



BERRIES

FOR THE



INLAND

NORTHWEST





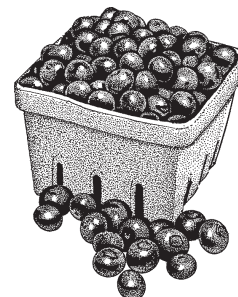
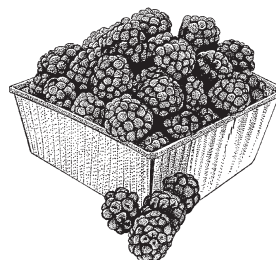
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GROWING BERRIES AND GRAPES



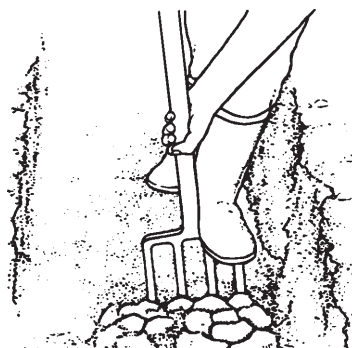
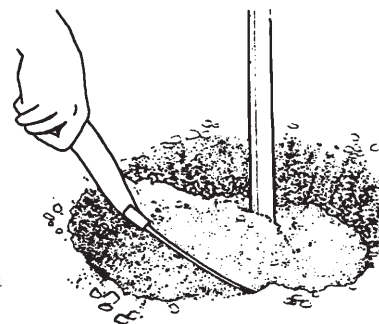
Berries and grapes offer many opportunities for Inland Northwest gardeners to expand their food gardens. Whether devoting a large portion of the garden to berries and grapes or tucking a few plants into a sunny corner, the following guidelines will help insure success.

Site selection

The ideal site for berries and grapes has 6 hours of sunshine and offers some protection from winter winds. Avoid low-lying areas where cold air collects and may kill young buds and blossoms.

Soil preparation

For best results, begin preparing your berry and grape plots the year before planting. Take time to remove weeds by repeated cultivation and/or using an herbicide on deep-rooted perennial weeds. Dig several holes in the garden and fill with water to monitor the time they take to drain. All the small fruits we grow in the Inland Northwest require quick drainage. If water doesn't drain away in 2 to 3 hours, consider a different location or build raised beds at least one foot high and fill with a combination of well-rotted compost and topsoil.



Cover the whole site with several inches of completely decomposed manure, compost, bagged steer manure, shredded leaves, or other organic material and dig or till into the top foot of soil. (If using raised beds these soil amendments can be limited to the individual beds.) This adds some nutritive value and improves the soil texture of either heavy or sandy soil. Planting a cover crop in the fall and tilling it in early in the spring will help control weeds and add organic matter to the soil. Further soil specifics are covered with each individual berry type.

Select varieties suited to the Inland Northwest climate

Our hardiness zones vary between USDA 4 and 5, depending on where you live. The varieties listed under each small fruit are considered hardy for the Inland Northwest. If you are new to the area ask your gardening neighbors which vegetables and fruits they prefer.

Cold acclimation

Keep your plants healthy by fertilizing as needed, controlling diseases and pests, and spacing and pruning properly to ensure they go into the winter in good condition. Do not encourage lush growth by fertilizing in the late summer or fall. (*The exception is strawberries, which are fertilized in late August.*) Reduce fall irrigation to harden off the plants before winter. One last deep watering before the ground freezes will help plants maintain moisture during the winter.

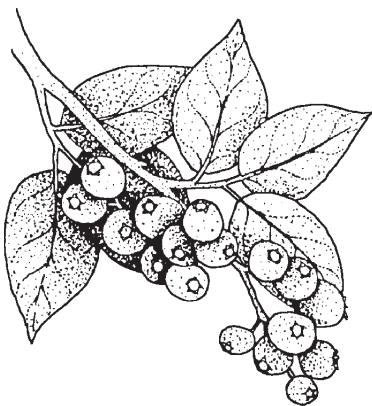
Mulch

Place sawdust or straw over the roots of berry plants to reduce winter injury and help control weeds. Rake the mulch away from the plants in early spring to allow the soil to dry and warm up.

Add 2 to 3 inches of organic mulches during the summer to protect roots from hot sun and drying winds. Organic mulches also keep the soil biology active, hold moisture, smother weeds, and add ongoing nutrition to the soil. Apply new mulch whenever the bare ground begins to show.



BLUEBERRIES



Blueberries are members of *Ericaceae* or heath family. They prefer growing conditions similar to those of rhododendrons and azaleas. Blueberries flourish in the moderate summer temperatures of the Northwest's coastal areas. They are not well adapted for eastern Washington and can be grown only with careful management of the soil environment. Bushes come into full production about six years after planting and yield about a gallon of berries per plant.

SITE SELECTION

- Full sun is best. Some shade, particularly in the late afternoon, may help avoid problems with sunburn in hot locations.
- Avoid planting in frost pockets where late cold snaps may injure the blossoms and young fruit. Also, very warm exposures such as on the warm side of buildings may force plants to bloom too early.
- Blueberries are classified by bloom time. Later blooming varieties are best suited for the Inland Northwest because they are less apt to be damaged by late spring frost.

SOIL REQUIREMENTS

- Blueberries require acidic soil with the pH in the 4.5 to 5.5 range. Most Inland Northwest soils have pH levels of 7.0 to 7.5. Test the soil where you plan to grow them. *The pH can be lowered one point by mixing 2 pounds sulfur powder per 100 square feet into the top 8 inches of soil.*
- If pH is between 5 and 6.5, mix 4 to 6 inches of peatmoss, sawdust, bark, or wood chips into the top 8 inches of soil. If you use uncomposted sawdust you'll also need to add extra nitrogen to prevent the soil nitrogen from being depleted. *As a rule of thumb, add one-half pound of ammonium sulfate (21-0-0) for each cubic foot of uncomposted organic matter.*
- If pH is above 6.5, plant blueberries in raised beds 8 inches deep. Fill with equal parts peatmoss and soil (sand mix). Soil below the bed must drain well.
- Since blueberries require an acid soil, soil tests should be done annually. Depending on the pH of the planting site, the root zone may benefit from sulfur applications every few years. Sprinkle powder around the dripline of each plant and gently scratch in. Water well after each application.

- Ammonium sulfate (21-0-0) gradually lowers soil pH.
- Red leaf color indicates nitrogen deficiency.
- Good growth and no red leaves means little or no fertilizer is required.

GROWING REQUIREMENTS

- Because they have a shallow, fibrous root system, blueberries prefer soils with high organic matter and good water-holding capacity.
- Water 1 to 2 inches per week.
- Mulching conserves moisture, controls weeds, and protects roots from extreme temperatures. Blueberries are shallow rooted and are susceptible to winterkill. Fall watering and good mulching will prevent dieback.

PLANTING

- Set dormant plants out as early in the spring as possible. It is important to prune hard after planting in order to stimulate vigorous growth.
- Plant bushes 5–8 feet apart in rows 8–10 feet wide.
- Blueberries are self-fertile; however, 2 varieties give good pollination and larger, earlier fruit.
- Use 2- or 3-year-old plants.

First-Year Care

1. Strip blossoms, preventing plants from setting fruit. This slows growth.
2. Remove dead branches, if any.
3. Mulch for weed control and to retain moisture.
4. *Do not fertilize the first year.*

Second-Year Care

1. Strip most of the blossoms.
2. Remove dead, damaged, or weak branches.
3. Renew mulch to 3–4 inches.
4. Fertilize.



Third-Year Care

1. Strip a few of the blossoms.
2. Remove dead, damaged, or weak branches.
Prune lightly.
3. Renew mulch to 3–4 inches.
4. Fertilize.



BLUEBERRY FERTILIZATION

Age of plants from transplant date	5-10-10 March 15– April 15	Ammonium sulfate (21-0-0) May 20	Ammonium sulfate (21-0-0) June 15
Newly set	0	0	0
1 year	2 oz. ($\frac{1}{4}$ cup)	1 oz. (2 Tbs.)	1 oz. (2 Tbs.)
2 years	4 oz. ($\frac{1}{2}$ cup)	1–2 oz. (2–4 Tbs.)	1–2 oz. (2–4 Tbs.)
3 years	6 oz. ($\frac{3}{4}$ cup)	1–2 oz. (2–4 Tbs.)	1–2 oz. (2–4 Tbs.)
4 years	8 oz. (1 cup)	2–3 oz. ($\frac{1}{4}$ cup + 1 Tbs.) 2–3 oz. ($1\frac{1}{4}$ cups + 2 Tbs.)	1–2 oz. (2–4 Tbs.)
5 years	10 oz. ($1\frac{1}{4}$ cups)	2–3 oz. ($\frac{1}{4}$ cup + 2 Tbs.)	1–2 oz. (2–4 Tbs.)
6 years and older	12 oz. ($1\frac{1}{2}$ cups)		1–2 oz. (2–4 Tbs.)

