off at soil level with loppers or by tilling beside the raspberry row. Small, commercial farmers may use registered contact herbicides to burn back the early emerging primocanes and lower fruiting laterals (primocane suppression).

After fruit harvest, the dying floricanes (Figure 12A, page 10) need to be removed by pruning them at the crown, near soil level (Figure12B); this is called caning out. Cane out immediately after harvest (Figure 12C) if there are cane disease issues, or wait until canes are fully dead by pruning them in autumn. Pruned canes can be chopped up between the rows using a flail mower, returning organic matter to the soil or be removed and composted. In winter (December through February), prune the remaining primocanes by removing weak, broken, diseased, and insect-damaged canes. Remove any primocanes that are outside the 6- to 12-inch-wide hedgerow by pruning or tilling. If you are growing plants in the hill system, leave all the healthy primocanes in the hill area and remove any that are growing between hills or plants and outside the row area. Shorten the primocanes to 6 feet and tie them to the trellis (Figure 13A, page 10) either as bundles of canes or individually. For a

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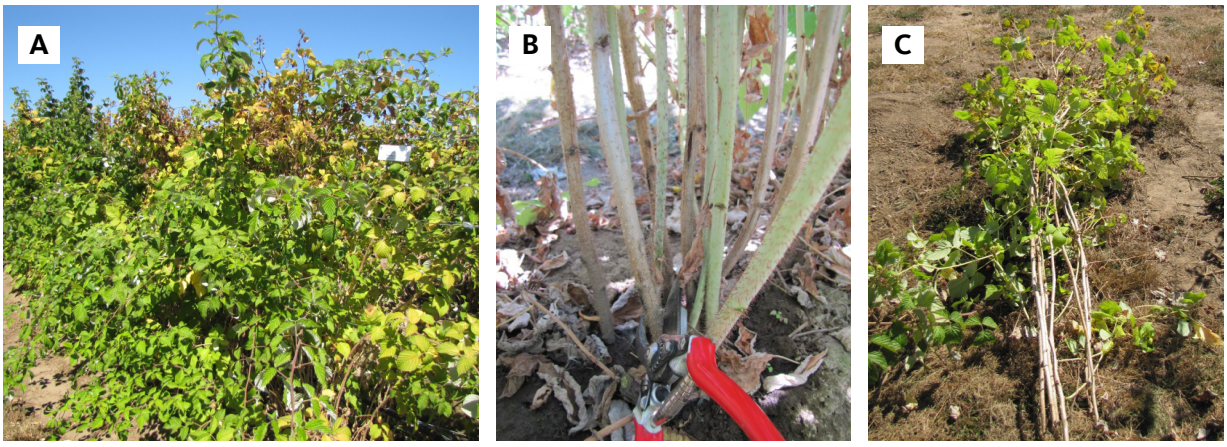

Figure 12. Summer-bearing red raspberry pruning. Dying floricanes (A) are yellow, whereas the new primocanes (B) are green; prune dying floricanes at crown level. Bundle of dying floricanes removed from one plant (C)

higher yield (although smaller fruit size), slightly tip the canes in late winter to remove very thin growth. Tie the cane bundle to the top wire and loop it down, tying the end to a lower training wire. This is called arc-cane training (Figure 13B).

Primocane-fruiting raspberries

Grow primocane-fruiting raspberries in a hedgerow. Maintain the hedgerow to a width of 12 to 18 inches by tilling or hoeing any primocanes outside the row (Figure 14). If you are producing two crops (floricane and primocane) per season, remove the dying floricanes soon after you harvest the early summer crop (following the instructions described for summer-bearing types) or the following winter. The late summer-autumn crop will be produced on the top portion of the new primocanes. In winter, remove the dead tips of the canes that fruited in late summer; the base of these canes will fruit in early summer as floricanes (Figure 14). Remove any weak or damaged canes and narrow the row. If you are only growing these cultivars for a single crop in late summer, cut all the canes to just above ground level in late winter (March) (Figure 15). Maintain your row width at 12 to 18 inches when the new primocanes emerge.

If you have the space, it is best to grow primocane-fruiting types for only the late-summer primocane crop and grow floricane-fruiting types for the early to mid-summer floricane crop. Summer-bearing types have better fruit quality and higher yield than primocane-fruiting types.