PRUNING

First Two Years

Prune dead branches only.

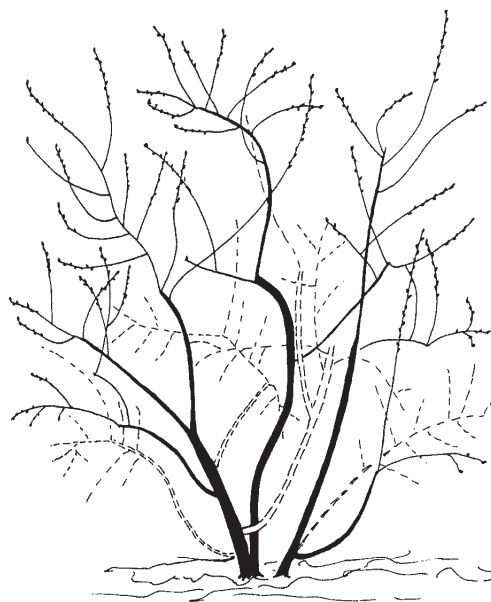
Third Year

1. Prune out crossing branches and dead twigs.
2. Cut 1 or 2 older canes back to the ground. Leave 1 or 2 new canes to replace them (new canes are not branched).
3. Leave 1 fruiting bud for each 3 inches of new shoot growth.
 - a. Each bud will produce 5 to 8 berries.
 - b. Fruiting buds are plump while leaf buds are small and pointed.

Severe pruning produces fewer but larger berries and more new growth.

Berries are produced on second- and third-year canes.

4. Prune in winter or early spring. Remove weak side shoots in top of plant.
5. To increase fruit size, head back shoots that have an abundance of flower buds.



DISEASES & INSECTS

Mummy berry: Fungus disease that invades blossoms and destroys fruit. Once berries have mummified, it is too late to do anything that year. Fungus overwinters; cultivate to bury mummies in the fall. In small plantings, clean up and destroy mummies.

Botrytis: Attacks blossoms and young fruit; gray mold can be a problem in prolonged wet springs.

Control: Copper octanoate in early spring and at 10-day intervals if wet weather persists.

TIPS:

- Consistent watering prevents cracking fruit.
- Full production occurs in the 6th to 8th year.
- Plants produce for 10 to 15 years.
- Potential yield is 1 gallon per plant.

BLUEBERRY VARIETIES

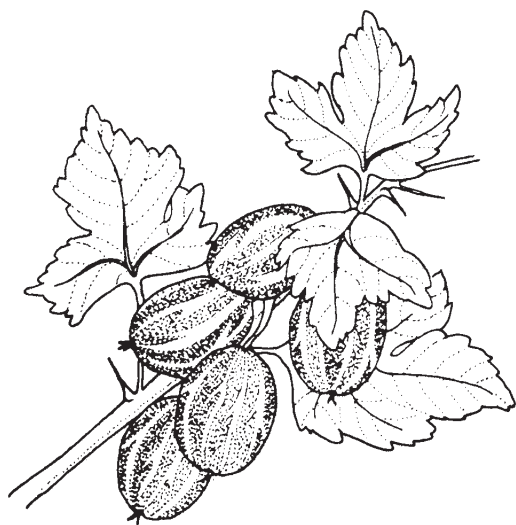
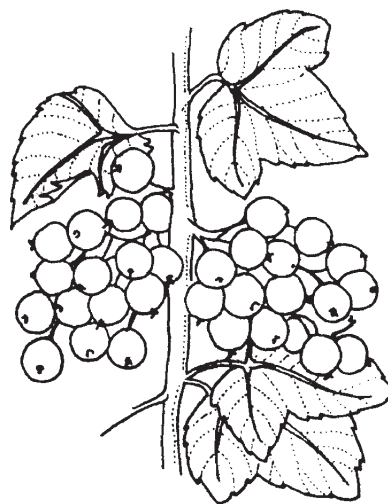
Cultivar	Harvest period	Fruit characteristics	Plant characteristics
Earliblue	Early	First to ripen, excellent dessert quality, large fruit size	Upright bush, avoid frost pockets and poorly drained soils
Spartan	Early	Very large, light blue, excellent dessert quality	Upright bush, productive, prefers 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 mummy berry 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

CURRENTS AND GOOSEBERRIES

Currents and gooseberries, *Ribes sativum* and *Ribes grossularia*, are shrubs that bear abundant berries. While some people enjoy eating them right from the bush, currents and gooseberries are so tart that they are usually used in jams, pies, and other desserts.

PLANTING SITES

- Both grow well in medium to heavy soils. Soil pH can be neutral, slightly alkaline or slightly acidic. (Most Inland Northwest soils are in this range.)
- Plant in sun or partial shade. Since they bloom fairly early, avoid frost prone areas.
- Both currents and gooseberries are alternate hosts for white pine blister rust (*Cronartium ribicola*), a disease that attacks fine-needle pines such as western white pine. If any of these pines are nearby, consider planting other small fruits.



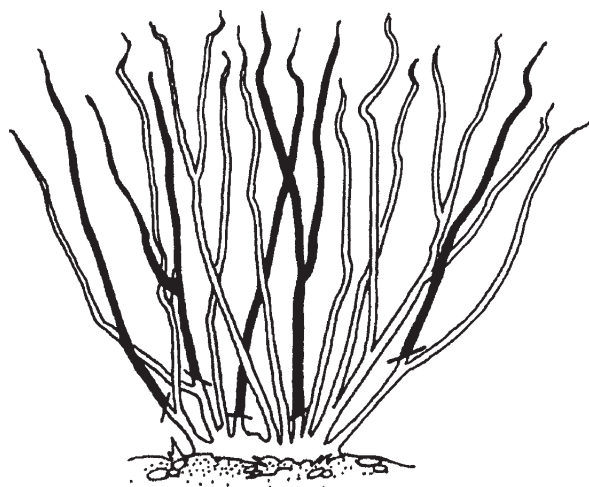
ESTABLISHMENT & CULTURE

- Currents and gooseberries are available at nurseries in spring, but can also be planted in fall after leaves drop.
- Plant four feet apart.
- Work in organic matter 6 to 8 inches **before** planting. Approximately 40 pounds of well rotted manure or compost per 100 sq. feet is recommended.
- Plants will bear fruit at two years, but don't bear full crops until their 3rd or 4th year.

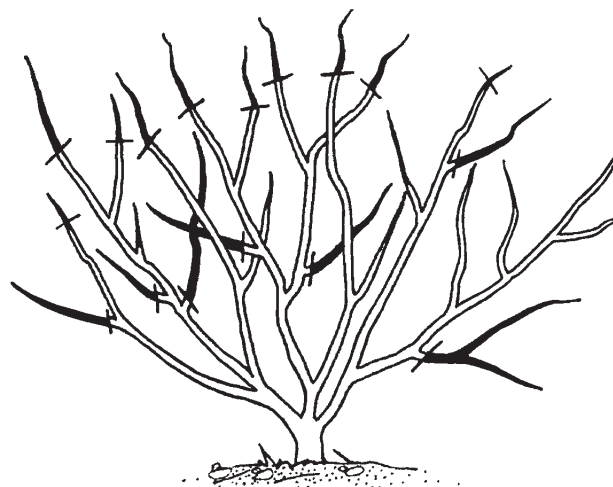
TRAINING AND PRUNING

Currants and gooseberries are grown as freestanding bushes or in hedge rows. Gooseberries can reach 5 to 7 feet at maturity. They have thorny, arching canes. Currants are more erect and are thornless.

- Use more thinning cuts (removal of an entire branch back to the base) rather than heading cuts (shortening a branch).
- Prune yearly. Bushes will be brushy and will not yield well otherwise.
- 2-, 3-, and 4-year-old canes are most productive.
- Maintain only 9 to 12 canes per plant. 3 or 4 each of 1-, 2-, and 3-year-old canes.
- Prune when plants are dormant in late winter.
- Remove all canes older than 4 years.
- Prune to form an open center.



Thinning-out cuts promote development of new wood.



Heading-back cuts promote branching on 2- to 3-year wood.

HARVEST AND USE

Harvesting currants and gooseberries is a slow process. Currants ripen over a 2-week period, but will hold for another week. It is not necessary to remove stems from currants intended for jelly or juices, as they will be strained.

Gooseberries ripen over a 4- to 6-week period. Pick when full-sized and proper color. Remove the blossom and stem ends before cooking.

Both fruits can be used in jellies, jams, and preserves, juiced or frozen for later use. All *Ribes* fruit are high in vitamins A, B, and C.

VARIETIES

Red Currants

Red Lake. Berries are medium to large, uniform, juicy, and flavorful. They ripen during the mid-to-late season. Canes are moderately vigorous, stand erect, and are only moderately resistant to powdery mildew. Clusters are long and easy to pick. One of the best red currants for home production.