Black and purple raspberries

For black and purple raspberries, tip the primocanes in late spring or early summer by removing the top 3 to 4 inches. Top them to a height of about 3 feet. You will need to go over the planting multiple times throughout early summer to catch all of the primocanes. These types produce productive lateral branches when they are topped (Figure 16, page 11). Remove dying or dead floricanes anytime from after fruit harvest through autumn; some commercial growers do not remove these dead canes due to labor costs, but this can increase pests and disease in the canopy. In winter, remove any damaged or diseased wood and shorten the lateral branches on the primocanes to 1.5 to 2.5 feet (Figure 17, page 11). In larger plantings, this can be done by mechanically hedging the rows using sickle bars.

Photos: Bernadine Strik, © Oregon State University

Figure 13. Summer-bearing red raspberry training. Primocanes topped at 6 feet in winter (A) and primocanes arc-cane trained, showing early bud break and growth (B) in spring

Figure 14. Primocane-fruiting raspberry in spring. Note the dead portion of floricane that fruited the previous late-summer/autumn (when it was a primocane). Note the new growth on the base of the floricane – this will fruit in early summer. The dead tip should have been removed by pruning in winter.

Photos: Bernadine Strik, © Oregon State University

Figure 15. Primocane-fruiting raspberry in late winter after pruning for only a late-summer/autumn primocane crop

Photo: Bernadine Srik, © Oregon State University

Figure 16. Black raspberry showing floricanes fruiting and a primocane branching after it was tipped

Photo: Bernadine Srik, © Oregon State University

Figure 17. Black raspberry in spring showing branches that were shortened the previous winter and bud break on the floricanes. New primocanes are emerging at the crown

Trailing blackberries

In the first growing season of trailing blackberries, primocanes should be trained to the trellis as they grow. Bundle them together and use twine to attach them straight up to the top wire; wrap them around the two wires, spreading out the canes, if they grow taller. These are the canes that will produce fruit the next year. In all subsequent years, plants will have fruiting canes (floricanes) trained on the wire that flower in the spring, and new primocanes will begin growing. In most trailing cultivars, the primocanes will "flop" over once they are about 3 feet long and will continue to grow along the ground through the season. Train these primocanes in a narrow bundle underneath the floricanes (Figure 18A) so they are out of the way and are not damaged as they grow. You may use wire hoops or stakes to keep the primocanes from being damaged between rows. Training will be easier if all of the primocanes from each plant are trained in the same direction so they are less tangled with those from the adjacent plants. Tipping trailing blackberry primocanes during the growing season will encourage branching and will not result in an increase in yield.

Remove the dying floricanes by the end of August and train the new primocanes onto the trellis. Train by dividing the primocanes from each plant into two bundles. Loop half the canes in one direction from the upper to lower trellis wires, bringing them back towards the plant with one or two twists; loop the other half in the opposite direction (Figure 18B). It is nearly impossible to train the long primocanes without damaging or kinking some canes during the process; however, taking care during training will improve yield. Secure the canes to the trellis using bailer's twine or ties, if needed. Remove canes that are too short. In colder, higher-elevation

Photos: Bernadine Strik, © Oregon State University

Figure 18. Trailing blackberry during fruiting with floricanes on the trellis and primocanes trained under the canopy (A). Training the primocanes in August after removing the dying floricanes (B).

Photo: Bernadine Strik, © Oregon State University

Figure 19. Erect blackberry in spring

sites or in areas with high wind, leaving the canes on the ground and training in February, well before bud break, may be of advantage so that canes are not exposed to colder temperatures or high winds during winter.

Summer-bearing erect blackberries

For summer-bearing erect blackberries, canes may trail along the ground the first year. Don't worry; this is normal, and the canes will become stiffer as the plants age. Once plants are in their second growing season, prune primocanes and floricanes as described below.

The primocanes of erect blackberries require summer pruning for good yield. Tip the primocanes in late spring or early summer by removing the top 3 to 4 inches. Top them to a height of about 3 to 3.5 feet. You will need to go over the planting multiple times throughout early summer to catch all of the primocanes. These types produce productive lateral branches when they are topped. These cultivars will send up primocanes (suckers) outside of the hedgerow. The suckers should be treated as weeds and removed as they emerge, keeping the hedgerow no wider than about 12 inches.

In winter, prune out the dead floricanes and shorten the lateral branches on the primocanes to about 1.5 to 2.5 feet long (Figure 19). In larger plantings, this can be done by mechanically hedging the rows using sickle bars.