Perfection. Berries ripen during early mid-season and are large, uniform, juicy, flavorful. They have a thin, tough skin. The cluster stems are long and easy to pick. Canes are small, only moderately dense, and moderately resistant to powdery mildew. One of the most cold-hardy. Canes are susceptible to breaking and the fruit sunscalds easily if not picked soon after ripening.

Wilder. The berries are variable, tending to be small to medium in size. They are tender, juicy, and of good quality. They are borne on long, easy-to-pick clusters and hang on the canes for a long time after ripening. Canes are erect to slightly spreading and are very resistant to powdery mildew.

White Currants

White Imperial. Fruit varies in size, ranging from medium to large. It is juicy and tender. Canes are medium-sized, vigorous, spreading, and highly resistant to powdery mildew.

Gooseberries

Green: *Captivator.* Medium-sized, smooth, green fruit with good flavor. Canes are moderately vigorous, erect, and less spiny than other varieties.

Oregon Champion (thornless). Fruit ripens during the mid-season, is small, white to pale green, tart, and has a thin tough skin. Canes are large, vigorous, erect to spreading, and quite resistant to powdery mildew.

Red: *Poorman.* Dull red fruit ripens over a long period, beginning in mid-season. Berries are small to medium in size, sweet and aromatic, with tough smooth skin. Canes are very large, erect to spreading, reasonably free of spines, and quite resistant to mildew.

Pink: *Pixwell.* The fruit is small to medium in size. It is green and hangs in clusters below the canes, making it easier to pick than some other varieties. Canes are vigorous, erect to spreading, and very resistant to mildew. One of the most reliable gooseberries in North America.

DISEASE AND INSECT PROBLEMS

Powdery Mildew

A fungal disease that is characterized by a whitish powdery growth on leaves, shoots, and fruit. This coating usually makes fruit unusable. Humid conditions and crowded plantings

that reduce air flow favor mildew. Clean up plant debris and place in trash bag. Do not compost. Space plants and prune for good air circulation.

Currant Aphid

Common on currants and occasionally found on gooseberries. Small yellowish aphids begin to appear when leaf buds open in spring. Feeding causes a cupping distortion and red color on leaves. Apply an insecticide or insecticidal soap when aphids appear. Repeat as necessary according to label directions.

Currant Fruit Fly (Gooseberry Maggot)

Larvae bore out of infested berries, fall to the ground and enter the soil in the summer, where they overwinter as pupae in brown cases about the size of wheat grains. Flies emerge from the soil in the spring and lay eggs in developing gooseberry or currant fruit. The currant fruit fly is one of the most serious pests of gooseberries and currants.

No chemical controls are registered for homeowners. Shallow cultivation under bushes can help to expose egg cases and larvae to predators.

GENERAL INFORMATION

Red and White Currants

Expected yield:	5 to 8 pounds per bush
Age to maturity:	3 to 5 years
Productive life:	15 to 20 years or more
Hardiness:	-13° to -31°F
Optimal pH:	5.9–6.8
Plant spacing:	4 to 5 feet apart in rows 6 to 10 feet apart

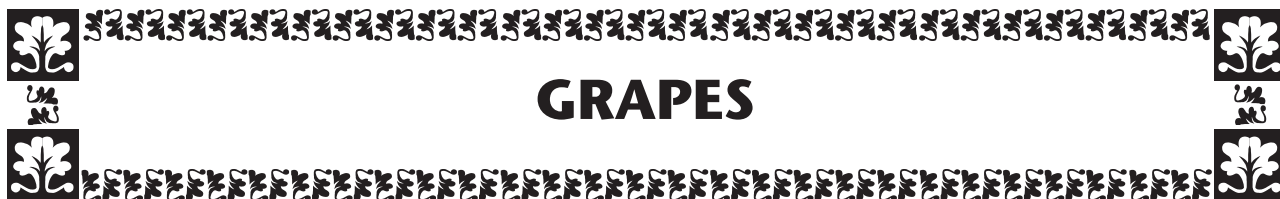
Black Currants

Expected yield:	5 pounds per bush
Age to maturity:	3 to 4 years
Productive life:	15 years or more
Hardiness:	-13° to -31°F
Optimal pH:	5.9–6.8
Plant spacing:	4 to 5 feet apart in rows 8 to 10 feet apart

Gooseberries

Expected yield:	5 pounds per bush
Age to maturity:	4 to 5 years
Productive life:	15 to 20 years or more
Hardiness:	-13° to -31°F
Optimal pH:	5.9–6.8
Plant spacing:	4 to 5 feet apart in rows 6 to 10 feet apart





GRAPES



Not all grape cultivars are suitable for growing in our area, but some cultivars can thrive given ideal growing conditions. Grapes require a minimum of 150 frost-free days to develop and mature the fruit. The Spokane area averages about 120 to 150 frost-free days. You might be able to extend the frost-free growing period by planting on a south-facing slope where air drainage is good and the soil contains enough gravel or stone to retain the sun's heat.

There are three types of grapes: North American, European wine, and French Hybrid.

- North American grapes (such as Concord) have skins that slip easily from the pulp, which makes them well-suited to juicing and processing. This group is quite cold hardy. There are seeded and seedless cultivars.
- European wine grapes (*Vitus vinifera*) are the wine grapes and are much less hardy than the American grapes. There are some seedless types. Given a warm site, home gardeners may be successful with some of the wine grape cultivars.
- French hybrids are a cross between the American and European grapes. These hybrids are of intermediate hardiness, used primarily for wines, and tend to have small berries.

GRAPE CULTURE

Planting

Plant grapes in early spring as soon as you can work the soil. Plant where they will get full sun. If you purchase bare root plants, do not let the roots dry out before planting. If you buy grapes growing in a container, water them well until planting. At planting, prune off any broken roots and trim very long roots to 6–8 inches so they fit in the planting hole without bending. Set the plant into the hole and spread roots, firming soil, and watering well.

Mulching

Mulches are not necessary. In fact, they can retard warming of the soil in the spring and delay growth of the grape vines. Mulching with white rocks will pick up heat.

Water

Keep soil moist the first year to insure good root development. Then, water less often, but deeply. Grape vines are deep rooted, sometimes penetrating 8 feet into the ground.

Stop watering the end of August or first of September to harden off grape vines for winter. Keep foliage dry—don't overhead water.

Fertilizer

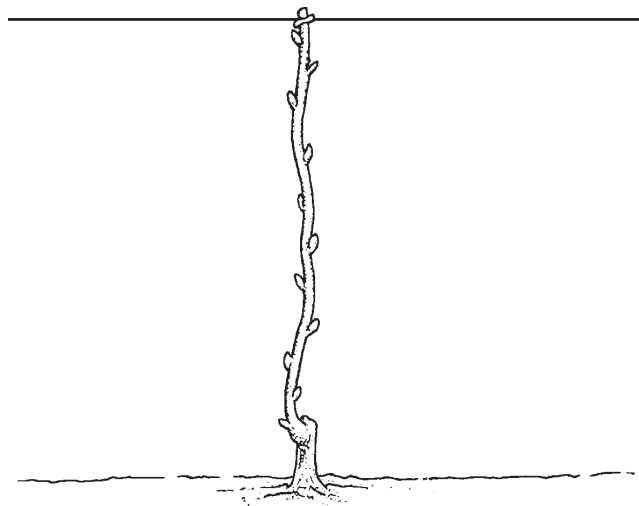
Grapes are light nitrogen feeders. Use a little less than $\frac{1}{4}$ cup of 21-0-0 in the spring. Water it in well. Keep fertilizer away from the trunk. Well-rotted manure laid about an inch thick in the spring is another good source of nitrogen. During the first season, the feeder roots will extend in a circle no more than 3 feet in diameter. Each succeeding year, the circle will increase until it reaches a diameter of 8 feet.

PRUNING

There are many ways to prune and train grapes. For a detailed description of each method, refer to WSU Extension Bulletin EB0637, *Training and Trellising Grapes for Production in Washington*. For most of the systems, a trellis support is required. Grape plants become very heavy with wood and fruit, so a trellis must be strong and well-braced. Most trellises are made with treated wood or metal posts and use number 12-gauge (or heavier) wire.

First Year:

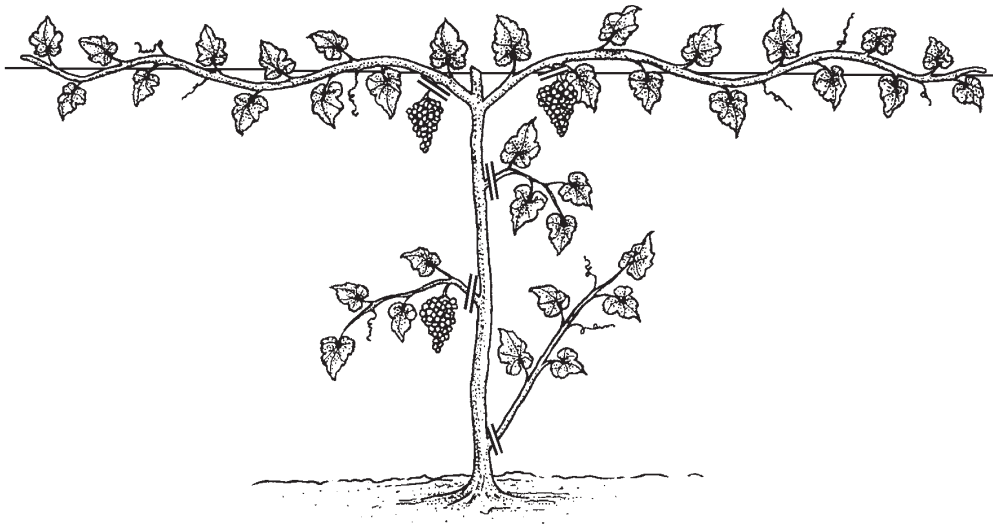
The objective of training vines the first year is to get vigorous top growth and a well-established root system. Unless you are using a multiple trunk system (discussed in following text), select the strongest shoot that grows from the newly planted vine and cut all others back to the ground. Train the single shoot along a temporary wire or string until it reaches the first wire of the trellis.



Cane pruning, first winter.

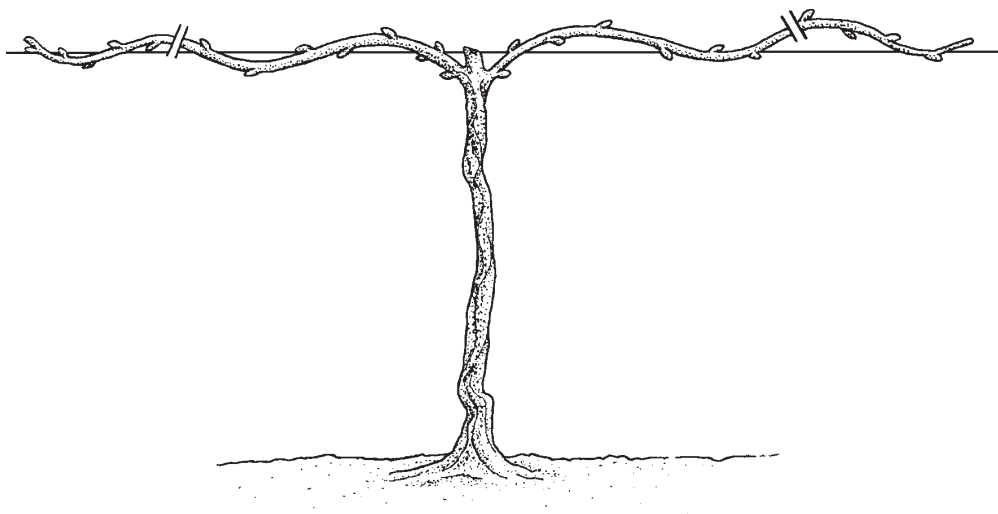
Second Year:

Shoots will have developed from buds on the young vine. Select two that grow a few inches below the trellis wire and train these, one on each side of the trunk, along the wire. Remove all the other shoots.



Cane pruning, second growing season.

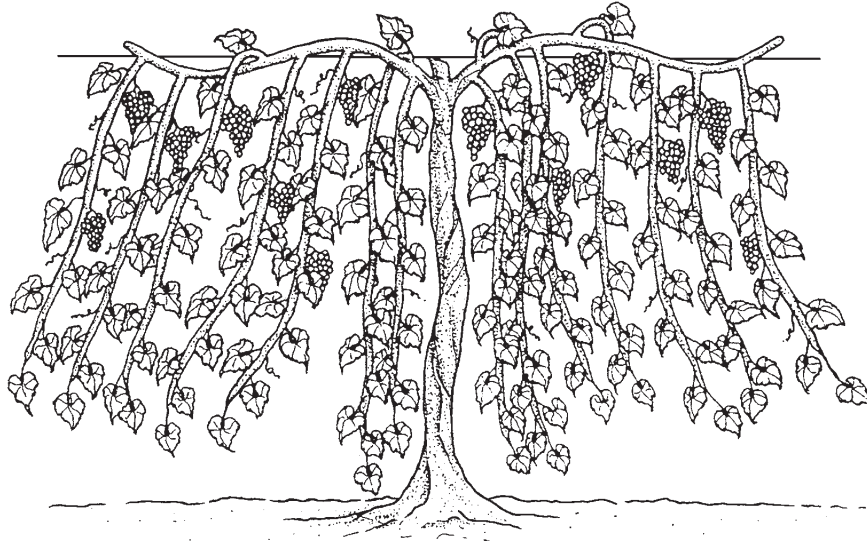
In the second winter, prune these two shoots back to 7 or 8 buds each.



Cane pruning, second winter.

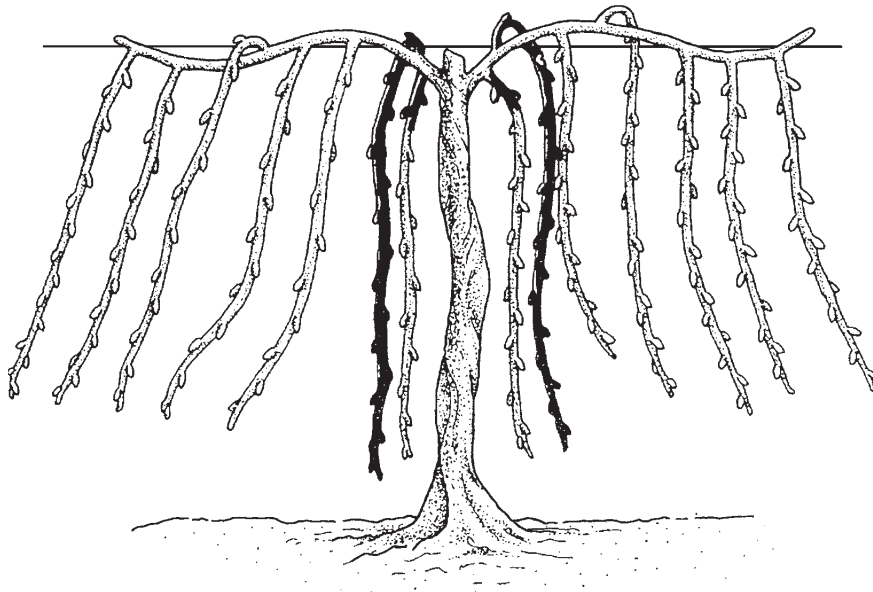
Third Year:

In the third growing season, shoots grow from the buds left on the one-year-old canes, and grapes are produced on these shoots.



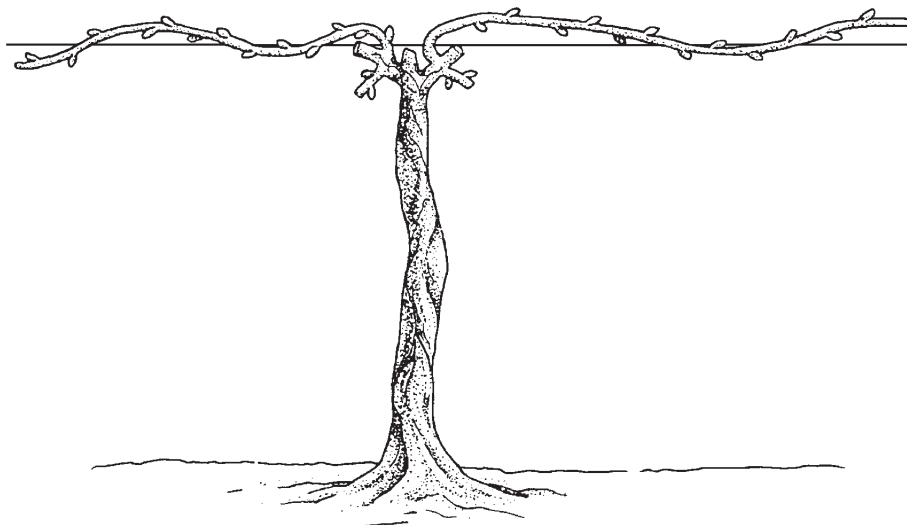
Cane pruning, third growing season.

In the third winter, select new fruiting wood and remove all others.



Cane pruning, third winter before pruning (solid color canes will be retained).

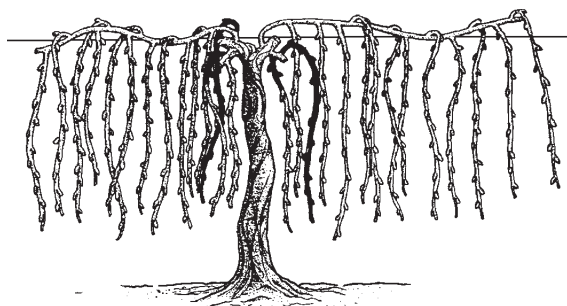
The two selected canes will be cut back to about 15 buds that have been exposed to good light and are at least as thick as a pencil. Wrap the canes around the trellis wire. Leave a one- or two-bud spur near the base of each cane. These renewal spurs will supply the new fruiting canes the following year.