Primocane-fruiting erect blackberries

If you have the space, it is best to grow primocane-fruiting blackberry cultivars only for the primocane crop and other types for the floricane crop. Producing a floricane crop on these cultivars reduces and delays the primocane crop, making it too late for much of the fruit to be harvested prior to autumn rains or frost. To produce a primocane-only crop, remove all canes by cutting them just above ground level in late winter. Remove the top 6 to 12 inches of the tip of each new primocane when they are 3.5 feet tall. The lateral branches will flower and fruit in the fall (Figure 17, page 11). These benefit from a temporary or permanent T-trellis in most regions to prevent the canes from breaking in the wind.

Semierect blackberries

Semierect blackberry cultivars are summer-pruned, similar to erect blackberry cultivars. Remove the top 2 to 6 inches of the primocane tip when the cane is just over 4 to 5 feet tall. This will encourage lateral branches and increase yield the following year. You will need to check the planting several times to ensure you have tipped all of the primocanes.

In winter, remove the dead floricanes. Train the primocanes to the wires of the trellis being used. You can shorten the lateral branches if they are too vigorous and if training the longer branches is difficult; this often leads to increased berry size.

Pests and problems

Weed management

Weeds compete with the berry plants for water, nutrients, and light, so it is important to keep weeds out of the row. A mulch layer of sawdust or bark can help control weeds, particularly annual ones.

In trailing and semierect blackberries, and black raspberries, you can use a perforated, polyethylene ground cover ("weed mat") as a mulch for weed control in the row (Figure 20, page 13). This type of mulch doesn't work well in erect blackberries or red raspberries that produce primocanes from the roots because the weed mat inhibits new primocane growth. Install the weed mat prior to or just after planting by 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 can also lay down the weed mat just after you plant, feel for the plants under the plastic, and then to carefully cut the holes. Even though weed mat is perforated, it is best to 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

Photos: Bernadine Srik, © Oregon State University

Figure 17. Blackberries (trailing or semierect types) can be grown with weed mat in the first year.

supply store for herbicides registered for use on raspberry or blackberry 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 area 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.

Refer to the *PNW Plant Disease Management Handbook* for more detailed information on weed control and specific weeds.

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 (erect and semierect blackberry and primocane-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."

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*. Control options vary for commercial small-acreage farmers (with commercial pesticide applicator's license) and home gardeners.

- **Raspberries**—Insect problems include root weevils, raspberry crown borer, leaf-roller larvae, spider mites, and aphids.
- **Blackberries**—The most important insect problems are leaf roller larvae, raspberry crown borer, and red berry mite (late-fruiting cultivars).

Diseases

Control methods are outlined in the *PNW Plant Disease Management Handbook*. Control options vary for commercial small-acreage farmers (with commercial pesticide applicator's license) and home gardeners. Check with your local office of the OSU Extension Service for control recommendations if diseases become a problem.

- **Raspberries**—Raspberries are extremely sensitive to wet soils. Root rot, a soil-borne disease aggravated in wet, heavy soil, can be a major problem. Although most cultivars are susceptible to root rot, there are some that are tolerant or even resistant. Check *Raspberry Cultivars for the Pacific Northwest* (PNW 655) for information on cultivar susceptibility to root rot. Black raspberries are also especially susceptible to verticillium wilt. Powdery mildew, yellow rust, and anthracnose can also be problem in some raspberries.
- B**lackberries**—Common blackberry disease problems include cane and leaf spot, yellow rust, anthracnose, and fruit rot.

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* (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: Blueberries* (EM 9179) https://catalog.extension.oregonstate.edu/em9179

- *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

- *Blackberry Cultivars for Oregon* (EC 1617) https://catalog.extension.oregonstate.edu/ec1617
- *Raspberry and Blackberry Nutrient Management Guide* (EM 8903) https://catalog.extension.oregonstate.edu/em8903
- *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 Blackberries in Your Home Garden* (EC 1303) https://catalog.extension.oregonstate.edu/ec1303
- *Nurturing Mason Bees in Your Backyard in Western Oregon* (EM9130) https://catalog.extension.oregonstate.edu/em9130
- *Raspberry Cultivars for the Pacific Northwest* (PNW 655) https://catalog.extension.oregonstate.edu/pnw655

Problems

- *A Detailed Guide for Testing Fruit for the Presence of Spotted Wing Drosophila (SWD)* (EM 9096) https://catalog.extension.oregonstate.edu/em9096
- *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

Additional resources

- 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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