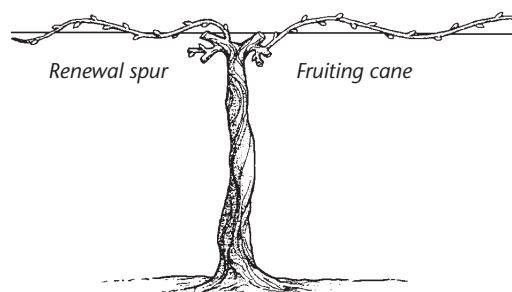
Cane pruning, third winter after pruning.

Fourth Year (and succeeding years):

Prune yearly to remove all growth except new fruiting canes and renewal spurs. If grape vines are not pruned severely, a number of small, scraggly branches will be produced. Usually 3 to 4 feet of growth per shoot is enough to ripen the crop. If plants become too vigorous, trim the shoots. Laterals will grow, but trim these as well.



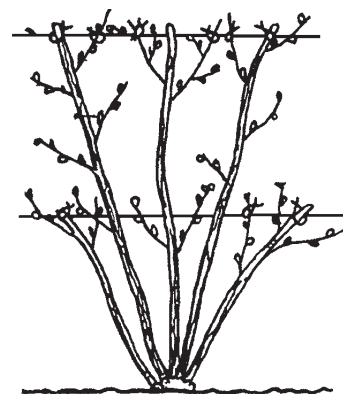
Cane pruning, fourth winter before pruning.



Cane pruning, fourth winter after pruning.

Multiple Trunk System

This system is used for vinifera grapes in cold areas where severe winter damage is possible. Instead of a single trunk, multiple trunks are allowed to develop. In this kind of training five canes serve as flexible trunks. The trunks and canes are removed from the trellis each fall and covered with soil for winter protection. The trunks are tied to the wire for support.



PROPAGATION

Layering

Bend down growing canes until they touch the ground. Make a slice through one or two buds on the underside of the stem, but don't cut all the way through. Bury cut nodes 3 to 4 inches, leaving two buds exposed above ground. The following spring, after roots have formed from nodes, sever the new plant from the buried cane and replant.

Cuttings can be taken either in the fall or in the spring.

Fall Cuttings:

Take cuttings in the fall after leaf drop. They should be $\frac{1}{4}$ inch thick, 12 to 16 inches long, with 3 to 5 buds preferably 4 to 5 inches apart. The basal cut (a straight cut) should be made just below a node; the top cut (made at an angle) should be made an inch above the third or fifth node. (Making the top cut slanted and the bottom cut straight will remind you which end is the bottom.)

Place the bundle of canes upside down (basal end up) in the ground over the winter. A callus will form on the basal end, which the plant needs before rooting. Separate the individual cuttings and plant in the spring. Apply a hormone powder to the basal cut before planting.

Spring Cuttings in Water:

In February or March, make cuttings and root them in water. When roots are 1 inch long (which takes about 6 weeks), pot them. Keep in a kitchen window. Keep the container covered as light inhibits root growth. Plant in June.

Spring Cuttings in Sand:

In February or March, make cuttings and root them in damp sand. Use a root hormone powder on basal ends. Place in a bright window (not direct sun). Cover pot with a plastic bag. When rooted, plant.

Place cuttings 6 inches apart in a row, with the top bud just above the soil surface. Allow them to grow vigorously throughout the summer. By the following year, these one-year plants will be ready to be set out in a permanent position.

GLOSSARY OF TERMS

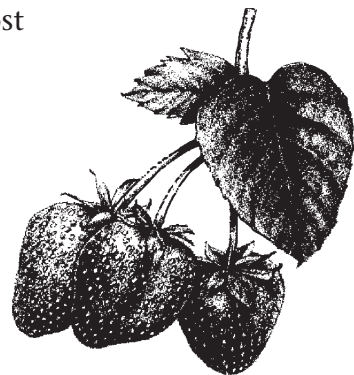
Trunk:	Permanent aboveground stem of the vine.
Arms:	Major short branches of the trunk from which canes develop.
Cordon:	A long arm, usually trained along a wire, from which canes develop.
Cane:	A matured shoot after leaf fall.
Spur:	A cane pruned back to one, two, three, or five nodes.
Shoot:	New green growth with leaves, developing from a bud of a cane or spur.
Lateral:	A branch of a shoot.
Node:	The thickened portion of the shoot or cane where the leaf and its compound bud are located.
Internode:	The portion of the shoot or cane between two nodes.
Bud:	A compound bud or eye containing the primary, secondary, and tertiary buds located in the axil of each leaf.
Tendrils:	A long, slender, curled structure borne at some of the nodes of a shoot that can firmly attach the shoot to other shoots and the trellis system.



STRAWBERRIES

Strawberries (*Fragaria ananassa*) are a small fruit crop adapted to most Washington climates. Even a small bed in full sun and well-drained soil will provide fruit for fresh eating, freezing, or preserving.

Strawberries are considered an herbaceous perennial. New shoots, leaves, and runners emerge from the crown and root structure each year. Homeowners can plan on 4 to 5 years of healthy growth and productive fruiting. Plantings by that time are usually declining in vigor, have picked up viruses or are overgrown with runners or perennial weeds. It is then advisable to begin with new dormant certified virus free nursery stock.



PLANTING SITE

- Strawberries must have at least six hours of direct sunlight to produce quality fruit.
- Avoid planting in a frost pocket. Strawberries bloom early and blossoms may be damaged by frost. In very cold areas, day-neutral cultivars (see page 25) offer an option as they bloom over a long period of time.
- Plants are highly susceptible to Verticillium wilt and should not be grown in areas previously planted with potatoes, tomatoes, eggplants, peppers, or black raspberries.

WEEDS

- Strawberries cannot compete with weeds. It is worth taking the time necessary to prepare the area the fall prior to planting. This can be done by hoeing or hand weeding repeatedly. Chemical control may be required for deep-rooted perennial weeds. Apply herbicides the fall before planting. *Only hoeing or hand weeding can be used to control weeds in established plantings.*

SOIL

- Strawberries grow best in loamy sandy soil, but they can be grown in almost any soil that is well-drained and contains organic matter. If possible, prepare the soil the fall before planting with compost or animal manure and consider planting a cover crop for both weed control and organic matter.

pH

- The optimum pH for strawberries is 5.0 to 6.5; however, most varieties will tolerate a pH as high as 7.5. Reduce pH by incorporating peat moss or sulfur 6–8 inches into soil before planting.
- Using ammonium sulfate (21-0-0) as a nitrogen source also lowers the pH. As a rule of thumb, add one-half pound of ammonium sulfate (21-0-0) for each cubic foot of uncomposted organic matter.

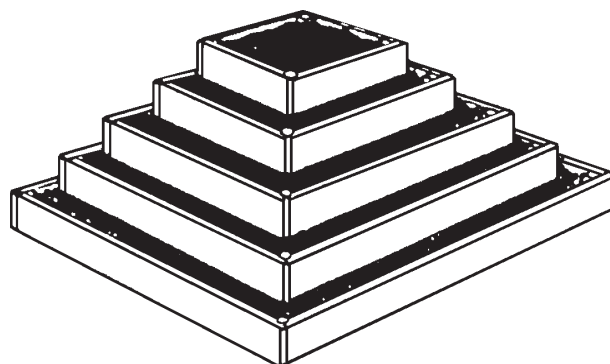
DRAINAGE

- Wet soils can lead to root diseases, frost heaving and fruit rots. **Raised beds** or **pyramids** offer options if berries are to be grown on heavier soil with slow drainage.
- Selection of root-disease tolerant varieties also are recommended for heavier soil. (*Refer to the cultivar lists.*)

Pyramid Planter

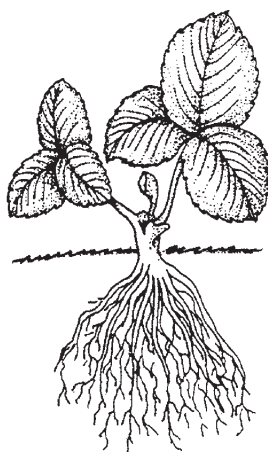
Materials needed to build a 72"-wide, square-sided pyramid planter where each ascending level is 12" or less in width:

- ✓ 4 boards 6' long & 6" wide
- ✓ 4 boards 5' long
- ✓ 4 boards 4' long
- ✓ 4 boards 3' long
- ✓ 10' of 2" x 2" for corners
- ✓ 1 lb. of 6-penny galvanized nails

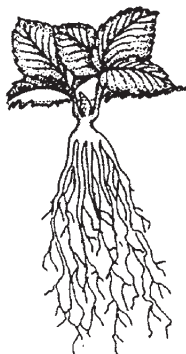


PLANTING

- Use certified virus-free stock. Resist the temptation to plant runners from your own plants or a neighbor's healthy-appearing plants. If they are two or three years old they probably have picked up viruses spread by aphids.
- Plant dormant stock late March to April. Set out potted plants in May.
- Setting out dormant plants: Trim roots 4 to 5 inches long. Dig a hole or trench 6 inches deep. Spread roots in a fan with the crown at soil surface. Press soil firmly against roots.



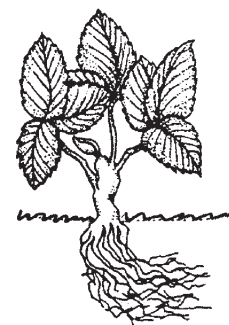
Proper planting depth



Crown too deep



Crown too high



Roots are bent

MULCHING

- Mulching with two to three inches of straw or four to five inches of pine needles along the rows during the summer conserves moisture and prevents many weeds. Check occasionally to be sure soil isn't becoming waterlogged.
- Before a hard freeze, mulch plants with pine needles or straw to protect plants from drying winds and help prevent soil heaving.
- Remove mulch **early** in the spring, before new growth begins. The mulch can be pulled away from plants and used as summer mulch. Be prepared to cover plants if an unexpected hard frost is forecast.
- If plants have heaved out of the ground during winter, firm them back into the ground and replace soil over the exposed roots.

WATERING

- Water soon after planting and keep plants well-watered through the first year.
- Supplemental watering during dry summer months results in a productive strawberry bed.
- Strawberries absorb 90% of their water from the top foot of soil.
- Water is critical before and during harvest and in late August when flower buds are formed for the next year.
- Avoid over-watering. Waterlogged soils encourage root rots.
- Overhead watering during harvesting time may encourage fruit rot.
- Mulches and drip irrigation systems adapt to strawberry culture and conserve water.

HARVESTING

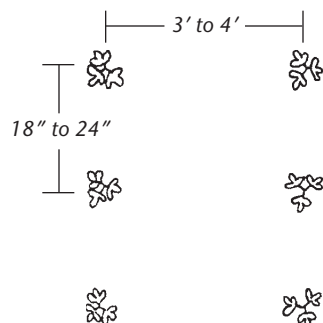
- Harvest berries in early morning if possible and place in the refrigerator immediately.
- Do not wash the berries before refrigerating unless you will use the fruit within a few hours.
- Picking berries when they are wet or cooling them with water hastens fruit rot.
- With optimum conditions, fresh strawberries have a shelf life of about seven days.

CHOOSING STRAWBERRIES FOR THE HOME GARDEN

JUNE-BEARERS

June-bearers are among the most productive of strawberries. They form flower buds in the fall and bear one heavy crop the next spring or early summer. Remove all blossoms the year of planting to strengthen plants. After harvesting, renovate strawberry beds by mowing off the leaves, taking care not to damage the crowns. Renovation stimulates new plant growth and reduces disease problems.

Use the matted row system for June-bearers:



Planting Year (2 rows)



Year 2 (1 row)

Before planting, incorporate 2 pounds of 5-10-5 or 5-10-10 fertilizer or $\frac{3}{4}$ pound 21-0-0 ammonium sulfate per 100 square feet into the soil.

In August, side-dress with $\frac{1}{2}$ pound of ammonium sulfate (21-0-0) per 100 square feet.

June-bearing cultivars

Hood. Early mid-season; good fresh or for preserves. Poor frozen. Resistant to root rots and mildew, moderately susceptible to viruses. Easy to pick, little fruit rot.

Shuksan. Mid-season, ripens a week after Hood. Good fresh or frozen. Moderately resistant to root rots, fruit rot, mildew, and viruses.

Benton. Late mid-season, ripens 10 days after Hood. Very good fresh, fair frozen. Has a long harvest season. Resistant to root rots, mildew, viruses, and fruit rot.

Rainier. Late mid-season, ripens 10 days after Hood. Excellent fresh or frozen and in preserves. Becomes dark quickly in hot weather. Somewhat susceptible to fruit rot. Resistant to root rots, mildew, and viruses.

Note: For flavor, Rainier and Shuksan are considered the best.

EVERBEARERS AND DAY-NEUTRALS

Everbearers and day-neutrals have the same general culture. Because day-neutrals set fruit all season long, their cultivars are replacing everbearers.

Many home gardeners grow these cultivars because fruit production is spread over the summer. However, the total yields are generally lower than other types of strawberries.

Everbearers

Everbearers bear fruit twice during the growing season, generally during the spring and in late summer.

Everbearer cultivars

Quinault. Reliable, good quality, but soft. Size and yield drop off after the first flush of large fruit.

Ogalalla. Very hardy, but small, soft, and of fair quality.

Day-neutrals

Day-neutrals will set fruit the year they are planted. Because these cultivars set flower buds regardless of day length, they set fruit from spring to fall. They produce few runners and can be planted either in short rows or in hills.

Day-neutrals are sensitive to extreme heat so fruit production generally drops during July and August. They are often replaced after 2 fruiting years as vigor and the fruit size decline.

Day-neutral cultivars

Tillicum. Very productive, good quality, medium size berry.

Tribute and *Tristar*. Productive, very good quality, medium size berry.

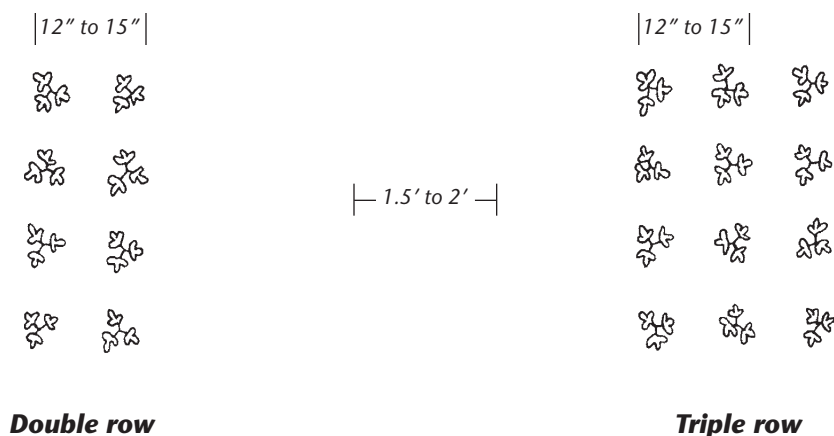
Hector. Productive, good quality, medium-to-large size berry.

General culture for Everbearers and Day-neutrals

Blossoms should be removed for at least 1½ months after planting potted plants. Remove blossoms until June 1 on dormant plants. Keep well watered through fall. Remove old, weak plants and excess runners each fall.

Use the matted row system (see June-bearers) or hill system for everbearers.

Use the hill system for day-neutrals, spacing plants 12 to 15 inches apart in 2-, 3- or 4-row beds:



(There are many planting recommendations for strawberry beds. These systems are examples and can be adapted to your home garden.)

Before planting, incorporate 2 pounds of 5-10-5 or 5-10-10 fertilizer or ¾ pound 21-0-0 ammonium sulfate per 100 square feet into the soil.

Beginning before bloom in April, side dress with ⅛ pound ammonium sulfate (21-0-0) per 100 square feet per month until mid-August.

June-bearers

Expected yield:	0.5 to 1.0 pound per foot of row
Fruiting year:	Second
Productive life:	4 to 5 years
Hardiness:	+20°F to -35°F
Optimal pH:	5.5 to 6.5
Plant spacing:	Matted row: 18 inches apart in rows 48 inches apart

Day-neutrals

Expected yield:	Year 1: 0.25 to 0.75 pound per foot of row Year 2: 0.5 to 1.5 pounds per foot of row
Fruiting year:	First
Productive life:	3 years
Hardiness:	+20°F to -35°F
Optimal pH:	5.5 to 6.5
Plant spacing:	6 to 9 inches apart in rows 42 inches wide

Double-cropping everbearers

Expected yield:	0.25 to 0.5 pound per foot of row
Fruiting year:	Second
Productive life:	4 to 5 years
Hardiness:	+20°F to -40°F
Optimal pH:	5.5 to 6.5
Plant spacing:	Matted row: 18 inches apart in rows 48 inches apart

PESTS AND DISEASES

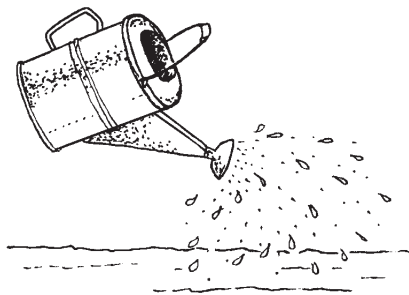
Verticillium wilt

This fungal disease is present in the soil. The best control is to avoid planting berries in sites where the disease is apt to be a problem, such as old strawberry beds, or places where potatoes, tomatoes, and asparagus have grown. If verticillium is/or expects to be a problem, use raised beds with new, non-infested soil.

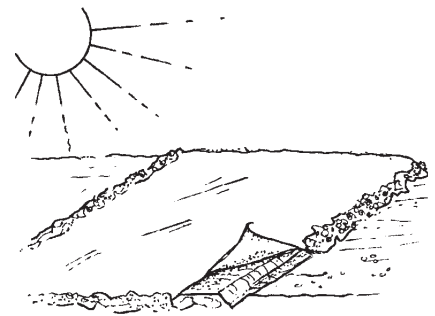
One may also “solarize” the site prior to planting using clear plastic tarp during mid-summer for a period of several weeks:



Remove existing weeds from the area you want to solarize.



Water the area to moisten the soil thoroughly.



Cover the site with a sheet of clear plastic and bury the edges.

Powdery mildew

This is a fungus disease that overwinters on old infected plants and garden debris in the bed. To avoid powdery mildew, plant resistant varieties and clean out garden debris in the fall. Homeowner fungicides are not particularly effective, although horticultural oils or sulfur products are registered.

Virus diseases

Several virus diseases with leaf symptoms of stunting, crinkling, mottling, and vein banding infect strawberry plants. Many are transmitted by the common strawberry aphid. Plant certified stock and choose cultivars that are resistant to viruses. Control aphids because they can carry virus diseases from one plant to another.

Renew beds every 4 to 6 years if virus has become an obvious problem. Avoid setting out new plantings next to old virus-infected ones.

Gray mold (Botrytis)

Fruit rot is caused by a fungus that attacks many plants. Strawberry leaves, stems, flowers, buds, and fruit may be attacked. The worst damage is to the fruit, which often develops a powdery-gray fungal growth. Plant varieties that show resistance to gray mold. Among these are "Shuksan," "Totem," and others with erect fruiting habits.

Space plants to provide good air circulation and reduce humidity. Avoid overhead watering. Pick off diseased fruit and clean up plant debris. Captan (a fungicide) can be applied as a spray when 10% of strawberry plants are in bloom and again 7 to 10 days later.



Root weevils

Several species of root weevils are common pests of strawberries. They range in size from $\frac{1}{5}$ inch to $\frac{1}{3}$ inch in length. Adults chew ragged notches in the leaf margins. The larvae cause the most damage by feeding on the roots, causing wilt and death to the plants.

Cultivate future planting sites in the fall to reduce the numbers of overwintering adults. Heavily damaged plantings should be destroyed. Hand picking weevils at night is partially effective.

Malathion was registered at time of publication. Use at night when adult weevils are feeding. Do not use when edible fruit is on the plants.

Slugs

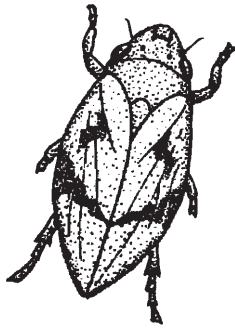
Slugs typically feed on strawberry fruit, making deep holes in ripening berries. Slugs may also feed on the leaves. Most feeding occurs at night and damage is worse during cool moist weather. Handpick and kill slugs when visible. Clean up weeds and debris that might provide shelter. Cut tall weeds and grasses around the garden.

Trap slugs with cans of beer sunk into the ground. *Use chemical baits with caution, as they can poison pets.* If using Metaldehyde baits, follow label directions exactly and treat around the bed, being careful to avoid contact with fruits.



Spittlebugs

Spittlebugs are tiny green insects that secrete protective foam around themselves and feed on many plants. On strawberries the nymphs feed on the leaves and leaf stems. Infested plant material, including the buds and fruit, may be distorted. The nymphs are present on the plants for 1 to 2 months, beginning around April or May.



Handpicking may be sufficient control in home gardens. Washing spittle from plants with a strong stream of water will expose insects to killing light and predators. Several home products containing carbaryl (Sevin) are registered for spittlebugs, but should not be used when flowers or fruit are present.



RASPBERRIES



Raspberries belong to the Rose family (*Rosaceae*) and to the genus *Rubus*, as do blackberries, and other caneberries. The plants have perennial roots, many living 40 or more years, while the upright canes are biennial. Fruiting canes die after harvest, but new canes (primocanes) have been growing from the root system to be next year's fruiting wood. The fruit is borne on lateral fruit spurs that are produced on 1-year-old canes.

SITE SELECTION

Plan to control weeds and build up soil tilth a year before planting. Hoe and dig or use a glyphosate product on perennial weeds. Consider planting a cover crop of cereal rye or barley in the planting site. This will both control weeds and add organic matter. Use 2 to 2.5 pounds of seed per 1,000 sq. ft.

Plant raspberries in full sun. Plants grown in shade will remain small and produce tart fruit. Raspberries grow best in loam or sandy soil at least 24 inches deep. Dig organic matter in 2 feet deep before planting.

The soil should be well-drained. Excessive soil moisture during the late winter when new roots are growing leads to root rot. To check drainage, dig a small hole and fill with water. The water should be gone within 2–3 hours. If your soil is heavy and has a tendency to remain wet, consider using raised beds at least one foot high.

BUYING, PLANTING, AND FERTILIZING NEW RASPBERRIES

Purchase dormant, certified plants at a garden store or nursery. Sucker plants dug from an established planting during the winter when plants are dormant often have virus diseases that can survive during transplanting.

Plant raspberries early in the spring, as close to April 1 as possible. Do not use any planting stock that has started to bud out appreciably; it generally does not perform well.

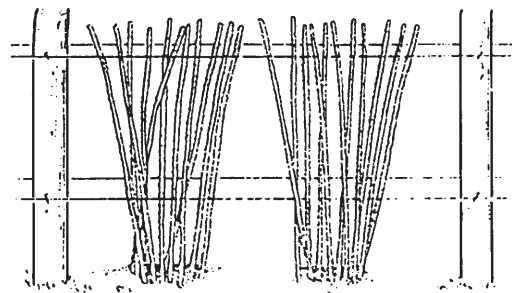
Space plants 2–3 feet apart along a fence or trellis as described under training. Cut canes back to 2-inch stubs after planting. New canes will begin growing from the roots. (Containerized raspberry and blackberry canes do not need to be cut back.)

Soon after the roots begin growing, apply 1 pound of ammonium sulfate (21-0-0) per 25-foot row, or 4 pounds of (5-10-10) or (5-10-5) fertilizer. Apply in bands 6 inches from the plants and water in well.

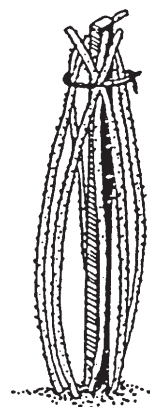
TRAINING

There are three methods of training raspberries: trellis, staked hill, or freestanding.

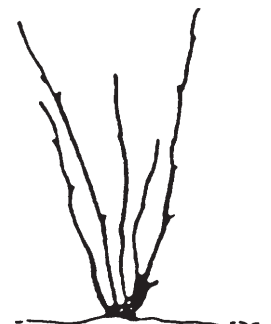
1. **Trellis.** Select sturdy posts and set them no more than 25 feet apart. Attach a #12 galvanized wire on both sides of posts 4 1/2 feet from the ground. Attach two more wires to hooks on each side of the posts about 2 feet from the ground. All canes high enough to reach the upper wires should be tied in the fall of the first year.



2. **Staked hill.** Raspberries can be trained on a single post. Choose five or six of the sturdiest canes and tie to a post. Cut the smaller canes to ground level. Top when the canes reach the top of the post.
3. **Freestanding.** Red raspberries can be left freestanding by choosing 5 to 7 canes and heading back below 4 1/2 feet.



Staked hill.



Free standing.

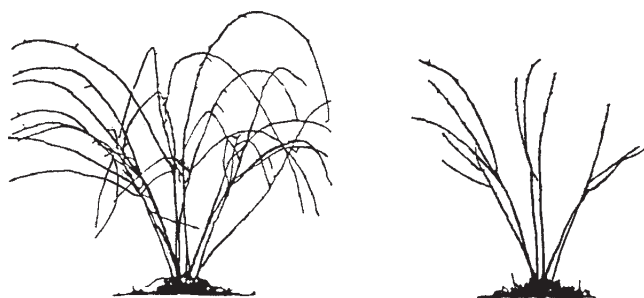
TRAINING FALL-BEARING RED RASPBERRIES

Fall-bearing raspberries bear fruit on the ends of new canes in late summer and fall, as well as on the lower portions of these canes the following year. However, fall-bearing red raspberries produce the largest fruit and are the easiest to manage if they are treated as a single crop in the fall. Mow the canes off at ground level each year after the fall crop is picked.

BLACK RASPBERRIES

Black raspberries do not send up suckers between plants. New shoots arise from the base of each plant, and are stockier than red raspberry canes.

Set plants 2 feet apart. Plant and fertilize as for red raspberries.



New canes should be encouraged to branch and form laterals by tipping when 30 inches high. The lateral shoots that develop after tipping will form many fruit buds.

Remove old canes soon after harvest each year. Lateral shoots on the new canes should be shortened in March to 6 to 12 inches.

PURPLE RASPBERRIES

Brandywine. Train as black raspberries.

Royalty. Train as red raspberries.

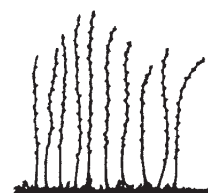
CULTURE IN SECOND AND FOLLOWING YEARS

Pruning

Consistent pruning each year will keep plants from becoming tangled and will produce better fruit. Raspberries bear fruit on young new canes. After bearing fruit, canes become brown and dry and will not produce fruit again.



Before pruning.



After pruning.

Cut old canes to ground level as soon as possible after berries are picked. This allows sun to reach the new canes. Keep 4 to 5 of the thickest new canes per hill and cut weakest canes (under pencil size) to the ground. Cut undesired suckers to ground level. Keep a maximum of 4 to 6 canes to a plant if trained as a hedge.

Before winter, tie the canes to trellises or stakes. Cut the tops back enough to keep them from whipping in the wind. Cut these tips back to 5 1/2 feet in March.

If you have recently moved into a home with raspberries and are not sure if the plants are June or fall-bearing, leave the plants alone until the following spring. Fall-bearing raspberries will produce fruit on the lower portion of the cane during the spring.

Fertilizing

Apply bands of 1/2 pound ammonia sulfate (21-0-0) or 2 pounds fertilizer (5-10-10) per 25-foot row in March. Apply at the same rate again near the end of April. If using other formulations of fertilizer, consult the label for rates for berries.

HARVESTING AND STORAGE

Pick dry firm fruit as it reaches the peak of color and sugar development. Pick into very shallow containers early in the morning, when the berries are coolest, but after the dew is off. Avoid picking wet fruit, as it will deteriorate quickly. Raspberries have a shelf life of only 2 to 3 days in the refrigerator. Wash or rinse just before using, serving, or processing.



VARIETIES

A. Summer fruiting:

Canby. Hardest, very sensitive to wet soil, susceptible to virus.

Summer. Hardy, tolerates wet soil, slightly sour, good cooked.

Meeker. Least hardy, higher in sugar, best for flavor. Not suitable for poorly drained sites.

Willamette. Hardy, dark red fruit, tart but good, excellent cooked.

Skeena. Hardy, sensitive to wet soils, very good fresh or cooked.

Newburgh. Hardy, fair quality.

Latham. Very hardy, poor quality and virus susceptible, not recommended.

Goldenwest. Sweet, golden fruits.

B. Fall-bearing red raspberries (double-cropping):

Heritage. Very good, berries are large, firm, bright red. Vigorous canes need support.

Amity. Large firm fruit ripens earlier than heritage.

Fallgold. Not very productive; soft, but sweet yellow fruit.

C. Purple raspberries:

Brandywine. Large seedy fruit, fair to good.

Royalty. Large seedy fruit.

D. Black raspberries:

Hardier than reds.

Munger. The most widely grown.

Bramble characteristics and requirements

Red and Yellow Raspberries

Expected yield:	2 to 3 pounds per hill
Age to maturity:	2
Productive life:	8 to 10 years
Hardiness:	-20°F
Optimal pH:	5.8 to 7.0
Plant spacing:	2.5 feet apart in rows 6 to 10 feet apart

Purple Raspberries

Expected yield:	3 to 4 pounds per hill
Age to maturity:	3 years after planting
Productive life:	8 to 12 years
Hardiness:	-15° to -20°F
Optimal pH:	5.8 to 7.0
Hill spacing:	3 to 4 feet apart in rows 10 feet apart

Black Raspberries

Expected yield:	2.5 to 3 pounds per hill
Age to maturity:	3 years after planting
Productive life:	8 to 10 years
Hardiness:	-5° to -10°F
Optimal pH:	5.8 to 7.0
Hill spacing:	2 to 3 feet apart in rows 6 to 10 feet apart



PESTS AND DISEASES

Anthracnose

Anthracnose is a fungal disease. It occurs primarily on raspberry canes, but affects leaves and fruit. Canes show small, circular, sunken spots that are initially reddish to purple, but enlarge and turn gray with raised purple margins. Severe infections may girdle canes, causing die-back.

Leaves and leaf stems may show various degrees of purple spotting and abnormally small berries may ripen unevenly. The fungus is spread by splashing water and it overwinters on infected canes. Black raspberries are susceptible, as are some varieties of red raspberries.

Select resistant red raspberries varieties such as “Chilcotin,” “Heritage,” “Meeker,” “Nootka,” and “Willamette.” Space plantings, prune and train to provide good air circulation and reduce humidity. Do not overfertilize as excess nitrogen promotes growth of succulent, susceptible tissues. Remove old fruiting canes and all dead or damaged canes after harvest. Do not compost diseased materials.

A late dormant or delayed dormant application (lime sulfur) just before buds open may be adequate.

Verticillium wilt

A fungus disease contracted from the soil. The best control is to avoid planting berries in sites where the disease is apt to be a problem, such as old raspberry or strawberry beds, or places

where potatoes, tomatoes, and asparagus have grown. If verticillium is currently or is expected to be a problem, use raised beds with new, non-infested soil.

Virus diseases

Several virus diseases with leaf symptoms of stunting, crinkling, mottling, and vein banding infect raspberry plants. Many are transmitted by the common strawberry aphid. Plant certified stock and choose cultivars that are resistant to viruses. Control aphids because they can carry virus diseases from one plant to another. Renew beds if virus becomes an obvious problem. Avoid setting out new plantings next to old virus-infected plants.

Botrytis (Gray Mold)

Fruit rot is caused by a fungus that attacks many plants. Raspberry leaves, stems, flower buds, and fruit may be attacked. The worst damage is to the fruit, which often develops a powdery-gray fungal growth.

Plant varieties that show resistance to gray mold. Among these are “Shuksan,” “Totem,” and others with erect fruiting habits. Space plants to provide good air circulation and reduce humidity. Avoid overhead watering. Pick off diseased fruit and clean up plant debris. Avoid injuring fruit and cool promptly after picking.

Aphids

Aphids are small-bodied, pear-shaped insects. Aphids on raspberries are typically found on the young growing tips of canes or on the undersides of leaves. Aphids produce honeydew, which attracts ants. Plants may also become covered with a dark growth of sooty mold. Honeydew and sooty mold reduce the quality of the berries. Raspberry aphids also transmit raspberry mosaic virus.

Plant certified, virus-free stock. Encourage natural enemies including lady beetles, lace-wings, and parasitic wasps. Control ants that may protect aphid colonies from predators.

High levels of nitrogen in the foliage encourage aphid reproduction. Switch to a slow-release or low nitrogen fertilizer when practical. Aphids can be controlled with insecticidal soap, diazinon, or malathion.

Spider mites

Spider mites are tiny, eight-legged mites. Several species may attack raspberries, including the two-spotted spider mite. Spider mites typically feed on the undersides of leaves, causing a yellowish speckling of the leaf. Adults overwinter in plant debris or on canes. Mite problems are worse in hot, dry, dusty conditions. Healthy plants are more tolerant of damage, while drought stressed plants are more susceptible.

Predatory mites and insects help control mites. Avoid use of broad-spectrum insecticides that also kill beneficials. Hosing mites from plants with a strong stream of water provides good control.

High levels of nitrogen in the foliage encourage mite reproduction. Switch to a slow-release or low nitrogen fertilizer when practical.



Blackberries have many of the same requirements as raspberries. They are more tolerant of soil conditions, but are much less hardy. They are divided into upright or erect and trailing cultivars, the erect being the hardiest. Mulch the base of the plant with straw or sawdust after one or two hard frosts.



Suggested cultivars:

Thornless Blackberries

Chester. Large firm, mild-flavored fruit is borne late in the season. Chester is resistant to cane blight.

Thorny Blackberries

Cherokee. Canes are erect, vigorous, and productive. The fruit matures during mid-season. Canes are susceptible to freezing injury where winter temperatures fluctuate.

Darrow. One of the most cold-hardy blackberries. The fruit begins to mature in mid-season and is borne over a long period of time. Berries are large, firm, and of good quality. The berries are best suited to processing. Growth habit is semi-erect and the plants benefit from some support.

Illini. One of the most cold-hardy. The canes are very vigorous and productive. Fruit quality and flavor are good.

Bramble characteristics and requirements

Blackberries

Expected yield:	6 to 7 pounds per hill
Age to maturity:	3 years after planting
Productive life:	8 to 12 years or more
Hardiness:	+5°F to -20°F
Optimal pH:	5.5 to 7.0
Hill spacing:	5 feet apart in row



College of Agricultural, Human, and Natural Resource Sciences

Use pesticides with care. Apply them only to plants, animals, or sites as listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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